Health Communication Design for Low-income and Low-literacy People in China

- *Designers as a core organizer contributing the whole process*

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Abstract

Health communication design has attracted increasing research attention in recent years. When designed effectively, health information can be disseminated to specific groups and bring major benefits by promoting healthy behaviours. In mainland China, the maternal and child health (MCH) communications sector has thrived as a result of the steady relaxation of the country's fertility policy (from the abolition of the one-child policy in 2015 to the implementation of the three-child policy in 2021). There is now an abundance of products related to health knowledge dissemination, as well as the emergence of internet influencers discussing health issues. In the field of academia, research in this area primarily focuses on specific health issues, such as obesity, cervical cancer, diabetes etc., and mainly adopts a medical research perspective. Design research in this field often focuses on the quality of graphic design and users' experience of communication artefacts. However, the primary focus of such studies tends to be on middle-class, well-educated, urban users. As a result, the needs of low-literacy and low-income users tend to be largely overlooked, both in research and in communication product development.

This study investigated the development of the dissemination of MCH knowledge designed for low-income and low-literacy groups within the context of mainland China. Focusing on this demographic, the study examined three main components: health behaviour, health needs, and the design and development status. The outcome of the research was the development of health communication strategies and recommendations tailored to the social and cultural circumstances of low-income and low-literacy Chinese users in non-urban communities. These strategies are informed by preliminary research on the influence of culture and social environment on the ways in which low-income, low-literacy people perceive health issues and adopt health behaviours. Methodologically, three types of qualitative methods were applied. Firstly, questionnaires were employed to understand the general health preferences of different groups (based on gender, age, marriage status, etc.). Secondly, semi-structured interviews were conducted to uncover the specific motivations behind certain health behaviours and users' opinions on existing MCH strategies/designs. Finally, users' preferences for MCH design products were explored in practice in three co-design workshops.

The discussion starts with analysis in the context of the preferences and behaviours of low-income, low-literacy participants based on survey results. These aspects were

subsequently analysed. The findings indicate a preference for social media rather than specific apps to access health information, as well as feelings of doubt and distrust regarding the health information to which users are exposed, especially when disseminated through commercial platforms. Finally, possible strategies and media design directions for MCH communication are discussed based on analysis of the outcomes of three co-design workshops conducted with the target audience.

The main output of this research is the proposal of a health communication framework, which revolves around three dimensions: designer attitudes, cultural inclusion, and visual design.

Keywords*: health communication design; health design; low-income; low-literacy; China*

Acknowledgment

How time flies! I can still recall the cold winter that greeted my arrival in Lancaster, when a drizzly morning marked the beginning of my PhD journey.

I am deeply grateful to my two supervisors, Emmanuel and Serena, whose selfless assistance helped me get through many difficult moments. Especially during the pandemic, you were among the few people I could contact and receive significant guidance from. Under your guidance, I have been able to successfully complete my academic journey. I have always considered myself fortunate in my academic pursuits to have encountered the best supervisors in the world during my undergraduate, master's, and doctoral stages.

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Finally, I want to thank my parents. It's so difficult to express my gratitude in words, as mere language feels too pale to do justice to how I feel. From a young age, I have always received your selfless love and support. You have respected every choice I ever made, never placing excessive importance on trivial matters. Instead, you have always focused on shaping my character and my attitude to the world. I believe you are the best parents in the world – kind, down-to-earth, and wise. Whenever I find it tough, just thinking about you immediately fills me with energy and motivation. Your love is the source of my continuous efforts, and I truly love you both immensely.

Declaration

I hereby declare that this thesis has been composed solely by myself and that it has not been submitted in substantially the same form to any previous application for a higher degree elsewhere. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

Linli Zhang

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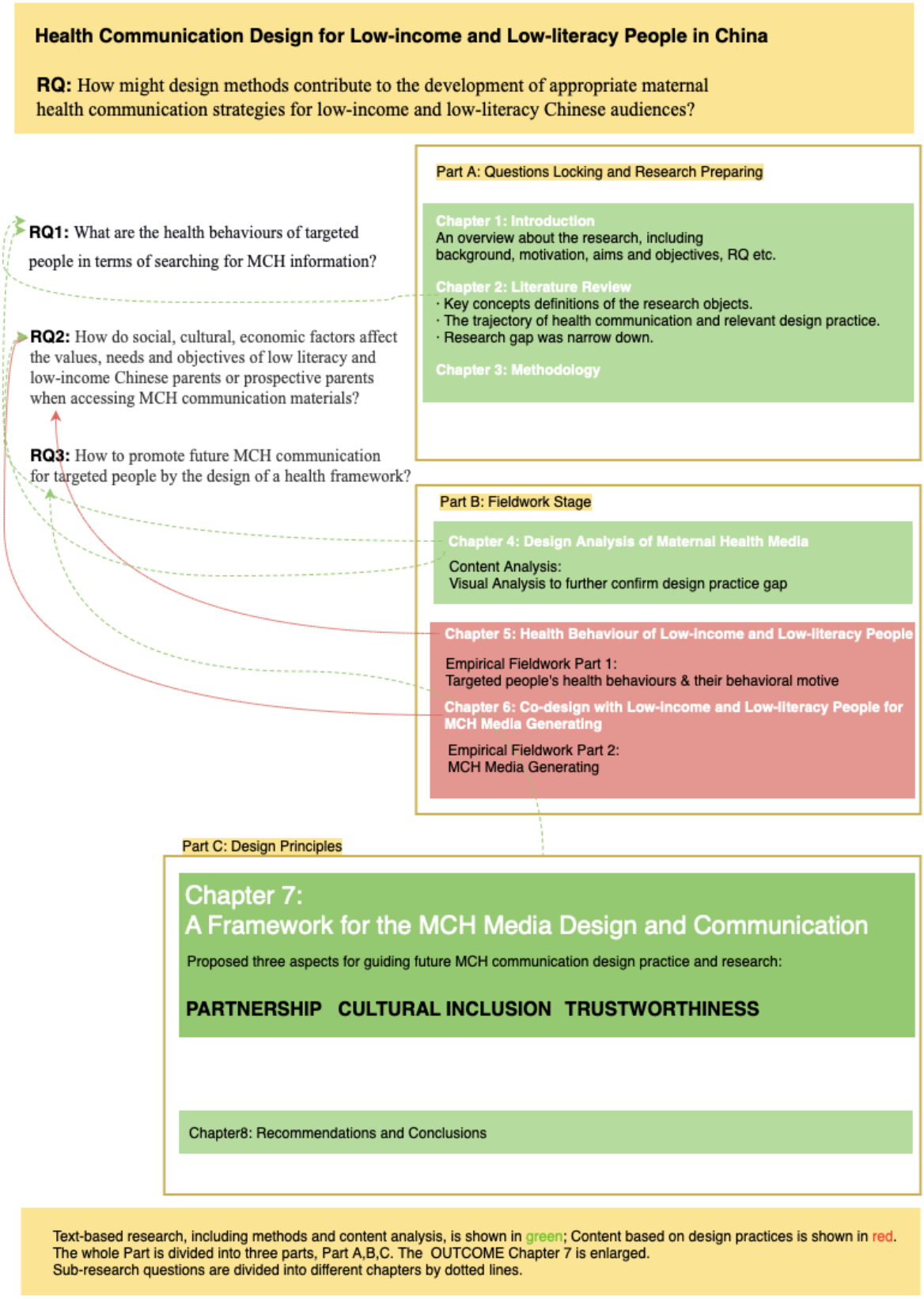

Figure 1 Journey map of the research.

Introduction

This chapter establishes the background and motivations for the research (1.1); specifies the research scope and direction (1.2) including the aim and objectives, research questions, location of field research, methodology of the research, main research findings. The structure of the thesis is also outlined (1.3) which helps the reader navigate through the materials.

1.1 Research Background and Motivations

In the last decades, the Chinese government's attitude towards family planning has undergone significant changes, from strict control of birth rates in the 1980's to encouraging births in recent years. The underlying reason behind this is that, with the passage of time, the population born during the peak fertility period (1949-1978) has gradually entered the middle and elderly age groups, leading to relative shortage of young generation. During 1949-1978, China had just emerged from years of continuous warfare to achieve social stability. The government of the People's Republic of China, led by the Chinese Communist Party, was in its early stages of establishment, and there was a need for widespread reconstruction. Consequently, both the Chinese government and the general population exhibited a particularly strong enthusiasm for childbirth. Meanwhile, younger generations of Chinese individuals are prefer bearing less child, resulting in a continuous decline in the birth rate. It could be seen from the public statistic from the National Bureau of Statistics (NBS), the birth rate in mainland China decreases for 8 years since 2016, from 13.57% in 2016 to 6.39% in 2023. Against this backdrop, the Chinese government's attitude towards birth policy from limited to encourage.

Tracing back to history, one of the most impactful family planning policies in modern China was the *one-child policy* started in 1979. It was originally adopted considering about overpopulation at that period. The government feared that rapid population growth would strain resources, hinder economic development, and lead to social instability (Fong, 2016). Within this policy, each family was generally only allowed to raise one child. Even there are exceptions, a group number of people, through concealing and deceiving enforcement personnel, have also raised more children. However, there are still huge amount of family only gave birth to one child. A study in 1996 (one child policy period) shows that 50.3% families in Shanghai are one child family, and the rate in Beijing is 49.9% (Liu & Liu, 1996). This policy was enforced for several decades, and starting from 1990, China's birth rate has been consistently declining (Zeng & Hesketh, 2016). In recent years, with the increasingly severe

issue of aging (from 26.32 million in 1953 to 200 million in 2021, accounting for 4.4% to 14.2% of China's population aged 65 and above; Chinese Society of Social Security, 2022), the working-age population between 16 and 59 years old has continued to decrease, and it stands at 880 million people, a reduction of over 40 million people compared to 2010 (CEIC Data, 2023). Eventually, the continuous decline in population and its potential risks drew the attention of the authorities, leading to the formal abolishment of the *one-child policy* in 2015. The new policy allows each household to have two children, but after experiencing a brief baby boom (a 0.2% rise compared to the previous year, 2014), China's new-born birth rate has continued to decline even further (Ni, 2023). So further, a policy of allowing each household to have three children was launched at the end of 2021 (p.45).

In addition to the implemented policy changes, the Chinese government's active encouragement of family planning can also be observed from another perspective, which is the annual National People's Congress held every March in Beijing. This is the highest legislative body in China, and is composed of representatives from various provinces, autonomous regions, and directly governed municipalities, as well as special administrative regions like Hong Kong and Macau. representors on this session can propose and draft decisions and policies (Paler, 2005).

In 2023 National People's Congress sessions, many representatives have clearly mentioned proposals related to family planning. For example, in this year’s congress, Ding Xuemei, a representative from Jiangmen (江门, a city in Guangdong Province), stated that China should elevate the encouragement of family planning to a national strategic level by providing subsidies for child-rearing and tuition assistance to reduce the cost of raising children and thereby increase the birth rate. In 2018, Zhu Lieyu, a representative of the Guangdong Provincial People's Congress, proposed the idea of allowing the national policy to permit up to three children (at that time, the policy allowed a maximum of two children). Even though there's a lack of specific statistical figures, the relevance of the conversations within national strategic policies demonstrates that issues related to childbirth have evidently garnered significant attention within the public discourse.

The attitude of prospective and new parents towards childbirth and child rearing has also shifted significantly, with more importance being given to information learning and child education. Currently, the main demographic in the maternal and child group is concentrated among those born in the 1990s and 1995s. This group places a higher emphasis on cultivating their children and paying special attention to acquiring scientific knowledge

related to raising kids from various sources (Zhao et al., 2020; Qiao et al., 2021), and are particularly fond of online communication (Zhu et al., 2020). According to a 2023 survey, over 38.5% of new maternal and child groups engage in daily online activities to seek or exchange information about maternal and childcare. Compared to 2022, over 50% of relevant consumers have increased their expenses in this area. From the listed above, it's evident that contemporary individuals are paying more and more attention to the maternal and childcare communication field (Juliang Cuculation 巨量算数,2023). This constitutes the background basis of this study.

1.1.1 Motivation

The increasing attention has gradually turned Maternal and Child Health (MCH) communication design into a popular research direction. In existing studies, research from perspectives such as communication and sociology has garnered significant attention. These studies focus on quantitatively comparing the health communication effects within specific groups (DiMatteo, 2004; George, Duran & Norris, 2014), including the communication between doctors and husbands (Roter & Hall, 2004), and the practical dissemination of health knowledge to specific populations (Snyder, 2007). While these studies contribute to the development of health communication from a multidisciplinary and multi-angle perspective, they lack a design-oriented viewpoint.

The combination of design and health communication is not a new topic. Designers are widely involved in many health communication activities. At the international level, designers can be seen participating in or leading health communication activities (Backer, Rogers & Sopory, 1992; Schiavo, 2013). However, such research is currently mostly concentrated in Western contexts, and health communication design in the mainland China is still in a developmental stage (Liu et al., 2020). The few studies conducted are mostly university-based and lack representation of low-income, low-cultural-level groups (Wang et al. 2019). The lower attention does not imply lower demand. Oppositely, as a result of lower literacy, this group may face more health challenges and need more health communication assistance (Nutbeam, 2000). Moreover, the market-oriented nature of activities primarily focused on gaining profits also inevitably excludes this group from mainstream health communication efforts (p.262). This also contributes to the neglect of target groups in the field of health communication.

This study seeks to address the current research gap in studies on maternal and child health communication targeting low-income and low-literacy people in mainland China, and to delve into the integration of design and health communication.

1.1.2 The Values of MCH research

Conducting health communication design targeting low-income and low-literacy people in China holds significant importance. From the perspective of social development, such design activities can promote the development of health equity to some extent. Numerous studies have previously indicated that low-income and low-literacy people often face higher levels of health inequality (Nutbeam, 2000). Through the implementation of relevant design activities, better meeting targeted people's specific health needs can contribute to achieving broader health equity. Driving more proactive health behaviours through the communication of health design is also crucial for preventing potential diseases. This, in turn, helps reduce social instability factors arising from health issues.

For the local community, this was a beneficial attempt, employing plain language, understandable visuals, and interactive formats to engage the target participants and contribute more effectively to activities related to their health and well-being. This series of activities will also have a positive impact on the future implementation of similar health communication initiatives locally, providing valuable references for other communities. China has many regions similar to the one I chose for my research, underdeveloped and home to a large population of low-income and low-literacy groups. The initiation of this study undoubtedly has a positive impact on promoting the development of health communication in similar areas.

For the core target group of the study, health communication design activities can provide them with more accessible health materials, thereby helping them enhance their health awareness and literacy. This, in turn, aims to improve their quality of life.

In summary, conducting health design research specifically for individuals with the targeted people in China contributes to enhancing the overall health status of society, promoting health equity, alleviating the burden on healthcare, and fostering sustainable social development. This research activity is profound in its significance and has far-reaching impacts.

1.2 Research scope and direction

This section offers the research scopes, objects, research questions, and other key information.

1.2.1 Aims and objectives

The aim of this research is to propose design guidance and strategies to improve the health wellbeing of low-income and low-literacy people who live in Mainland China.

In order to achieve this aim, the research explores the past and present of MCH communication from a design perspective, with a particular focus on the target audience and taking into account their health behaviour characteristics.

Correspondingly, six objectives are summarised here:

1. Clearly identify the existing issues in both current academic research and design practices.
2. Conduct surveys among a wide-ranging audience to determine the characteristics of individuals with low income and low literacy levels regarding their access to health information and their own health behaviours.
3. Precisely target the specific group and understand the motivations behind their particular health behaviours.
4. Understand the target group's needs and usage of health media.
5. Collaborate with the target group in design practices to create media that aligns with user expectations.
6. Develop a design framework to guide similar research/health information dissemination activities in other regions or among different ethnic groups in the future.

1.2.2 Research questions

Key research question:

How might design methods contribute to the development of appropriate maternal and child health communication strategies for low-income and low-literacy Chinese audiences?

Followed by three sub-questions:

- What are the health behaviours of targeted people in terms of searching for MCH information? –their specific health features, and reasons behind.

- How do social, cultural, economic factors affect the values, needs and objectives of low literacy and low-income Chinese parents or prospective parents when accessing MCH communication materials?
- How to promote future MCH communication for targeted people by the design of a health framework?

1.2.3 Location of field research

In order to ensure that the final design research outcomes benefit a broader population, the following considerations were made in the selection of participants. Firstly, all participants are from lower-middle GDP areas in China. This is because people in such areas generally have lower levels of education and lack stable sources of income, making residents in these areas' natural subjects for this study. Secondly, considering the vast territorial expanse of China and significant regional differences, after reviewing the GDP of different regions over the past two years, the core participants were narrowed down to four provinces: Shanxi, Shaanxi and Henan. These three provinces are at a medium to lower level of economic development among the 34 provinces in China (NBS, 2024).

In terms of specific participants selection, different methods were adopted. Online surveys were distributed widely across the selected four regions for the study. As it is difficult to accurately identify whether each respondent is low-income and low-literacy before they filling out the survey, I have specifically included inquiries about these two aspects in demographic sections of the questionnaire. This is to ensure that targeted people's information can be considered in the subsequent analysis when the survey responses are completed. For the subsequent interviews, I selected 21 participants from the four provinces mentioned earlier based on three criteria: lower cultural level (high school education or below), low income (monthly income below 300 Pounds/2,500 RMB), and have child(ren) under 3 years old. After selection, 1 to 1 in-depth interviews were done. Finally, three co-design workshops were organised in Xiangyuan County, Changzhi City, Shanxi Province, and 18 people participated in. Figure 2 shows all three types of participants' location around the country, and further detailed information can be found in Chapter 3.

Figure 2 An overview of participants in three main fieldwork methods.

(This is the administrative map of China, source link: https://www.nationsonline.org/oneworld/map/china_administrative_map.htm).

1.3 Structure of Thesis

Chapter 1 Introduction

This chapter sets out the background, focus, methodology, and an overview of the research contained within this thesis. It explains the rationale for this study, its aims and questions and a summary of the chapters.

Chapter 2 Literature Review

This chapter presents an in-depth literature review that focuses on three areas of examination: i) defining the main concepts; ii) giving an overview of health communication's history and policies change; iii) the trajectory of MCH communication design.

The primary aim of the literature review was to construct an integrated foundation incorporating social background, low-income and low-literacy people, and the media of MCH design communication so to narrow down the research scope and focusing on the main research area.

Chapter 3 Methodology

This chapter provides a detailed description of the theoretical basis for using the selected methodological approaches, detailed plan and research process of fieldwork, and a justification for the methods used.

Chapter 4 Design Analysis of MCH Media

This chapter includes two parts. First, it presents a horizontal analysis of trending social media in health communication through an overview of four top media in China—WeChat, Weibo, Xiaohongshu, and TikTok. It aims to identify the diversity in communicating health information and hopes to use these results for the final framework.

Second, it also includes the evaluation result of the MCH app design. From the general introduction of visual design, then discussing how it meet or not meet the needs of targeted people's requirement. Design features of MCH media in the Chinese market were detailed introduced. Finally, I have identified the gap between the current app design and the targeted group's needs to emphasis the gap existed and the importance to conduct this study.

Chapter 5 Health Behaviour of Low-income and Low-literacy People in China

This chapter mainly shows the questionnaire & interviews result, which included the preference difference between different groups (various ages). I try to find out the reasons beyond their user preferences and combined with the analysis result and the product analysis from Chapter 4, I discussed how the current MCH media did not meet the target group's needs, and such unmet will also lead to a series of consequences.

For the interview part, this chapter explores the detailed design principles of health communication for the targeted group via interview. It analysed the dominant role—young females in accessing relevant information, and the contribution of other family members such as husbands and elders. At the same time, children as self-conscious individuals in MCH campaigns, but always been ignored are also discussed in this section.

Chapter 6 Co-design with Low-income and Low-literacy People for Generating MCH Media

The chapter mainly include two parts, one is a set of games to play with targeted users for the desirable MCH media generation, another is guidance and reflection of how to cooperate with low-income and low-literacy Chinese that are still a gap in current research. At the first part, start from observing user experience to understand their self-unawareness barriers, then games like scene mocks, functional requirements, visual preference, contents, and prototyping were conducted in order to deeply understand targeted users' requirement and thoughts. At the second part, group features were discussed to give detailed guidance for activity organisation, and the whole collaboration process was also rediscussed to find out any noticeable issues.

Chapter 7 A Framework for the MCH Media Design and Communication

This chapter provides a framework, which includes three key aspects-- Partnership, Cultural inclusion, and trust. This framework is comprehensively covering the designer's perspective, content presentation and visual design of MCH media. The partnership is thought the most important mindset for designers to conduct similar activities, and it also give specific advice for set up relevant campaigns. Then, cultural inclusion was proposed, since it continued to be mentioned by participants that current media did not suitable for the context of their local custom. Then, trust, a word that throughout the whole study, was discussed. It is not only frequently mentioned by participants, but also is the inner force for them to pick up specific health behaviour. Correspondingly, a set of advice was given for further research considering. At the most finally part, the potential applications beyond the research groups and areas were explained, covering various ethics and people from Mainland China and other areas around the world.

Chapter 8 Recommendation and Conclusion

As the conclusion section, main findings and outcomes and the recommendations were given. Contributions and potential beneficiaries were highlighted, along with the rethink of limitation and potential improvement.

CHAPTER 2 Literature Review

2.1 Overview

The content discussed in this chapter serves as the premise and foundation for the entire research, making it of great importance. It commences by defining the main concepts, delving deeply into the target group and the main beneficiaries (females), as well as other stakeholders, such as husbands and household elders. In establishing the scope of the research, specific cultural backgrounds and social situations from the real world are incorporated as support in an attempt to provide reasonable explanations for each group that appears in this study. Furthermore, the economic and cultural backgrounds of the beneficiaries are explored to facilitate the reader's understanding of the research subject. It is crucial to have an initial impression of this group at this point, even though this understanding is further shaped by analysis of the subsequent fieldwork data.

The second part of this chapter focuses on the historical development of health communication and policy change. This includes the evolution of China's family planning, media transformation, and the crucial platform for current MCH communication, the internet, all of which are discussed in great depth. This section concentrates on tracing the evolutionary patterns from a historical development perspective. Deriving insights from historical developments and providing references for future growth is essential. In terms of narrative, emphasis is placed on the developments in the contemporary era to offer more insights and reflections for the subsequent fieldwork.

If the second part leans more towards a general historical narrative and discussion of current trends, the third part is more inclined towards literature research. This section, focusing on the keyword "MCH communication design," discusses studies from mainland China and other countries that offer meaningful insights. The discussion primarily centres on the current research status in the Chinese context and on similar studies to this (e.g. research in underdeveloped countries or regions targeting low-literacy groups of other ethnicities). Through a critical thinking approach, there is thoughtful reflection on these studies.

Finally, in the conclusion section, the discussions and conclusions of this chapter are summarised once again, narrowing down the scope of the subsequent research and pinpointing specific research gaps.

2.2 Main Concepts and Definitions

2.2.1 MCH information audiences: beneficiaries

'Maternal Health' refers to women's health during pregnancy, childbirth, and the postpartum period, whereas perinatal health refers to health from 22 completed weeks of gestation until seven completed days after birth (Fahey & Shenassa, 2013). Child health is the health of children six or under six years old (World Health Organization [WHO], 2024). One of the strategic goals of Chinese family health and planning policies is to improve the well-being of mothers, infants, and children, whose well-being determines the health of the next generation and can help predict future public health challenges for families, communities, and the health care system (Healthy People, 2020). This aim sits within broader guidelines from the World Health Organisations (WHO), which state that maternal and child health matters relate to every person, society, and country, and should be viewed from both a human rights and well-being perspective as highly important topics (WHO, Mental Health, 2024). Although in the literal sense maternal and child health communication only refers to mothers and infants/children, in the actual communication activities, it will involve a broader range of other family members. Therefore, it is necessary to provide a detailed explanation of the stakeholders involved in the following sections.

What worth noting is that the term "rural" mentioned repeatedly below does not refer to rural areas in a geographical sense, but rather to individuals born in rural areas who may have moved to urban areas but still belong to the low-income group. China's household registration system distinguishes this group from those originally born in urban areas. The government officially registers and tracks its citizens' residence, migration, and categories and regulates access to social services such as education, healthcare, and housing based on this classification. Historically, it has created disparities between urban and rural residents regarding access to public services and opportunities. Over the years of development of this system, it still plays a significant role in Chinese society and administration (Song, 2014). Therefore, all the "rural" mentioned in the following text refer to the low-income groups born in rural areas and have rural household registration.

2.2.1.1 Older generations' impact

Even though the younger generations (mothers and fathers) are the main protagonists in caring for children, the older generations (i.e., grandparents) also play a vital role in childrearing activities, especially in the context of Chinese traditional practices and culture

(Burnette, Sun & Sun, 2013). One important reason is that multiple generations often live in the same house in a less-developed area, usually with the paternal grandparents by the Chinese tradition of "filial piety"(孝道), so naturally, the old may interfere in many home affairs (Liu, 2014). According to the Six National Census in 2010, 13% of urban Chinese families, 13% of suburban families, and 20% of rural (low-income) families had three or more generations living in the same household (The Sixth National Population Census, 2012). Compared with previous investigation (p.2), the number of rural multi-generational families had increased (p.3). A comparison of urban and rural data indicates that the percentage of rural senior citizens living with their children and grandchildren, living with their children only, or living alone is higher than that of urban seniors in the same circumstances. Apart from customs, low-income is another important factor in this phenomenon (Silverstein, Cong & Li, 2006).

One reason for the different rates of rural senior citizens living with their children is that senior citizens in rural areas rely more on their children for support and care since they do not receive any pension (Cai et al., 2012). The lack of an insurance system to sustain the basic living needs of elderly individuals in rural areas is also widely criticised (Campbell & Ikegami, 2000). Indeed, more broadly, Qiao, Lian & Su (2019) report that state provision is limited for most people. Although the urban–rural gap in care is not as wide as in other welfare provisions (e.g., social insurance, retirement pensions and healthcare), it is still significant. This divide is most evident in changes in childcare provision. In urban areas, care services provided by the state and employers for the children of working mothers have been reduced, while the number of private-sector childcare enterprises is growing (p.79). Meanwhile, in rural areas, many farmers have migrated to urban areas for work, leaving their children behind in caring for their elderly parents. As a result, the elderly care of children in rural areas is unavoidably insufficient. In China, childcare is a mixed regime: families are the main care providers for most children, and the government plays a residual role, providing care services for a limited number of children without family care through institutions funded by the state. As there is no policy to provide protection and support for families, many children in rural areas live long stretches of their childhood without seeing their parents (Shang & Wu, 2011). Families in urban areas, however, can access caregiving services provided by businesses. This situation has far-reaching consequences for the traditional care regime in China, especially in rural areas.

Furthermore, in the Chinese traditional context, caring for a grandchild is an expression of family altruism (Silverstein, Cong & Li, 2010), considered to demonstrate a family's harmony. Caring for each other within different generations is considered a virtuous circle in

which the young generation can spend more time on their work, and the older generation can prove their self-worth by contributing to the family (Schulz, 2020).

2.2.1.2 The role of the male in child caring

Chinese families and fathers differ to some degree from Euro-American families with respect to parenting traditions, family structure and gender roles (Hewlett, 2017). Chinese fathers are now entitled to ten days of paternal leave around childbirth, but this right needs to be well-known and widely implemented (p.320). One important reason for the situation of "father absence" can be attributable to the "floating population" (流动人口), in which men who leave their places of origin alone to find work, often moving from rural areas to cities (Shwalb, Shwalb & Lamb, 2013, p.23). As a result, the growth of the "floating population" poses an impediment to fathering and parenting. The latest governmental statistics show that the floating population in mainland China has reached 239 million (National Bureau of Statistics (NBS), 2019), most of whom are young migrant workers (mostly male, mean age=27.3 years) who lack higher education, and training opportunities and social resources (Law & Xu, 2013). Floating fathers, frequently with working wives, leave behind a growing number of "skipped generation families" (隔代家庭) consisting of grandparents and children. The chronic absence of a father in a family also reflects the traditional notion that "the man goes out to work while the woman looks after the house ('男主外, 女主内' in Chinese)", which still prevails in many parts of mainland China (p.147). In the Chinese context, it means that each family member performs his/her functions in order to ensure a harmonious atmosphere in the family.

Yee et al. (2016) analysed and compared the effects of parenting beliefs and fathers' involvement of 459 Chinese and Korean couples with children aged 3 to 5 years old. The authors found that Chinese mothers more frequently controlled their father's parenting than Korean mothers, which has a significant influence on the father's parenting involvement. Excessive intervention has caused the father to develop a certain degree of resistance to parenting. This resistance has led the mother to take on more parenting responsibilities, intensifying family conflicts. This study vividly demonstrates that even in South Korea and China, in similar East Asian contexts, mothers and fathers have very different parenting roles.

The complicated social reality discussed above has substantially increased the diversity of the Chinese population and complicated the task of maternal health information communication (Li, 2004). The most prominent manifestation of this complication lies in the

diversity of the information recipients, involving many stakeholders. Also, the discrepancy between direct maternal involvement in the everyday practice of childcare and the influence of paternal decisions over family matters complicates strategies of maternal health information communication. While maternal and child research may seem only to target two groups of mothers and children, it does need to involve a wide range of family members. Therefore, this research aims to study this group systematically from a comprehensive perspective. According to the level of participation in the parenting process, I divided the participants in this study into three categories: mother/pregnant women (core participants), fathers/older adults (secondary participants), and doctors (other stakeholders).

2.2.1.3 The difference between core user and wide stakeholders

Besides the previously mentioned elderly and male groups, the people involved in the entire MCH communication activities also include medical personnel. They play an important role in health check-ups and daily health consultations. However, unlike the primary subjects of pregnancy, stakeholders I mentioned are indirect influencers of maternal and child health communication as information senders. Pregnant women, as the sole recipients/core users of the information, play different roles in maternal and child health communication compared to other stakeholders.

Pregnant women are the core users of MCH information and the primary recipients of all information. After actively or passively receiving health information from the outside, they use their own judgment to decide whether to accept the information and put it into practice. From another perspective, husbands, the elderly, and doctors are the information transmitters. They primarily convey relevant information to pregnant women but are not responsible for implementation. Therefore, in the design of health information communication, it is important to distinguish between these two roles.

The design of information transmission for the core users—pregnant women—needs to fully consider the completeness and coherence of the information, as this is crucial for ultimately encouraging the core users to take health actions (Li, 2004).

For other stakeholders, different information transmission design strategies are needed. The elderly usually have a wealth of experience in the field of MCH, so they are more inclined to pass on their experiences to pregnant women, which may not always be scientific parenting information. Therefore, when designing for this group, it is important to distinguish between scientific information and traditional superstitions (Silverstein, Cong & Li, 2006).

For husbands who are less involved in decision-making in parenting activities, they are more likely to play with their children after work. Thus, the health communication design for this group should include more parent-child activities (Shwalb, Shwalb & Lamb, 2013, p.23).

Lastly, as doctors are transmitters of scientific information and have access to scientific and professional information, health information design for this group can focus more on showcasing the health behaviours of the target group and the characteristics of information reception.

2.2.2 The relation between economic, literacy and information receiving

At present, China is facing the coexistence of rapid economic growth and prominent social contradictions (Jinglun & Xin, 2020). A series of social contradictions, such as unequal economic development and gradual expansion of the gap between the rich and the poor, have become more serious (Yang, 2002; Chauvin et al., 2017). As the marginalised population in cities, low-income and low-literacy people are often ignored by social economy activities (Cingano, 2014). According to the classification from the report-- Income of rural residents in poor areas in the first quarter of the National Bureau of Statistics in 2020, 560 million people live with a monthly income of less than 1,000 yuan (exchange rate: 9, 112 pounds, extreme poverty); 310 million people perceive a monthly income of between 1,000 and 2,000 yuan (112 to 223 pounds), and 380 million people a monthly income of between 2,000 and 5,000 yuan (223 to 556 pounds). That is, about 1,250 million people's monthly income is lower than 556 pounds, far below China's poverty standard (people with incomes below 9,180 Yuan/ 1,000 Pounds are considered poor).

Although low-income people are large in number, they have been overlooked in the health communication market for a long time (Qiu, 2009, p.103). Low-income people are less likely to be sought out by many advertisers, spend money on subscription services, participate in politics as voters, or connect with others through the Internet or social media (Hamilton & Morgan, 2018).

Apart from the impact of income on the information received listed above, the educational level also has a relevant impact. In 2018, about 17% of the Chinese population aged 25 to 64 held a higher education degree. There is no common standard for dividing educational levels currently, but it is worth noting that more than 80 percent of Chinese only have a high school degree or less (McFarland et al., 2018).

Previous studies have shown that low-literacy and low-income groups have certain deficiencies in receiving health information, understanding health knowledge, and putting it into practice, compared with high-income and high-education groups (Hahn & Truman, 2015). Therefore, the low-literacy and low-income group is also known as an information poverty group (Chatman, 1996, p. 197). The information poverty group refers to people in a clearly disadvantaged position in information acquiring and utilisation due to the information exploring in contemporary society. From the perspective of demography, the demographic characteristics of information poverty groups include the elderly, women, rural people, low-educated population, and low-income population etc. (p.189). Fan, Liu, and Yan (2022) researched information differentiation in rural China, which shows that information differentiation between people with different economic statuses is very obvious. The information poverty group is actually economically disadvantaged. It can be seen from this that the information poverty group is the disadvantaged group in the general sense to a large extent, but with the advent of the information age, this group of people has added a new characteristic—information weakness. In addition, there are certain differences between men and women in information reserve, and a large proportion of information poverty groups are obviously biased towards the female population (Marcoux, 1998; Lingel & Boyd, 2013; Marshall & McKeon, 2013). For this argument, there are still many controversies. But it is worth noting that women, as the main subject of childbirth and nurturing, are more need to learn about maternal and child health information than men.

Although women are particularly concerned about pregnancy and infant knowledge due to their special family role—as mothers, their characteristics like low education and low income and other external conditions will also greatly affect their information-seeking, understanding and practice. Lewis (2017, pp.9-25) believes that the poor are separated from mainstream society, that may result in a set of psychological patterns of behaviours that adapt to poverty or the continuous fermentation of poverty situations, such as strong obedience, weak awareness of planning for the future, lack of ability to change, and doubt about authority, etc. These characteristics circulate within the impoverished groups and are passed on by the times, forming a culture of poverty (Lewis, 1969). From the perspective of cultural differences, there are obvious differences in cultural enjoyment of different classes in China, and the gap of cultural inequity between the rich and poor is relatively high (Pinches, 2005). From the perspective of differences between urban and rural areas, the total amount of fundamental public cultural resources and infrastructure in rural China is relatively weak and poor quality compared with the urban. Cultural institutions that serve rural areas are difficult to operate due

to the lack of financial support and less awareness of rural residents (p.62). Meng et al. (2012) examined the rural and urban residents' health information reserves. They found that the rural population's health knowledge base is weaker than urban residents. In the self-evaluation step, a majority of rural residents definite their status as information poverty, while urban citizens do the opposite.

Apart from their economic status that determines the obstacles to the information seeking of information poverty groups, the experience of human social information communication shows that there are clear gaps in information acquisition, understanding, processing, and practice among information subjects with different educational levels (Neuman, 2006). This gap is also reflected in the number of computers and smart devices people owned, and the time of use. Specifically, the Internet penetration rate in rural areas is 46.2%, while the urban Internet penetration rate is more than 80%. Netizens in rural areas account for approximately 50% of the total rural population, while the rate of urban netizens is about 80% of the total (CAC, 2019). The knowledge gap is also called the digital divide, which refers to the gap between those able to benefit from the Internet and those who are not (Sutherland-Smith, Snyder & Angus, 2003). Furthermore, even though individuals might be capable of accessing the Internet, many of them are thwarted by barriers to entry, such as a lack of devices or the inability to comprehend the information the Internet provides. In recent years, this notion has been further developed into the second-level digital divide. It is also referred to as the production gap, which describes the gap that separates the consumers of content on the Internet from the producers of content (Schradie, 2011). Simply put, with the Internet's popularisation, we have entered the era of information exploration. A large amount of reliable and unreliable information is presented to the audience, and information poverty groups usually cannot distinguish what they see. Also, some difficult scientific articles with terminologies cannot be effectively understood and put into practice. To sum up, various issues have caused the digital divide to grow. The situation mentioned here is also present in the residents of rural areas of China.

Besides, in the process of information seeking, although some information may be considered useful, people will often choose to give up seeking if more effort is required. For many information poverty groups, due to the lack of educational opportunities, many unawareness behaviours of them are not suitable for their own health, but since their limited knowledge cannot help them to identify poor behaviours, which may lead to poor results. What's more, living habits eventually accelerate poor results like illness and increasing poverty (Dutta-Bergman, 2004; Yu et al., 2016; Mou & Xu, 2020).

In general, China’s development in recent decades has brought tremendous changes to society and improved people’s living standards (Zheng, 2009). However, the gaps between the rich and the poor, between the urban and rural areas, have become increasingly prominent and profoundly affect MCH information communication. Especially the low-income and low-literacy MCH information audiences who lack the capability to seek effective information. As a result, their living standard and personal health may be affected a lot. Different life situations give rise to different information needs, and the information behaviour of low-income and low-literacy people has its particularities (p.13). In the information explosion era, while praising the abundance and convenience of information, we must also pay attention to the vulnerable groups that stand at the margins of society. Thus, based on these realities listed above, the targeted group of this study is a relatively broad MCH information audience that includes but is not limited to low-income and low-literacy pregnant women, fathers, and the older generation.

2.2.3 The capability of health information cognition and health literacy of targeted people

Addressing health literacy— the ability to understand and act on health information— is one of the most pressing issues in the health care system today. Accessibility of information, regardless of background, education, or literacy level, has been highlighted as one more pressing challenge in health communication (McCray, 2005; Zelezny-Green, Vosloo & Conole, 2018). The American Medical Association (1999) pointed out the future research on health literacy should focus on four areas: (1) health literacy screening, (2) improving communication with low-literacy patients, (3) costs and outcomes of poor health literacy, and (4) causal pathways of how poor health literacy influences health. The Institute of Medicine (IOM) report defines *health literacy* as "the degree to which individuals can obtain, process, and understand basic health information and services needed to make appropriate health decisions." The IOM views the issue as one that involves matching the needs of the individual to the information and services provided by the health care system. In China's current healthcare environment, there often is a serious mismatch between an individual's background, skills, and expectations and the information and services available to that individual (Shang & Wu, 2011). Especially people with low literacy levels, due to their limitations, do not often have access to appropriate information or cannot fully understand the information they have been exposed to and apply it in practice. Information communication is about meaning construction, which is driven by context (Knudsen & Haase, 2018). A person's situation

determines his/her thinking perspective and in turn, affects information to use or non-use behaviour (Solomon, 1999). This is also true for the targeted people in this study.

As mentioned earlier, the MCH communication design in China involves a wide range of stakeholders. In addition to husbands playing a significant role, elderly family members actively participate in the childcare process.

From the perspective of low-literacy pregnant women, Shieh et al. (2009) used a cross-sectional design to investigate health literacy and its association with the use of information sources and with barriers to information seeking in a sample of clinic-based pregnant women. Overall, low health literacy was not associated with the use of different information sources except for the use of the Internet. Pregnant women with low health literacy were less likely to use the Internet as frequently as pregnant women with high health literacy. Pregnant women with low health literacy had more personal barriers to information seeking, such as not knowing how to take care of themselves during pregnancy and not knowing how to use the Internet. No significant differences in contextual barriers, such as affordability and availability of information, were found between low and high health literacy groups. Study findings indicate that interventions to promote information-seeking skills and to improve access to information, particularly the Internet, may be helpful for pregnant women with low health literacy. Because there are many similarities between husbands and pregnant women, so here will not go into details.

A brief analysis of the information characteristics of the elderly is conducted here. Among the low-income population, the elderly exhibit lower cognitive and comprehension abilities than younger individuals. Weiss et al. (1995) examined health information seeking of low-income seniors. They had two findings in this research: 1) low-income older persons have poor reading skills; 2) many of these individuals do not use or understand written information, and instead, they obtain needed information mostly from television. Most importantly, written patient education materials and written administrative information for healthcare plans require reading skills far higher than the fifth-grade skills found in our population of low-income seniors. This research reflects on the literacy skills and communication methods of low-income older persons. In order to understand the difficulties that patients with low literacy with interacting with the health care system, Baker et al. (1996) designed focus groups and interviews with 49 patients. The author found that many patients recounted serious medication errors resulting from their inability to read labels. Patients with low literacy usually use a friend or family member as a surrogate reader since they rely heavily on oral explanations, visual clues, and demonstrations of tasks to learn new material. Because of their shame, patients with

low literacy may be unwilling to disclose their problems to healthcare providers, and screening tests of reading ability may be necessary to identify those who need special assistance.

In general, creating low-barrier material is valuable and meaningful for low-income and low-literacy groups to overcome difficulties in cognition, perception, understanding, and searching for information. Current issues on health communication urge designers to orient toward the subset of readers for whom the potential barriers are the greatest, that is, the readers who are less attentive, less interested, less knowledgeable, less skilled at reading, and less income (Centers for Medicare and Medicaid Services (CMS), 2020).

2.3 History, Policies, and Health Communication

2.3.1 The trajectory

There are two different views about the emergence of health communication in China (Huang, 1992). The first view is from the perspective of public health research, which argues that including health education or health promotion issues in the public discussion was the beginning of health communication. The landmark event was the first seminar on health education theories in 1987. In this seminar, communication theories were systematically introduced for the first time, and issues such as the application of communication theories in health education were raised. This also marked the beginning of communication theories gaining attention in public health (Yao & Jiang, 2006). The second view is from the perspective of communication. It is marked by the first proposal of the concept of health communication during a UNICEF/Chinese government project to promote maternal and child health literacy between 1989 to 1993. This is the fourth phase of the cooperation project between UNICEF and the Chinese government in the field of health. In this project, a health education program has been added to disseminate knowledge on maternal and child health care widely. This signifies the comprehensive acknowledgment of the concept of health communication in the prominent execution process (p.251).

Currently, the professional organisations of health communication in China respond to the propaganda department of local health institutions, and the health communication design has developed significantly in the last two decades (Zhang, 2009). Media advertising health information includes popular magazines like China's Health Education (the highest authority health communication magazine in China) and health communication forums, i.e., the Healthy China Forum, which has been operating for more than 15 years (Chen, 1997; Cao, 2009).

Broadly speaking, communication activities have existed in mainland China since ancient times (Huang, Ding & Liu, 2006). This non-strictly academic form of health communication is highly diverse. Simply put, it can be divided into two aspects: verbal health communication and non-verbal health communication. Verbal health communication includes conversations in interpersonal interactions and methods such as lectures. Non-verbal communication includes widely accepted health practices such as exercise and physical activity (p.179). The first officially recognized medical work in China, also known as the founding book of medicine, is called the Huangdi Neijing (in Chinese 黄帝内经). It was compiled during the Warring States period, covering a wide range of content, including various fundamental pathological knowledge and health care information.

There are also health-related proverbs and stories spread through folklore. The representative proverbs include "have breakfast like a king, eat lunch like a rich man, and eat less at dinner like a beggar (早餐要吃好，午餐要吃饱，晚餐要吃少)" "hunger does not overeat, thirst does not overdrink (饿不过量吃饭，渴不大量喝水)". The two proverbs focus on stomach protection. For the first proverb, Chinese medicine believes that breakfast is like a switch to turn on one day; thus, people must eat well. For dinner, it is near the end of the day, and people will hit bed a few hours later; thus, eating less is beneficial for digestion. The second proverb could be understood in the way that the more anxious people are, the more they need to do things slowly so as not to make mistakes. Eating is the same, if a person eats in a hurry, it will lead to digestive problems (Zhong, 2001; Zhang, 2008).

At the early time of the founding of the People's Republic of China (around the 1950s), health information was primarily disseminated by the government and the national public health department (Zhang, 2009). In 1987, the application of communication strategies in the field of medical education was first proposed in the first national seminar on health education. In 1996, Mi Guangming & Wang Guanren published a book named The Theory and Practice of Health Communication, in which they discuss the basic theory and provide an analysis of some representative health cases in China. In this book, the two authors started with the basic definition of health, symbols, etc., and relevant concepts, discussed the relationship between audiences and media in detail, and explained communication relationships, actions, and barriers. Examples include health consulting and community health activities are shown. After this initial publication, the number of books on health communication gradually increased, and a large number of overseas works were translated into Chinese. In 2000, Journalism University

(published by Fudan University) published the health communication paper--Health Communication and Prospects in China as the first professional journal of health communication in China. Zhang Zili published Health Communication and Society in 2008, dividing the research topics of health communication into nine parts. He also published another monograph, the Exchange of Body and Mind—Health Communication in 2009. This book studies the development of health communication, basic theories, and research fields and discusses some public health emergencies and health communication theories separately. It offers a deep analyses of health communication problems in China, such as healthy social marketing, rural health communication, and AIDS prevention. When sorting out the research results related to health communication, I found that the research related to the non-specialised audience appeared relatively late, while the earlier research related to health communication was more targeted at professional or academic audiences.

The 2003 SARS epidemic stands out as one of the notable landmarks in the progress of Chinese health communication. It demonstrated the importance and effectiveness of mass media for health education and information dissemination. At the peak of the health emergency, many professional health newspapers, magazines, radio stations, and television channels were established.

Soon after, in 2006, the health ministry and Tsinghua University co-sponsored the first health communication forum, the China Health Communication Forum, which is considered the beginning of mutual research on medicine and communication. The purpose of the forum is to build a health communication platform for the government, hospitals, media and academia to discuss how to deliver more accurate health information to the public through effective channels. As of December 2018, the forum has been successfully held for 13 sessions.

The outbreak of COVID at the end of 2019 further demonstrated the role of health communication to influence health behaviour in mainland China. During this crisis, the public mostly used online platforms to access health knowledge and the latest policies. Prominent Chinese social media platforms such as Weibo and WeChat played a crucial role by providing real-time information monitoring and early prediction and serving as essential channels for public information retrieval, healthcare services, and public opinion monitoring during the pandemic. However, the sentiments on social media can be irrational and influential, showcasing distinctive characteristics (Kiráľová & Pavlíčeka, 2015). Although the government and other authorities, i.e., hospitals and research institutes, will release relevant information through official accounts on Weibo or WeChat, some ordinary people/KoLs with certain social influences also release unverified rumors sometimes, thus causing panic and confusion among

the public. Although Weibo/WeChat employs a large number of programmers to review all the information posted, it also takes a lot of time to read, sift, delete in the face of a large amount of information, which also leaves a certain time for rumors to spread. Therefore, the widespread adoption of online communication allows broad public engagement in emergency responses. It is crucial to emphasise ethical online behaviour, privacy protection, and filtering out misinformation, those aspects are equally deserving of attention.

It can be observed that the behaviour of health communication existed in China long before the formal concept was established. From ancient times, even before the conceptualization of health communication, various forms of expressions such as proverbs and the "Huangdineijing" (黄帝内经, Yellow Emperor's Inner Canon) were indicative of health communication practices. The latest milestone in the development of health communication in China occurred in 1949 with the establishment of the new Chinese government. Since then, the trajectory of health communication has been progressing towards specialization, standardization, systematization, and diversification. The government has played a crucial role in shaping major policies and guiding the overall development of health communication. Concurrently, academia has served as a significant complementary force, contributing significantly to the field. Renowned universities, including the previously mentioned Tsinghua University, actively participated in health communication, combining academic research with social practices, and making substantial contributions. Discussing pivotal catalysts in the history of health communication in China, it is essential to mention the outbreak of SARS in 2003 and the COVID-19 pandemic that erupted in late 2019. The latter particularly elevated the integration of new media and health communication to new heights. Social media platforms such as Weibo and WeChat played a crucial role during the pandemic and its aftermath. They provided channels for official platforms to communicate, as well as accessible pathways for public discourse. Non-professional audiences leveraged the rapid development of mass media in voicing their opinions on public platforms, breaking the previous limitation of health communication to the elite class. The development of health communication in the digital media age undoubtedly offers significant advantages in mobilizing a broader range of participants. The research target involves women, the elderly, children, ordinary urban citizens, the rural population, and other groups.

2.3.2 Family planning and maternal and child health policies and programs

Since its founding in 1949, China has made several adjustments to its childbirth policy in 70 years. From the early days of the founding of China (about 1949 to the 1980s), the propaganda of "Many hands provide great strength (人多力量大 in Chinese)" was promoted to encourage childbirth so as to contribute to social development (Jiang & Liu, 2016). Later, in order to control population growth and promote economic development, in response to the severe shortage of natural resources and consumer goods under the planned economic system, the family planning policy (also known as the one-child policy) was adopted after 1979. It is fair to say that politics have always controlled China's fertility. In recent years of development, like many other countries, the rapid development of China's socio-economic culture has accelerated the decline in its fertility rate. After entering the new century, China's fertility rate is far below the replacement fertility, and this country is beginning to face increasing pressure brought about by the continued low fertility rate. In this context, the one-child policy was officially abolished in 2015 (p551.).

Increasing the fertility rate and improving the population's quality of life has always been the goal of the Chinese government (Healthy China, 2020). However, due to the uneven regional development and the large income gap between urban and rural areas, low-income and low-literacy people have always been marginalised, and their own MCH knowledge is also relative weakness (Zhang & Zheng, 2019). As for national policy, during the formulation of the 11th five-year plan in 2006, the Chinese government first included maternal health services in the basic public health services, and it also became one of the main tasks for ensuring maternal health at the 13th five-year health plan period. The newest Healthy China policy (2020), which was put forward in 2017, also prioritizes improving the health literacy of women and children.

In recent years, the government has issued several laws and policies to protect the basic health well-being of low-income people. According to the "Report on the Development of China's Maternal and Child Health Career" released in 2019 by the National Bureau of Statistics, the official health department needs to implement the five steps of maternal safety throughout the country, 1) pregnancy risk screening and assessment, 2) project management of high-risk pregnant women, 3) treatment of severe cases, 4) maternal deaths case report, and 5) hospitals internal notification system. In addition, China has also stepped-up efforts to promote natural labour, improving obstetric service, and maternal delivery experience, adding the number of professional institutions and staff. As of 2018, there were 26,000 midwifery

institutions, 180,000 midwives, and nearly 210,000 obstetricians in China (Xinhua, 2019). In short, the research of MCH communication in modern China has obtained sufficient and well-rounded development. Three out of four regional hospitals have maternal health departments responsible for caring for pregnant women and infants, and there are health communication organisations and institutions spreading nationwide. However, it is worth noting that most high-quality medical resources are located in developed cities and areas, while broader rural areas face a shortage of medical resources (Zhang& Zheng, 2019).

In order to solve the problem of imbalanced medical resources in China and the lack of access to high-quality and high-efficiency medical care for low-income populations, the Chinese government and UNICEF have launched several activities to help disadvantaged mothers and infants get better care and care. The current UNICEF Director, Henrietta Fore, have been said "we can use a pair of safe hands, well-functioning facilities and better quality of care to curb this pain before, during and after a woman becomes pregnant, and save millions of people's life" (2019). UNICEF officially started to cooperate with the Chinese government in 1979 and has carried out a lot of work in the protection of women and children. For example, the program-maternal and infant health led by the two organisations in 2005 aims to reduce maternal and infant mortality, but due to lack of public data, it is hardly to know the progress of the project and the results of the work. Early Child Development (ECD) is another far-reaching project which started in 2012. This project includes nutrition, health care, early enlightenment, and other comprehensive early childhood development services (Tan & Chua, 2022).

In 2014, WHO and UNICEF launched the Newborn Safety Project (ENAP), focusing on reducing neonatal deaths, strengthening neonatal healthcare services, and promoting the survival, health, and development of newborns. The project covers Qinghai, Ningxia, Guizhou, and Sichuan, four provinces with relatively high neonatal mortality. Moxon et al. (2015) measured the program effect of ENAP, they found that two factors—per capita GDP and financial subsidies for maternal health, have a significant impact on maternal mortality. It is also recommended that the central and local governments should continue to increase investment in maternal health while maintaining the steady development of the local economy. In addition, while investment in maternal health should be strengthened, infrastructure construction should also be strengthened, and the education level of grassroots service staffs should be improved to improve the quality and effectiveness of maternal and child health services. In addition, an important weakness of this project is that it only covers a few regions in China (four provinces), and these four provinces are located in the remote southwestern

mountainous areas of China. These southwestern provinces also have concentrations of some ethnic minority groups, such as Ningxia, an autonomous region for the Hui ethnic group. Different ethnic backgrounds may lead to different health behaviours. Therefore, research on the low-income and low-educational level residents in the vast Central Plains region (predominantly Han Chinese, accounting for 91.11% of the entire Chinese population) is still lacking.

In general, in order to protect the health of women and infants, the Chinese government and UNICEF also have made unremitting efforts and achieved fruitful results. The maternal mortality rate in China has dropped from 1.5% to 0.183% within 70 years, partly due to the efforts of the government, hospitals and other institutions, and professional workers and researchers in terms of improving the construction of the health care system, welfare, and other related fields. But what needs to be noticed is that the main focus of policy investment is still on disease treatment, reducing mortality, and attention to daily health and nutrition care needs to be put in place, which can be seen from the few numbers of relevant studies. As a powerful supplementary force, UNICEF has played a vital role in maternal health care in China. However, extensive research and practices related to MCH communication for groups residing in other regions are still lacking.

2.3.3 Media transformation

The history of Chinese communication media in a broad sense can be traced back to the Song dynasty (960-1279), when there was a similar newspaper named 'Di Bao', but it's without cultural value, just a kind of "government gazette" (Huang, Ding & Liu, 2006). The substantial breakthrough and transformation from traditional advertising to the modern one of the Chinese advertising industries will have to wait until the late Qing Dynasty (the 1840s). At that time, a variety of advertising media was introduced into China like magazines, street signs, and window displays. The emergence of such novel communication strategies encouraged Chinese consumption. The main reason for this phenomenon can be traced to foreign merchants' urgent need to sell their goods, which were mass-produced, following the industrial revolutions in the early 19th century (p.560).

The most significant symbol of modern advertising development is the invention of the newspaper. The first newspaper in China was launched in 1833 and named Eastern Western Monthly Magazine. The acceptable, most influential communication newspaper in modern China was created in 1872—ShenBao (申报), which developed many neoteric advertising

strategies to make a profit. Newspapers and periodicals are the two main mass media in modern China. However, the development of the magazine industry had been stagnant for a long time since its born and this condition was changed until the 1920s (Wang, 2000).

Between the 1950s to 1970s, it was the transition period of Chinese posters (p.157). Because of domestic political problems, mainstream posters in that period have distinctive picture characteristics. The biggest difference from the previous posters is that the theme changed to celebrate the future from the disclosure of the darkness and the spurring of the struggle. That is political posters that are combative and satirical against imperialism and feudalism evolved into posters that eulogise the leaders and heroes of this period and show the production and construction of new China. Also, advertising expression changed from cartoon and printmaking, the main style of the first half of the 20th century, to ink and oil painting. Because most of the poster creators at the time were not trained sufficiently in character drawing and professional drawing skills. However, it can still be seen that at that stage, people had a certain degree of cognition for visual aid propaganda, and designers/advertising staff also put this concept into practice.

In 1958, China's first television station BTV (Beijing TV) started operating. From then on television was becoming a standard household appliance in a typical Chinese family. As an important medium for broadcasting advertising, television also marked China's media development entering the modern era. However, because of the cultural revolution (1966-76), the domestic commercial advertising industry had stopped developing adverts for about ten years. During this time, all kinds of advertisement media were used for political purposes, non-commercial advertising existed, and many media like neon-light advertisements were vanishing for a long time. Developed until 1979, there were only sixty-nine newspapers in the country, all run by the communist party and government. One of the biggest features of this time is the colour scheme of design works. The two commonest hues were red and light yellow, which implied the sunny connotation of Mao Zedong (China's first state president) shining on the land. Another distinct feature is the symmetrical composition, conveying a sense of stability, dignity, neatness, and serenity. From the development during this stage, it can be seen that national politics will have a decisive impact on health communication. Fortunately, this relatively negative influence did not last for too long.

After a slow development or even stagnation for ten years (Dikötter, 2016), China ushered in a new generation of leaders, bringing new policies, namely the policy of reform and opening up. This policy began in the later 1970s and marked a shift from the previous strategy of isolation and non-engagement in foreign trade to actively embracing foreign investment and

collaboration. The new approach also encouraged all aspects of China's domestic business and cultural development. Under such context, overseas agencies and companies have returned to Mainland China, and health communication has ushered in a new round of development. Traditional paper media, newspapers, magazines, and books on spreading MCH information have played a prominent role. There are at least 10 journals dedicated to publishing health communication articles and representative magazines like Health Pregnant, Chinese Reproductive Health, Mother and Baby's World, Healthy Mother, Mother and Baby. Most of them have e-books versions. Also, most of them are diverse in form and rich in content not only about MCH information, but also with games in parent-child campaigns and entertainment. Thousands of books can be found by using the search keywords" maternal and child books" on the most famous shopping website, Taobao. All of the books with colourful contents and various types, covering health care information in different periods, from the very beginning, The First 40-week Pregnancy to the pregnant How to Eat When Pregnant, until childbirth Pregnancy and Child-rearing, also involving infant education, diet, pregnancy taboos, early education, infant mental health, and other aspects. It could be said that the traditional paper media in the current market covers almost every aspect of pregnancy requirements (Zhang, 2007).

The "Open Door" policy has also led to rapid development in mass media, especially new media development, along with the prevalence of computers and the popularity of the Internet. Large commercial news websites like Sina and Soho, and one of the most important social networks, QQ, were successively created. Sina blog is a kind of public social media that communicates ideas and perspectives via the format of long articles on the website, it first appeared in 2005, but soon was replaced by Weibo, which is a social media platform similar to Twitter in 2009. In 2011, the most popular social networking software WeChat was invented, and it shares the same manufacturer with QQ. The emergence of mass media has had a transformative impact on the development of health communication. At this point, the era of popularization of health communication has ushered in (Choudhury, 2011).

Along with the abolishing of the One-child Policy in 2015, the MCH topics has become one of the most popular talking themes in Chinese TV programs. The Path of Health hold by China Central Television (CCTV) once broadcasted an introduction of painless labour (3/2015). Program Health Long Know popularised child accident prevention in July 2017. With the normalisation of digital television, a large number of digital channels for maternal and child health have also begun to appear. The Baby Channel is specially made for children aged 0 to 6 and their parents, and it mainly offers health knowledge and guidance for children's intellectual

development. The "Youyo" Baby Channel, founded by Beiguang Media Group, is mainly based on helping pregnant women give better birth. These channels are tailored to different audiences of maternal and child health information, which is very targeted.

The role of the Internet and other communication technologies in the health care system is beginning to be widely used in the last two decades. From the above brief historical description of health communication media, it can be seen that health communication design has been continuously optimized in the historical development process. For example, the increase of visual design elements and the multi-form communication mode of multimedia and multi-platforms (digital media, television) in the late stage have made outstanding contributions to the development of health communication. Looking at the development of health communication media, it can also be seen that the development of this field is more and more toward the direction of popularization and popularization. Increasingly accessible information not only gives the public easy access to all kinds of health information but also provides them with many channels to speak out. For example, Weibo and WeChat, developed in the era of digital media, are platforms where the public can participate and make their voices heard. Here is just a brief mention of Internet and health communication, which will be discussed in detail in Chapter 4. Because the combination of the Internet and new media with health communication is the current development trend, it takes up a large space.

2.3.4 The Internet as the main platform for health communication

Online media is an excellent medium for communication, connecting, academic uses, and psychosocial well-being (Liu et al., 2019). Official institutions such as governments, hospitals, research institutes, well-known experts such as university professors, sociologists, economists, etc., and the general student population are all users of online media. Users use this medium to share content, exchange ideas, and learn. It has not only enabled users to share numerous forms of content, but also provided them with new ways to organise, manage, and discover that content (O'Riordan, Feller & Nagle, 2012). In the health communication, online media are channels for sharing health information, information flow and relationship interaction promote each other on online media (Heldman, Schindelar & Weaver, 2013). Information through relationships spreads faster and more effectively, which brings convenience to health information exchange and opens up a new path for health communication.

Surveys in the USA report (Keckley & Hoffmann, 2010), for example, that about one-third of Internet users who research their health situations online tend to use SNSs to find fellow patients and exchange information. Among them, 36% consult other consumers before making health-care decisions. Doctors fare similarly; 60% of surveyed physicians in the USA are interested in using online networks for professional purposes. A recent survey suggested that, of the 8% of Internet users in the USA who indicated that they had posted health-related information online, nearly half of them said they were sharing their personal health experience (Centres for Medicare and Medicaid Services, 2020). Medlock et al. (2015) found that seniors also take the Internet as a preferred and most popular source of health information, despite concerns over the quality of online information. Scholars believe that social media have great potential to support information searching and decision-making on self-care and health-related issues. In this sense, SNSs are arguably reshaping health care (e.g., Hawn, 2009) as increasingly adopted as communication tools. It has thus become imperative for scholars and practitioners in public health and communication to better understand the roles of online social networks in the dissemination of health-related information, and tailor them accordingly to future health communications campaigns (Chew & Eysenbach, 2010).

Using the Internet to access health information is common for the Chinese public. There are two reasons for this status. First, because seeing doctors at hospitals is a bit complex, people tend to solve minor health problems themselves (Yip & Hsiao, 2008). Another factor contributing to the patient's internet use for health information is the long travel time to access offline healthcare resources. Generally, the cost associated with time to visit healthcare providers in traditional settings influences patients' motivation to seek health information online. One research shows that around 30% of the patients with COVID-19 lived at a distance more than 3 km from their nearest clinic or designated hospital (Zhao et al., 2020). In a word, the two reasons caused that Chinese people seem more likely to get health information via the Internet (p.220).

As the above mentioned that many Chinese patients faced difficulties accessing offline healthcare services, and this situation became more serious during the COVID-19 period. As the lockdown policy was found to cut off the patients' social support network, preventing them from seeking help from family members, which leads to seek information and help online. A high proportion of female users were seeking health information and help for their parents or older adults at home (p.220). The most searched information included accessing medical treatment, managing self-quarantine, and offline to online support, which highlights a need for information originating from the stretched condition in the health care system and the anxiety

over the lack of access to proper treatment. To the patients and their families, the act of searching for information online is a help-seeking step so that they can manage their health with the affordance of the internet. Scholars suggest this kind of behaviour should be encouraged as an integral and positive part of the patients' journey because online health information seeking enables patients to accumulate more social support, which is associated with better health outcomes and heath decision-making (Niederdeppe et al., 2007; Peddie & Kelly-Campbell,2017; Zhao et al., 2020).

The Chinese public uses the internet as an important source of information and help. Although previous studies mainly focused on the online health information–seeking experience of the young and educated (Wang et al., 2014; Cao et al., 2016). There is still research on the needs of older adults, and it shows this group may have equal motivations but lack the ability to search and comprehend online health-related information. Therefore, in addition to making relevant and high-quality information available online, it is vital to motivate social support to facilitate their information needs (Zhao et al., 2020). In a word, social media breaks free of demographical and contextual restrictions, such as race, education, or the channels of receiving health care services (Chou et al., 2009). The high penetration rate makes social media as the best choice for a large number of people with a variety of socioeconomic status and health conditions to access health information. Also, combined with the doctors, other patients and the people around could give users a solid sense to facilitate behavioural changes (Maher et al. 2014; Liu et al., 2017). Based on this context, the following sections will focus on the analysis of how the design was combined with communication strategies for various people to diffuse health information.

2.3.5 Co-design beyond the Western context

Co-design is the main method applied in this study, which will have an important impact on the subsequent data collection process. Therefore, a separate section is dedicated here to discuss the inspiration brought to this research by studies related to co-design, as well as the significance of conducting such design methods under the context of mainland China. Originally generated from the Scandinavian approach, cooperative design (co-design) or participatory design is user-oriented rather than a traditional approach, usually limited to a designer-centered perspective (Vaajakallio, 2012). Co-design refers to a class of design approaches that stresses the importance of the active, creative participation and collaboration of potential end-users and other stakeholders in the design process (Blomkamp, 2022;

Kankainen et al., 2012; Goodyear-Smith, Jackson & Greenhalgh, 2015). People can contribute their views, insights, and feedback throughout the design process at all stages. It has been widely used as an approach in urban planning (Cruickshank, Coupe & Hennessy, 2013; Pollastri et al., 2017), healthcare (Donetto et al., 2015; Tsekleves, 2019), and design for policymaking (Darby et al., 2015; Tsekleves et al., 2022). Besides the used in academia, this method has also been adopted in public sectors—for example, the Policy Lab practice led by GOV.The UK conducted a series of practices around testing innovative approaches to policymaking, which refers to multidiscipline, including social sciences, sciences, humanities, or arts. Commercial design agencies, including Continuum, Frog Design, IDEO, etc., also explore this area further and get a great reputation for tool development like Ideo method cards, that is a set of cards created by the design firm IDEO to aid designers in exploring new design methods.

A widely accepted concept is that co-design has different adoption in different areas. It is easy to understand since the significant differences in the development of political civilisation (democracy), economic level (what people are exposed to in daily life), and educational level (cultural level and understanding level) between the Global South and the Global North countries are bound to lead to the uneven development of co-design. People who live in areas with lower economic levels are less democratic & more corrupt (Canache & Allison, 2005; Mathur & Singh, 2013; Moreno, 2003), and less educated & more information accessing barriers (Jagtap, 2022; Lawrence & Tar, 2010) has been confirmed by many studies. To effectively tackle the variations and challenges in highly unequal regions like the Global South, it is important to move beyond overly standardised and universal solutions primarily originating from the Global North (Tsekleves et al., 2022).

2.3.5.1 Research in wide global south countries

From the perspective of geographical factors, the co-design practice has been explored in wide Global South Countries, i.e., Latin America (Ecuador, etc.), Africa (Namibia, etc.), and Asia (China, India, Cambodia, etc.). To solve the problem of loss of young people (they are moving from rural to urban) in South Africa, a community-based project (Kapuire, Winschiers-Theophilus & Blake, 2015) was conducted to develop new concepts for reinvigorating local development. A wide range of residents was involved and showed significant group features based on their different demographic backgrounds. For example, older adults need help understanding the intention of the activity well at the beginning of the project, and they are

afraid of learning or using new technology. But with the patience of the organisers, they gradually learned how to contribute to the project and showed great enthusiasm for learning unknown knowledge. In addition, female participants always interrupted their attendance due to the long-time activities and their busy homework. Another practice (Gibbs et al., 2022) in rural South Africa is a health communication intervention for violence. Ten male peer navigators were hired and trained by the African Health Research Institute (AHEI) to promote health information via online platforms, i.e., Facebook and WhatsApp. During the research process, organisers found that most participants did not have a laptop, and a smartphone is their only modern digital device. Also, smartphones were often old and had trouble working and battery issues. Thus, the research only focused on social media on smartphones. It also adopted one-on-one telephonic in-depth interviews to explore more potential issues.

The research conducted in Africa can provide important references for this study. Firstly, the migration of rural populations to urban areas is a problem faced by many developed regions. One direct consequence is the need to change the research locations for low-income individuals from rural areas to low-income settlements in cities. Secondly, when female participants engage in co-design activities, the potential risks of interrupted participation due to their responsibilities in the household need to be fully considered. It is necessary to mitigate such risks as much as possible in the initial co-design planning. Thirdly, for low-income groups, it is very difficult for them to have a computer or a high-quality smartphone (Jagtap, 2022). Therefore, leveraging social media to disseminate relevant health knowledge is highly feasible.

In terms of Latin America, Ecuador University (Williams Goodrich, 2019) organised a social practice activity for art and design students aimed at helping cocoa growers in remote areas shape their brand image to enhance the economic value of their products. Prior to this initiative, the growers in the region often sold cocoa at low prices to intermediaries, who would then resell the cocoa beans to local chocolate manufacturers at higher prices. Due to a lack of brand awareness and brand image development, the cocoa growers, who were part of the production process, typically received limited returns. The students first visited the plantations for observation and interviewed the growers. However, due to the remote location of the plantations and the challenging natural environment, the students had to wear heavy rubber boots and apply mosquito repellent, which led to some degree of resistance among them. Based on preliminary research, it was concluded that the most immediate design issue was the need for more sufficient signage. Firstly, there were no signs indicating the way to the plantations, which resulted in the isolation of the plantations from the outside. In addition to the absence of

signage, the lack of brand awareness was also a significant factor contributing to the low prices of the products. Considering these two points, the students conducted comprehensive brand packaging design for the plantations. The study also made an important discovery that Kimbell (2015, p.289) also indicated, despite all the claims of the design process being user-centered, the designer is still the 'main agent within the design', a fact which questions whether there has indeed been social empowerment of the user or democratisation of the design process in the use of these community engagement strategies. Besides, the author also mentioned Kristin Donaldson (2008, 36) makes a point of this in her article, 'Why to be wary of "design for developing countries"', in which she states that much of the design taking place in developing countries are subject to the Western designer's 'free time and the fiscal schedules of donor agencies' and hence tend to be short-term ventures. For this reason, they propose a sustainable approach to design in 'less industrialised economies' (Donaldson, 2008, p.35), which would be more feasible if local designers were involved in the process.

The research in Ecuador can provide valuable insights for collaborative research with underdeveloped areas. For example, students encountered certain obstacles during the initial stages of the research due to their aversion to on-site investigations (wearing rubber boots) and unfavourable environmental conditions (mosquitoes and remote locations). When designers engage in related design interventions in underdeveloped areas, it is essential to clearly understand the natural and cultural environment of the destination before starting. This helps to avoid situations where data collection is compromised due to insufficient subjective judgment on the part of the design team. Also, rather than relying on foreign assistance, it is easier to address the underlying issues by conducting research with local designers or individuals from the country itself. This is an important characteristic that provokes thoughtful consideration because only the locals truly understand the local culture and development situation. Furthermore, when designers engage in relevant activities, it is crucial to uphold the democratic principles of design and provide ample opportunities for research participants to offer suggestions and participate autonomously in the design process. After all, while designers may be the driving force behind the design activities, it is the participants who are the primary stakeholders in the relevant issues.

In terms of Asian research, research related to urban health communication in India (Hirom et al., 2017) for slum communities was explored with designers, students, and users. The author argues that most perspectives on Participatory Design (PD) stem from the popular "design thinking" in the business and design fields, making these methods more inclined to be applied in business-related projects. Additionally, when conducting PD in a developing country

context, assumptions from a Western perspective, such as a democratised workspace, high literacy, good infrastructure, and better technology, may be questioned. Therefore, when conducting related research in underdeveloped areas, particular attention should be paid to potential issues adapting PD methods to different cultural backgrounds. The article specifically mentions the influence of gender, highlighting that there are distinct differences in enthusiasm and participation levels exhibited by participants based on their gender (female, male, or mixed). This assumption was also proved by Jagtap (2021), who interviewed 18 designers to talk about the barriers when they conducted co-design workshops. Most designers gave the feedback that participants are more able to freely provide suggestions when in a single-gender environment. A comparative study between India and Scandinavia (Wakil & Dalsgaard, 2013) offers more insights into learning the difference in people's performance in participatory workshops. It has been observed that Indian students are unwilling to participate in design activities and are cautious when discussing topics. They struggle to articulate the issues and design insights clearly, leading to many communication problems. This necessitates constant adjustments and interventions by the organisers to keep the process going. In contrast, participants from the Scandinavian Peninsula exhibit an opposite attitude, being open and proactive. The limited and open structure that restricts Indian students is actually favoured by Scandinavian students. This difference stems from the disparity in educational systems, where project-based learning is more prevalent in the Western educational system, while Indian students have a more traditional and rule-bound framework for their assignments. Furthermore, Scandinavian students are very familiar with interactive technology and use it throughout the day, whereas Indian students have limited knowledge of technology. In the case of Indonesian pastry makers (Thamrin & Mulyono, 2018), due to the poor display, they faced a serious marketing issue in product sales. Thus, designers were invited to conduct a practice that combines participatory design and a human-centered design approach to involve users and experts to ensure the usability of the product design. The re-design strategy includes five steps--empathise, define, ideate, prototype and test. Designers participate in pastry making to gain a deep understanding of their difficulties, aspirations and goals. They also visited vendors and performed a usability test of the product by participating in a sales trial using the furniture product to ensure it would be truly usable. Finally, designers develop a multi-function furniture product for pastry display that incorporates traditional Indonesian display modes.

The research in the Asian region also presents many features that can be learned. Firstly, gender differences are mentioned more than once. Particularly in Jagtap's research (2021), there was a specific exploration of the impact of different genders on workshops. The research

findings also indicated that co-design involving male, female, or mixed-gender participants exhibits completely different trends. Specifically, in co-design with participants of different genders present, single-gender individuals tend to withhold their expressed viewpoints. Secondly, it is intriguing to note the argument that design thinking focuses more on business-related aspects rather than marginalized groups. This aligns partially with the conclusions in my chapter 4, where the current market economy has played a significant role in the health communication field, but the focus has not yet shifted towards marginalised groups. Thirdly, the participation status of low-income individuals with low levels of education in India, as observed in collaborative design with the Scandinavian region, is an important reference for the development of this research. Fourthly, involving a wide range of stakeholders is crucial as it allows for a comprehensive understanding of research problems and enables targeted solutions from multiple perspectives.

2.3.5.2 Research in mainland China

Although the previous section described a broad range of co-design situations in the Global South countries, it is understandable that different countries in the Global South have unique economic, cultural, and political systems, which can result in variations in the implementation of co-design practices. Therefore, it is essential to conduct a review of co-design research specific to Mainland China.

Co-design in China is not as widely adopted as an approach as it is in Europe and the United States. A few pieces of research about co-design can be found online, and those are mainly carried out in specific university settings and partially extended to the industry. Especially in collaboration with Western institutions, like the cooperation between Tongji University and Brunel University/Politecnico di Milano/Aalto University (Yuan & Dong, 2014; Jiang & Lou, 2018). With limited studies on disadvantaged groups with low cultural and low-income backgrounds. One of the few studies includes a practical project on transforming the old city area in Kashi. In this research, the entire collaborative design process was gamified to facilitate the participation of individuals with lower cultural levels, enabling them to contribute ideas more effectively through collaborative design. The results of the design practice showed that gamifying the data collection process can effectively stimulate participants' enthusiasm and is one of the high-quality communication methods for better interaction with participants. Additionally, Hunan University (Wang, Bryan-Kinns, & Ji, 2016) conducted an immersive opera design project, which engaged rural residents in rural

revitalisation. The research found that by enabling participants to acquire a certain level of technical knowledge, they could effectively understand the boundaries of technology in enhancing their artistic expression, thus maximising their imagination to contribute to the final success. The two cases show that when engaging in collaborative design with low-income groups, the process of gamified and playful data collection is essential. It facilitates the quick and convenient collection of desired data while allowing participants to contribute more ideas in a relaxed state.

In a word, research between the Global North and Global South is distinctive and existed few research for marginalised people largely focused on solving very 'down-to-earth' problems rather than speculating about an unseen future (Emmanuel et al., 2022; Hussain et al., 2012; Puri, 2004). This is understandable as the researchers have to deal with scarcity in time, resources, and finances in underdeveloped communities. Even then, the participatory design practice requires more cultural translation to work with different cultural perspectives and expectations (Byrne et al., 2007; Emmanuel et al., 2022; Hussain et al., 2012). Under such context, combined with the fact that the lack of co-design research and practices in Mainland China, this research is typically significant.

2.3.6 Health communication design

The development of health communication design has gone through several significant nodes. In this section, a brief review of recent years' milestones provides more references for further research.

Change 4 Life campaign was launched in England in Jan 2009 and aims to address rising obesity and related health issues in the population. By providing practical tips, advice, and resources to support people in making healthier choices in areas such as eating more fruits and vegetables, reducing super intake, being more active, and limiting sedentary behavior. The vibrant primary color of bright yellow, coupled with personified font designs, simulates scenes of people engaging in everyday activities such as sports, shopping, and eating, aiming to attract public attention and thus raise health awareness. This initiative provides valuable insights for this study, from the government-led health communication strategy formulation to the design style and approach. The approachable, populist design style and clearly defined communication strategy are all strengths of this campaign (Fletcher, 2009).

Health communication design is an "opportunity" to apply design methods and approaches to offer value and benefit within health (Tsekleves & Cooper 2017, pp.388-408).

Walker has done exhaustive research on integrating the information design process into effective communication with users and suggests that the design process—user input, iteration, and consideration of circumstances of use—is key to successful communication. This study offers many valuable experiences for MCH relevant studies in health communication design practices, particularly using diagrams and images, employing proportions and simplification to capture attention, utilizing storytelling to engage people, avoiding overwhelming readers with excessive information, and using straightforward language. The core concept can be summarised in one sentence: Interdisciplinary research is the key to successful health communication (Walker, 2019).

Most recently, COVID-19 has been a significant catalyst for the development of health communication design. Under this pandemic, many scholars have engaged in discussions on how to conduct health communication design more effectively. The integration with reality is an important characteristic of these studies. These studies have contributed important and practical guidance to theories and practices at different pandemic stages. For example, in the early stages of the pandemic when the public was generally restricted to staying at home for disease control, monitoring the disease became an urgent issue that needed to be addressed. An information design-led response to this issue was proposed, which aims to address the need identified by manufacturers and distributors of lateral flow testing kits (LFTs) that could be used for people in their homes or workplaces without medical supervision (Walker et al., 2022). Also, the toolkit to support community-based testing technology and medical conditions was developed (Walker, Bravo & Edwards, 2024). During this phase, researchers continue to implement user-centered design research methods and mobilize a broad audience to participate in the research. A study by Walker et al. (2021), with this approach at the heart of their health communication design activities, worked with local communities in Rwanda, Africa, to conduct a campaign named " Beat Bad Microbes". Content such as illustrations and visual leaflets are designed and used in the campaign. The results show that the health communication activities have achieved good results in terms of communication. This study provides a useful reference for future activities in China, including the organizational form (cooperating with the local community) of the activities and the output (multimedia materials) of healthy communication design materials.

2.4 The Review of MCH Communication Design

2.4.1 General elements

Over the past 20 years, the development of maternal health communication has been collaboratively designed, implemented, and evaluated communication design outputs aimed at achieving the goal of improving health in a significant and lasting way by empowering people to change their behaviour and by facilitating social change (Schiavo, 2013, p.12). Health communication from the 1990s to the present has evolved into what may be called the "strategic era (Elrod & Fortenberry, 2018)". This phase is marked by the integration of multiple communication channels, a diverse range of stakeholders, heightened focus on evaluation and evidence-based research, significant national-level impact, more widespread utilization of mass media, and a collaborative communication process where both senders and receivers actively contribute to and share information (p.4).

In a study on reading and cognition, Brown (2017) suggests that information, including health information materials, should be designed with easy-to-read text. If not, the audiences cannot be persuasive or impact health-related motivation or behaviour. For instance, page size and positioning are important, and the viewing distancing between posters and readers may need special attention. There is also evidence that justified text might be more helpful for less able readers, including young children or older adults (p.473).

In addition, understanding the message is the first step to facilitating behavioural change (Abraham & Kools, 2011) and enhancing the understanding of written text by taking account of cognitive characteristics underpinning readers' comprehension. From the perspective of cognitive ergonomics or looking at the design of materials from a usability perspective, capturing and focusing readers' attention and helping them find specific information within text materials is critical to the impact of putting that advice into practice. Patricia Wright also points out that any particular graphic should be clear to the designer and should be positioned carefully in the text to facilitate reading. Graphics must be tailored to readers' knowledge, literacy level, and social context. The graphics cannot replace clear writing, for example, in opposite may undermine text messages if badly chosen.

Jiang et al. (2013) examined the coverage of maternal health care in rural areas in central and western China. The author found that the basic international MCH care includes pre-pregnancy intervention (contraception, folic acid supplementation, safe abortion, etc.) and pregnancy intervention (prenatal check-ups), nutritional supplements, disease diagnosis, HIV prevention, etc.) have been carried out in most rural areas of China. However, the rate of

nutrition, contraception and childbirth guidance of obstetricians has not shown an increasing trend in recent years, and medical staff have not played a greater role in providing health consultation. Regarding personal health care, the intake of micro-elements (nutrition) in pregnant women is still low, and health education, such as perinatal hygiene, is not widely available. Finally, the author thinks that with the popularisation of television and network media, it is necessary to give full play to its health education publicity role.

Kang & Sun (2020) divided 366 pregnant women into two groups and investigated the role of new media in health education. They found that health education during pregnancy and childbirth can help pregnant women and their families understand the health condition of babies and pregnant women and improve the quality of life of women and fetuses. Pregnant women are prone to many diseases during pregnancy, such as diabetes, threatened abortion, etc. Traditional health education is limited to oral education, which can no longer meet the needs of pregnant women. The new media health education model disseminates health information without time and location limited through the Internet, which can carry out popular science propaganda faster and wider. In short, the use of new media for health education in maternal health has a significant effect, which can effectively improve the pregnancy outcome and improve postpartum anxiety and depression.

The content of this section provides a basic reference for the concepts of health communication design and influences the direction of further discussion.

2.4.2 Regional research

To maintain population wellbeing, activities related to health (ill-being) prevention have begun to increase, and designers and researchers play an important role in supporting and contributing to healthy lifestyle development (Tsekleves & Cooper, 2017, p.21). the studies listed below have conducted evidence-based investigation on MCH communication from different perspectives.

2.4.2.1 Studies in China

Several studies that examine the design of the media that communicate MCH information in the mainland China context can be found in academic literature. Hung & Stones (2011) investigated the web designs of the children's health websites in the West (UK & US) and East (China & Taiwan), which led them to present three conclusions: 1) in terms of information design, credibility is better presented in the West than in the East, whereas users'

needs are better presented in the East than in the West; 2) in terms of multimedia design, demonstrations and humanity are better presented in the West than in the East, and the segmentation of demonstrations is valued by both the East and the West; and 3) in terms of interface design, the West presents a better appearance than the East, and methodology is valued by both the East and the West. Zhang (2018) researches the design of information visualisation in pregnant health apps, the key research view of this study is information visualisation and interaction between users and apps, and then the author puts forward the method of pregnant apps in information visualisation design at the end. Luo (2014) examined the interfacial design of MCH apps on mobile phones and then found that there are problems with seriously homogeneous products and messy interfaces on current MCH apps, and the author designed a new app targeted to solve the problems above. Zhou (2015) gives advice for the design of educating child apps from the perspective of community culture and also practices reality works targeting interaction function. From the perspective of brand image design, Zhang (2014) explores the local maternal and child brands in China and studies the historical development of them. The author finds that there was a lack of research on the visual image design of Chinese maternal and child brands, and the existing brand image was not clear about the key concept of the brand and not well integrated with the local culture. Another maternal and child branding research conducted by E (2013) is aimed at an electrical goods website study. These studies conducted a multi-faceted analysis of app and website designs related to maternal and child health in China, including design evaluation, a comparison between Eastern and Western apps, the integration of MCH brands with local culture, etc. This literature section provides multiple insights and perspectives, serving as a foundation for the development of this research from various angles.

The research habits of users regarding MCH information are also worth paying attention to. Wu (2018) examines the problems related to online health information search behaviour of pregnant women in a 3A hospital (3A hospital means top level). Among the 500 participants, 93% would actively obtain health information through the Internet. The top three information and communication channels of their choice are apps, websites, and WeChat public account, and most of the users are satisfied with the content of the information they searched. Yet, the author also notes that this study is limited to a hospital in an economically developed area. This means the findings do not represent an online health information search behaviour of pregnant women living in other low income or less developed regions in China. The development of new media has greatly promoted the diffusion of MCH knowledge, and a large number of audiences choose this method to acquire health knowledge, which is also an

important revelation for this study, that is, in the process of designing follow-up surveys, additional attention should be paid to the target group's use of the Internet.

Research about new media, such as Weibo and WeChat, has also aroused a lot of interest. Song (2014) investigates the public account of health communication on Weibo. The author finds health communication bloggers on Weibo are concentrated in first-tier cities such as Beijing, Shanghai, Guangzhou, and economically developed provinces. The content of Weibo health communication accounts is mainly on scientific knowledge, and problems like zombie accounts, the absence of government management, and the proliferation of false redundant information still exist. Dong (2016) examined the credibility of Weibo in the health communication field. The author concludes that there are five reasons that caused insufficient credibility of Weibo: 1) insufficient professional ability of opinion leaders, 2) the cognitive difference between disseminators and recipients, 3) massive information overwhelms value issues, and 4) the recipients lack health and media literacy. Zhong and Sun (2016) analysed the spread of health communication accounts in WeChat and found two problems: from the perspective of dissemination of content, the originality of health information is insufficient, and various accounts always push daily health care and diet nutrition information; from the perspective of communication effects, personal accounts are the most popular among audiences, the official accounts of paper media have a high degree of satisfaction of users, and hospital accounts have relatively poor effects. Although the health public account provides the audience with convenient and accurate information acquisition channels, problems like text homogeneity, controversy, and over-marketing still exist. Zhu and Deng (2015) investigated the preferences of the elderly when searching for health information on WeChat. The author finds they have a low awareness of extracting reliable information and are keen to forward information to their relatives and friends without verifying the information's validity/credibility. Videos are the most acceptable form of accessing health information, but they also think that there are some shortcomings in WeChat, such as over-advertising and conflicting health information. Zhao (2018) checked the impact of online health information on the attitudes and behaviours of young audiences. The study results show that youth groups with higher education backgrounds are more susceptible to the impact of health information, thus changing their attitudes and behaviors. Although there is much evidence-based research on the two media—Weibo and WeChat, I found there are few articles analyse the MCH apps and web that are used on the broad audience. The later chapter will talk about this phenomenon and try to find effective ways to enhance their communication function.

2.4.2.2 Other countries beyond China

There are also many studies focusing on maternal and child health design in countries and regions other than China, especially in less developed regions, such as India, Cambodia, and other places. Because these studies focus on low-income and low-literacy areas or groups, there is something in common with the target group of this study. Therefore, the literature analysis of this part can also bring great reference value for this study, especially in the determination of research problems and the formulation of subsequent fieldwork programs.

From the perspective of design practice, Khanna et al. (2013) examined the content design of an Indian government-developed portal called "Repository on Maternal Child Health," which gathers MCH information from various resources by using an open-source content management system. The author analyses the usage of this MCH portal and finds that it is growing in popularity in India. While they also suggest that interactive technologies could be used to improve the portal's content presentation further, and it is needed to translate the information gathered by the portal into regional languages so to improve the portal's usage and accessibility in different parts of India including rural areas. Desta et al. (2014) investigated the designs of the content and presentation patterns of a mobile video show that communicates the knowledge of maternal and newborn health in the "media-dark" areas in rural Ethiopia and then examined the effect of this mobile video. The authors find that the video show significantly affects the community knowledge, attitudes, and beliefs regarding maternal and newborn health, especially regarding care-seeking behaviour and the use of a skilled attendant for birth and postnatal care, and then by relating the design of the mobile video show with its effect, the authors get three conclusions: 1) the entertaining nature and local organisation of the mobile video show event encourage attendance; 2) building the video around recognisable characters (particularly the husbands) contributes to bringing about desired changes in people's knowledge and beliefs; and 3) making the show readily available (through the mobile van) and bundling it with facilitated reflection sessions has a considerable impact on people's knowledge and confidence (Wang et al., 2019). Scott et al. (2015) examined the designs of the content and user interfaces of the top ten free MCH apps available in Google and Apple stores and found that among the ten APPs, only four were developed with the involvement of health professionals, only four provide information from evidence-based medical content, only four are fully functional, only two are fully usable and only three are adequately implemented security mechanisms to guarantee privacy of user data, while two of the ten apps are inoperative. Then this study concludes that there is great variation in the quality of content,

functionality and security of the ten MCH apps. The literature listed above provides many useful references for the construction of the design framework, such as adding interactive technology to attract audiences, and the participation of other family members (husband) should not be ignored in the relevant creation, and the function and security should be paid attention to when designing the app.

Besides the aforementioned studies on the designs of existing MCH media, there are also some studies that discuss how to design one or several types of "experimental" media for MCH communication and then test the experimental media's effectiveness in communicating MCH information to a certain group of people. Chib (2010) investigated the design of an experimental mobile phone project for midwives, in which midwives are given the project mobile phones with specific apps that enable the midwives to transmit health statistics to a central database, contact coordinators and peers for health advice and information, and communicate with doctors and patients, and then the author examines the test of this project on the midwives in Aceh Besar, Indonesia. In the test, the project mobile phones are given to a study group of 121 midwives but not given to a control group of 102 midwives, and the test results indicate that using the project phone makes it easier for a midwife to get the childbirth knowledge needed, and then increases the midwife's confidence to solve difficult problems in midwife care. As can be seen from this study, even among professional midwives, there is still a lack of knowledge on relevant issues, so it is essential to conduct expert research among stakeholders.

Mutanda Waiswa & Namutamba (2016) examined how Uganda's Ministry of Health, the Global Health Media Project, and the World Health Organization (WHO) collaborate with the local communities in rural Eastern Uganda to design and test a set of experimental mobile videos that try to communicate MCH knowledge to the local semi-illiterate people. In the test, mothers in two intervention sub-counties are organised by the village health teams to watch the experimental mobile videos, while mothers in two control sub-counties just receive the health teams' visits for MCH education but do not watch the videos, and then the test results show that the mobile videos are effective in improving knowledge, attitudes, practices and use of MCH messages among rural semi-illiterate communities. This study effectively proves the effectiveness of video in health communication for low-income & low-literacy people, who has great reference value for the construction of the design framework in this study.

There are also many studies on the design of different media combinations for health communication, and this literature further provides a perspective for the construction of the design framework in this study. The literature in this series mainly refers to the "Behaviour

Change Communication (BCC)" programs that try to change the MCH-related behaviours of the target people, by communicating MCH knowledge to the target people through a combination of several different types of media. Rahman et al. (2016) explored the design and effect of a BCC program that aims at reducing maternal, neonatal and child mortality and morbidity in poor communities in rural Bangladesh. Through communicating with the target people in these poor communities through a combination of several types of media including stickers, posters, folk songs, street theatre performances and TV programs. The authors find that although the BCC program is generally effective, there are some weaknesses in the current design of the BCC program: some target people have poor understanding and limited cultural acceptance of some illustrations particularly the maternal and new-born danger signs, timing and location of some folk songs and street theatre performances are inappropriate; and despite the program's relatively full coverage of the pregnant women and mothers, there is still limited coverage of the secondary audiences like men and the elderly. Kaufman et al. (2017) examined the design and effect of a campaign that aims at improving a range of maternal health outcomes in Tanzania, including individual birth planning, timely antenatal care (ANC) attendance, and giving birth in a healthcare facility, by communicating with the target people in Tanzania through a combination of several types of media including radio and TV spots, billboards, magazine articles and advertisements, and a variety of health facility and promotional materials. This campaign's design is informed by the Social Cognitive Theory that emphasises the importance of reciprocal determinism. The author concludes that the results from a post-hoc evaluation of this BCC campaign indicate that the campaign could lead to better pregnancy and childbirth outcomes for women in low-resource settings. Besides these studies on certain programs for MCH communication, a study by Nwagbara (2017) indicated that for communicating MCH information to the Nigerian public, it is an effective communication strategy that masses media partner with midwives to bring MCH messages to the public in several ways including news reports, drama presentations, panel discussions, teaching sessions, songs, comedies, jingles and announcements.

In addition to the above multi-platform and multi-form discussion on health communication design from the perspective of designers, health behaviour as a target group is also an important research direction. Szwajcer et al. (2012) investigated Dutch nulliparous women's behaviours of seeking pregnancy-related information , and the authors find that for all pregnant women, the Internet, the midwife and books are the top three sources of pregnancy-related information. Shieh et al. (2009) investigated health literacy and its association with the

use of information sources and with barriers to information seeking among English-speaking, low-income pregnant women in a clinic in the midwestern USA. The authors find that comparing with the pregnant women with high health literacy, the pregnant women with low health literacy are less likely to use the Internet for searching pregnancy health information, and they are more likely to have personal barriers to information seeking. Based on the Wilson Model of health information-seeking framework, Das and Sarkar (2014) access the information-seeking behaviours and the barriers to information seeking among pregnant women in rural Delhi, India. The authors find that due to a lack of access to health care and pregnancy-related health information, the pregnant women in this area rely heavily on information and misconceptions about pregnancy heard from older women, friends, and mothers-in-law and husbands, and only during complications, the pregnant women may consult doctors and para-medical staff. Wallwiener et al. (2016) investigated the user proportions and characteristics of German-speaking pregnant women who are based in the University Hospitals of Heidelberg and use eHealth information and mHealth applications. The authors find that the women using eHealth information showed no specific profile, while the women using mHealth applications tended to be younger, were more likely to be in their first pregnancy, felt less healthy, and were more likely to be influenced by the retrieved information. Lupton and Pedersen (2016) explored the use of pregnancy and parenting apps among Australian women. The authors find that almost three-quarters of the respondents found the apps useful or helpful, particularly for providing information, monitoring foetal or child development and changes in their own bodies, and providing reassurance, but many users were not actively assessing the validity of the content of these apps or considering issues concerning the security and privacy of the personal information about themselves and their children that these apps collect. Although the research objects listed here are non-Chinese, some health behaviours of these groups, such as lack of information retrieval ability and relying heavily on friends, mother-in-law and husband as important sources of health information, may also occur in the target group of this study. Because they are low-income and low-literacy groups.

In conclusion, the academic research in the field of MCH communication in China is limited, with many relevant papers published in recent years. Although some of the literature has investigated the design of current media—websites and apps, it is just focused on middle-class populations in China. There is also literature that only examines the attitude and behaviour of audiences in searching for health information, and the use of new media—Weibo and WeChat. As for related research in other countries (except for China), the research is more robust and varied on topics ranging from MCH media design to communication strategies

analysis, also covering different social strategies. These studies also provide a valuable reference for this research from the research to the final design framework output. It is clear from the above that there is still a large gap in the studies on MCH for low-income and deprived populations in China, this will form the focus of this thesis.

2.5 Summary

The purpose of this chapter is to review the literature on MCH communication design for low-income and low-literacy people in order to clarify the current development of the research and to provide references for the data collection, discussion, and findings of the subsequent stage. Three kinds of literature were identified in relation to the main topic of this research, health communication design for low-income and low-literacy people in China. The first focus of the literature review was on definitions of the stakeholders (pregnant women/mothers, their husbands, and elders) within the Chinese cultural context. Next, the history of health communication strategies was explored to enable researchers and readers to understand the developmental patterns, with particular attention paid to recent years. Two public health crises were mentioned here: SARS in 2003 and COVID in 2019, which have undoubtedly pushed the development of health communication to new heights while also accelerating the rapid shift to a digital era. Digital platforms now enable ordinary people to participate in health communication activities, and multiple channels allow them to interact with other people/officials. The purpose of discussing the historical development was to clarify the current state of health communication in this area and to inspire thinking for future development.

The third section mainly addresses MCH communication design. It focuses particularly on relevant design activity studies, i.e., empirical studies, from mainland China and other countries. The design practices research related to MCH in mainland China were systematically sorted out to clarify the core direction of this study, with a focus on low-income and low-literacy people. Overseas studies exploring cases in Asia, Africa, and Latin America provided references for the data collection and results generation in the present study. They assisted in identifying the health behavioural characteristics of the target population (i.e., low literacy groups with a lower ability to

discriminate between health messages), and the effectiveness of video and interactive designs in targeting low-literacy populations. It is worth emphasising that although the analysis is based on the keyword “MCH communication design”, the literature covered in this section focuses on peer-reviewed studies published in journal or books. For media design analyses, see Chapter 4. This distinction is to enable audiences to clearly distinguish between textual studies and media design analyses and thus better understand the current status of the different types of research.

Based on the above analysis, six points can be summarised:

1) In addition to the core group of pregnant women and mothers, other members of the family (e.g. husbands and elders) also play an important role in this study. Therefore, those stakeholders should be taken into account in the subsequent design research.

2) Low-income and low-literacy groups in different socio-historical and cultural contexts exhibit distinctive characteristics. They have a low capacity for discrimination and lack basic health awareness. In addition, not all health promotion designs are effective or understood by the general public. For instance, when pictures are not utilised properly, they can overload the reader and thus increase the time required to communicate a message. Therefore, when developing multimodal designs, it is also important to keep in close contact with the target group to check the effectiveness of the media design.

3) The popularisation of the Internet offers a new opportunity for health communication design and can facilitate greater engagement with a broad non-specialist audience. Unlike traditional media, which are one-way (e.g., television, paper), online media allows viewers to interact and express their ideas as participants. This two-way communication can certainly contribute to the efficient development of health communication.

4) China's health strategy has undergone many changes over the decades. Starting with the rapid population growth following the Second World War, followed by the implementation of a one-child policy with its strict limitations on population control starting from 1979, before shifting to the present-day gradual liberalisation of fertility restrictions, it can be seen that the attitude of the Chinese government has now

become one of encouraging childbearing. In the context of a policy promoting childbearing, it is meaningful to seek to improve the quality of life and the health behaviours of the childbearing subjects.

5) A number of studies conducted in third-world countries and less developed regions also provide some insights for this study, serving as important references and highlighting the importance of ethnicity, education, and reading ability as important factors that might impact the effectiveness of health communication. Therefore, religious differences and ethnic culture must also be taken into account in subsequent studies.

6) Returning to the core of this study, i.e., MCH communication design, it can be observed that the current research focuses on a number of undergraduate and master's degree theses and journal papers (see Section 2.4.2.1). These studies, while contributing very valuable insights, do not offer a complete perspective due to their depth-of-research constraints. Hence, one of the driving motivations for this study is the need to fill this gap.

Next, this study sought to address the two main research questions:

- What are the health behaviours of targeted people in terms of searching for MCH information? –their specific health features, and reasons behind.
- How do social, cultural, economic factors affect the values, needs and objectives of low literacy and low-income Chinese parents or prospective parents when accessing MCH communication materials?

Throughout the study, I take social, cultural, and economic factors into consideration to explore how these factors influence the target group's access to health information. Also, as a PhD study in design, once these two issues above have been resolved, this study will continue by incorporating design methodologies in a co-design project with the target group. The ultimate goal is to contribute to a comprehensive, systematic, and interdisciplinary integrated health communication design framework that incorporates relevant knowledge from communication studies to guide future research on MCH communication design.

CHAPTER 3 Methodology

3.1 Research Questions

This chapter discusses the methodological orientation, including an overview of the epistemological and methodological stance adopted in this research. The methodology discussion relies mainly upon the research process necessary to collect and analyse the fieldwork. I also explain the main aspects of the methods and research details about implementing the fieldwork.

It is required to examine the research questions before choosing an appropriate methodology and a method. Lewis (2003) believes that factors like "feasibility, clarity, connectivity to existing research or theory, the potentiality of making an original contribution, and the capability to collect data and reflectivity of interest to the researcher", should be examined formulating research questions. For qualitative researchers, applying propositions rather than hypotheses is more appropriate to acclaim the research's core aim in defining meanings beyond the topic (Creswell, 2018, p.7). In this study, for achieving the goal of bring positive impact on MCH communication for low-income and low-literacy people, one key question and three sub-questions were proposed:

Key research question:

How might design methods contribute to the development of appropriate maternal health communication strategies for low-income and low-literacy Chinese audiences?

Three sub-questions:

What are the health behaviours of targeted people in terms of searching for MCH information? –their specific health features, and reasons behind.

How do social, cultural, economic factors affect the values, needs and objectives of low literacy and low-income Chinese parents or prospective parents when accessing MCH communication materials?

How to promote future MCH communication for targeted people by the design of a health framework?

Corresponding to listed questions, six objectives are summarised:

1. Clearly identify the existing issues in both current academic research and design media practices.
2. Conduct surveys among a wide-ranging audience to determine the characteristics of individuals with low income and low literacy levels regarding their access to health information and their own health behaviours.

3. Precisely target the specific group and understand the motivations behind their particular health behaviours.
4. Understand the target group's needs and usage of health media.
5. Collaborate with the target group in design practices to create media that aligns with user expectations.
6. Develop a design framework to guide similar research/health information dissemination activities in other regions or among different ethnic groups in the future.

Among the six objectives, objective 1 was partly solved by Chapter 2. The rest were discussed in the following sections by a combination of research activities.

3.2 Research Paradigms

This study mainly explores health behaviours and the improvement of MCH communication media design for low-income and low-literacy groups in China. The data throughout the entire process are primarily descriptive and involve interpreting reasons, motivations, and meanings. Therefore, it is clear that qualitative and natural research methods are more suitable for this research. The following content focuses on the epistemology, methodology and other issues related to this research, aiming to present the theoretical framework related to this research comprehensively.

3.2.1 Constructing the epistemology

This research employs constructivism as an approach to knowledge generation that enables me to understand how low-income and low-literacy people’s health behaviours were constructed by the social environment, economics, and their literacy background.

In the context of constructivism, research in design studies has many advantages. Firstly, constructivism allows researchers to explore deeply into participants' subjective experiences and perspectives, which is crucial for creating meaningful designs. As suggested by constructivists, human modes of living originate from and persist within social relations. If the chosen research topic revolves around establishing common conversational ways, then these related practices must be studied (Gergen,1998). All such research is empirical in nature, as it utilizes observation to support its conclusions. However, it differs from traditional empirical research in that it does not rely on many of the strict requirements of traditional methods, such as large samples, measurements, or statistical data (p.150). In the context of this

research, I summarised information from everyday language use and behaviour to interpret the health behaviours of the target group.

Furthermore, conducting research that situates participants' subjective experiences and perspectives within the socio-cultural and historical context can lead to more culturally sensitive solutions (Gergen, 2011). This is also the main reason why this study insists on incorporating relevant historical background in the literature review (in Chapter 2, Sections 2.3 and 2.4). Any research, including historical reviews, is not conducted in isolation from the world but rather constructs the world in a particular way.

Thirdly, this study emphasises the active involvement and empowerment of participants in the design research process, treating users and other stakeholders as co-creators and collaborators to ensure that design solutions reflect their needs, preferences, and visions. In constructivist co-design research, constructing narratives of life, characterized by first-hand accounts and respecting the voices of participants, is crucial in conveying their messages to the public (Gergen,1998). Here, narrative means are used to serve the construction of social wellbeing, generating a broader and deeper understanding by allowing targeted groups in society to express their opinions and share first-hand experiences. This helps bridge the gap between different social groups, stimulating positive actions from society or government to some extent (p.149).

In constructivist research, however, being overly subjective/lacking objectivity has long been a common criticism. Constructivist research often involves subjective interpretation and understanding of data, which may raise concerns about the reliability and validity of findings (p.155). Researchers need to address issues of bias and ensure transparency in their interpretations. However, the notion of complete impartiality itself is unreasonable and misleading (Gergen, 2011). The research process is inherently motivated by the researcher's own values. Although efforts are made to maintain critical reflection and openness to dialogue throughout the research process, it is important to remember that every portrayal has potential and limitations (p.110). Therefore, for this constructivist-based study, it is sufficient to maintain the research purpose always aimed at interpreting, constructing, and towards valuable changes in the world.

3.2.2 Research purpose and types

This research adopts multiple aspects of three types of research, exploratory, descriptive, and explanatory, together to construct an MCH communication design for low-

income and low-literacy people under the context of Morden China. This is based on the considering from cross-disciplinary perspectives, as the research characteristic cannot be defined as a single and simple description. Specifically, for in explanatory, “What” is the current MCH information communication media and strategies design; in descriptive, describing the difficulties and barriers that prevent low-income groups from accessing high-quality MCH information, along with the in-depth analysis of MCH media; and in exploratory, “How” to improve MCH information communication via design practices (p.114).

The three research types provide a solid conceptual framework for the RQs listed above (in 3.1). From a more detailed point, the exploration of “What” start with a literature review (narrowing down the theoretical research field) and visual analysis (chapter 4); then, the targeted people’s health behaviours were described based on the survey, and their health motivation was discussed combined with the visual design features; finally, a series of co-design workshops were held, and an MCH communication framework was generated to improve the information communication for targeted people. The three types of research are constructed together this research, to make sure the whole research is carried out within the established framework.

3.3 Research Strategy

The widely accepted classification of research strategies includes three main types: qualitative research, quantitative research, and mixed methods (which integrates the first two approaches) (Robson, 2011). After reviewing the definitions of these three strategies, the nature of this study was determined to be qualitative research. Qualitative research methods primarily aim to deepen the understanding of the essence, significance, and characteristics of phenomena through collecting and analysing non-numerical data. Creswell (2016, p44) gave the following definition:

"Qualitative research begins with assumptions and the use of interpretive/theoretical frameworks that inform the study of research problems addressing the meaning individuals or groups ascribe to a social or human problem. To study this problem, qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is both inductive and deductive and establishes patterns or themes. The final written report or presentation includes the voices of

participants, the researcher's reflexivity, a complex description and interpretation of the problem, and its contribution to the literature or a call for change."

Research in the practice of arts-related subjects is more likely to employ qualitative research methods (Gary & Malins, 2016, p 21). This kind of research does not, typically, begin with a predetermined set of questions or assumptions but arises from particular situations or contexts, which can be described with sufficient precision for a project to emerge which can be scrutinised and approved by the institution and supervisor (UK Council for Graduate Education, 1997, p. 16). In this study, qualitative methods are applied to understand and emphasize the health behaviours and motivations of target populations under specific cultural, economic, and social influences. "Qualitative research can be made creative, non-intrusive and fun" (Stickley, 2012). It is essentially qualitative, naturalistic and reflective. It acknowledges the complexity and real experience and practice—it is 'real-world research', and all 'mistakes' are revealed and acknowledged for the sake of methodological transparency (Gray & Malins, 2016, p72).

3.4 Research Design

3.4.1 Structuring the research process

This research design is based on Kolb's four steps theory: thinking, doing, feeling, and watching. Specifically, the whole research process was divided into three parts. The content analysis at the first stage mainly focuses on analysing whether the current MCH communication media convey health information to intended groups well from the perspective of design. Based on the result from the first stage, the second stage will conduct evidence-based fieldwork to identify the information needs and search preferences of low-income and low-literacy groups. The third stage is the creative practice stage, which will conduct participatory co-design with participators combined with the former two stages' data.

Qualitative research in the design research context is essentially characteristic of employing a range of methods—visual, practice, or adapted from other research paradigms (p.31). The use of more than two methods of collecting information on one issue is called 'triangulation', which is a way of using a variety of methods to collect data on one topic. The more information we have from varying perspectives, the more able we are to test our ideas. Using several complementary methods is more likely to yield a more significant, critical and holistic view than any single method alone (Austin & Sutton, 2014).

Such complementary methods may involve using various media (and multimedia) to integrate visual, tactile, kinaesthetic, and experiential data into 'rich' information (Gary & Malins, 2016, p.46). The multi-method concept also suggests using multiple media in its information technology sense (multimedia/hypermedia) and its value in using and integrating different kinds of media that provide different kinds of complementary sensory information (p.31). Projects can be collaborative and inter-disciplinary, either by design or necessity, and this may be due to the complexity of art and design research questions. It also demonstrates a willingness to examine other fields and make sensible connections. It requires an open-mind attitude and an awareness of other research cultures and paradigms (p.72).

3.4.1.1 Stage 1—visual design review

Qualitative research methods collect detailed descriptions such as open-ended responses, narrative descriptions, and visual expressions, often characterised as an "attractive nuisance" (Robson, 2002). Due to this research's primary aim and objective being to examine and improve intended groups' MCH health literacy, analysing MCH communication media was chosen to build a substantial foundation to conduct the primary research.

The majority of the literature I mentioned in Chapter 2 used a variety of methods such as surveys, content analysis, case studies and ethnography, etc. Specifically, some research systematically sorted out the current maternal media (apps, websites, etc.) in China's market from the perspective of design (layout, font, color, etc.). Besides, there are some useful methods, even from other disciplines, i.e., Multimodal. It is original a linguistic term that refers to multiple "modes" of communicating a message. For instance, while traditional papers typically only have one mode (text), a multimodal project would include a combination of text, images, motion, or audio (Jewitt et al., 2016). Due to the special comprehensive analysis character, it also could be used in the visual design analysis from an art and design perspective. Some linguistics researchers used and focused on their knowledge-based textual and visual narrative to provide in-depth contextual meaning (p.130). These approaches and methods are useful and essential in constructing researchers' purposes for understanding the health media design, especially the multimodal method. In the past, a single analysis method is no longer sufficient to summarise network media's design characteristics. Network media is an expression of narrative art and requires more complex analysis methods. However, multimodality is a linguistics class method after all, so it will be modified accordingly to meet the design discipline requirements. How it will be changed is shown in Chapter 4.

The outputs from content analysis differ significantly from interviews, surveys or observations. They generate rich visual, subjective and tangible material to work with. Designers benefit from working with tangible things they can see and feel. The immediacy and accessibility of this kind of material make it a natural resource for designers, quite different from a report (Mattelmäki & Battarbee, 2002). For example, just like imagery can be quickly scanned and used by designers, this kind of material can be much more accessible than traditional research outputs (like traditional paper media).

The visual study's focus is to provide general ideas on how maternal-related media design. This section laid the foundation for future research and at the same time, filled the gap in the current design and analysis of MCH communication media. Design discipline has always been regarded as a practice-oriented discipline, and it is true, but it should not ignore theoretical research (Ridder, 2017). Therefore, this study hopes to use professional theoretical knowledge to comprehensively and deeply analyse the current MCH media design issues in China.

3.4.1.2 Stage 2 questionnaire and stakeholders' interviews

The previous stage of visual research has laid a foundation for this stage of research. This part includes two ways to explore the intended groups' MCH information access and health behaviour. The surveys usually contain two primary tools to collect information—questionnaires and interviews (Willis, 2004). The traditional questionnaire is designed to collect self-report information from people about their characteristics, thoughts, feelings, perceptions, behaviours, or attitudes, typically in written form. Software and online services are excellent resources for efficient and effective questionnaire construction and distribution but are no substitute for good judgment in wording and design. Several factors in securing a reasonable response rate are the appearance, clarity, instructions, arrangement, design and layout of questionnaires (Robson, 2016, p.35). It is triangulated with other methods—interviews, which supplement the data with personal insights that may not be evident in written responses and may verify or challenge self-reported behaviours (p.35). Even in unstructured interviews, the researcher typically has a prepared set of topics that he/she hopes to address in the session and further, investigate participators' responses.

As the most critical part of this research, applying these two methods plays a vital role. The questionnaire can provide a general overview of the dissemination of MCH information, allowing us to understand the differences between different groups better. Interviews can

provide us with an opportunity to dig deeper into the characteristics of low-income and low-education groups' health behaviours.

3.1.1.3 Stage 3 co-design workshop

As the third stage of this research, the primary purpose of this stage is to invite researchers and participants to design the media for the intended groups by combining the research results of the previous stages one and two. Participatory design has a wide range of applications in the field of art design. Co-design is focused on developing practical, real-world solutions to issues facing individuals, families and communities (Steen, 2013).

What is worth mentioning here is the use of co-design as a way of collecting additional information and facilitating conversations rather than towards the design of an output that is intended to exist out in the world. These conversations further expand the dialogue with the target group from previous research methods, deeply insight into the considerations of relevant issues through richer design activities (mobilizing more design materials to visualize the ideas of the target group).

The primary form at this stage is the design workshop. Design workshops are a form of participatory design that consolidates creative co-design methods into organised sessions for several participants to work with design team members. It is an efficient, compelling, fun way to gain stakeholders' creative trust and input through activity-based research (Hanington & Martin, 2019).

3.4.2 Connection between the Three Stages

The three research stages are iterative, contribute to the final aims.

To understand the current communication of MCH knowledge for low-income and low-literacy groups, it is necessary to systematically analyse the dissemination and design of MCH media through the literature review. It could provide a critical point of view on other media design, also as the fundamental pilot stage, paved the way for the later two research stages. Nevertheless, it is not sufficient just to illustrate this in the literature. Therefore, to fully understand the group characteristics of the targeted users, the survey is essential. First of all, the questionnaire can show us the most basic situation of this problem through a series of quantitative questions. Then, through interviews, the target group's preferences and cognition are deeply explored, and then a series of data analyses is carried out to form preliminary conclusions on this basis. Next, participants were invited to join the final practical creation—

co-design workshop, put forward their opinions and suggestions, and finally complete the final design and thesis.

3.4.3 Analytic methods

The whole research process is iterative and mutually influenced, so there are also similarities in analysis methods. Specifically, based on the research on specific methods in existing literature, I decided on a series of qualitative methods that would be most appropriate to this research, which is presented below and discussed in more detail in the following section:

In the pilot study, I analysed the content of communication media using methods from a multimodal approach to research in visual communication. Multimodality is an interdisciplinary approach that understands communication and representation to be more than about language. Over the past decade, it has been developed to systematically address much-debated questions about changes in society, for instance, about new media and technologies. Communication is multimodal and even includes speeches at times, a spoken comment, instructions or requests, a gaze, and actions—touching or others (Kress, 2020, p.32). Multimodality is one of the research methods of linguistics, but it also plays a significant role in analysing new media such as web pages.

The main purpose of the questionnaire is to show the different tendencies of groups (income, education level) in obtaining MCH information, especially for my target group (low-income and low-literacy), to understand their cognition for obtaining health information from a general perspective, and the situation is essential. Therefore, the display of data is mainly based on nominal scale data with the interpretation of percentages. Because it does not involve the analysis of causality, etc., it will not be applied to quantitative methods.

The semi-structured interview was recorded and transcribed verbatim, then used traditional qualitative data analysis 'coding' (Miles Huberman & Saldaña, 2014). It mainly adopted the six-step method (Figure 3) of thematic analysis (Braun & Clarke, 2006) to summarise the interview context I collected before. Thematic analysis is the method adopted in this section, allowing researchers to identify and organise relevant topics and subtopics, which can then be sorted into analysis units. Each unit is a sub-theme in research, and that can be further classified into smaller pieces. The major operation of thematic analysis, therefore, is thematisation (Paillé & Mucchielli, 2016, p.57).

Figure 3 Six Steps of Thematic Analysis.

The data from the co-design workshop primarily consists of three main categories: audio recordings, on-site notes, and co-designed works. The thematic analysis method was also applied to summarise and distill key points from the data.

3.5 Research Process

3.5.1 Visual design review

3.5.1.1 Rationale for cases selection—social media cases selection

Recent studies show that people tend to be exposed to digital media more often than print media (Strouse et al., 2019). The growing prevalence of smartphones and wireless networks engages them in the media and digital devices. China has built more than 1.15 million 5G base stations, accounting for more than 70% of the global population. 5G network coverage has been achieved in urban areas of all prefecture-level cities, 97% of countries and 40% of rural towns across the country, and the 4G population coverage rate reached 94%. Besides, statistics from 2021 show that China has the highest penetration of smartphones worldwide, which has soared from No.8 compared with last year. Smartphone users have over 953.55 million and may keep the increase in the future. It is clear that even for rural residents, accessing the Internet via smartphone seems not a problem nowadays.

Furthermore, the Chinese Academy of Press and Publication released the 17th national reading survey in 2020, which paints a promising picture of reading habits in the Internet era (ChinaDaily). The survey found that the daily reading time and annual reading number of paper books, printed newspapers and printed journals had declined in 2019. In contrast, digital reading has continuously increased. Every day, Chinese citizens use mobile phones for 100.41 minutes, which is 15.5% higher year-on-year. The proportion of citizens reading on mobile phones, tablets, personal computers or iPads, had increased from the year before. Another example from a survey by NBS (National Bureau of Statistics) in 2019, which engaged more than 2,000 participants and the result shows: 1 from the perspective of occupation, unemployed, part-time workers, self-employed and farmers are the main groups of mobile

phone readers; 2 in terms of educational background, the number of mobile phone readers is inversely proportional to their educational background. The targeted group of this research is low-income and low-literacy people, a group that is less likely to access printed books and media (Neuman & Celano, 2001). Additionally, as long as people can access the Internet and smart devices, the accessibility and adaptability of online media mean that information can be made available to users without limitations on location and time. For this reason, the analysis conducted in this study only relates to online media.

The selection of cases to analyse, is separated into two parts. This section focuses on horizontal comparison, which involves four different and comparable social media platforms. The chosen based on below reasons:1 The media must have different characteristics and strengths; 2 must be the most frequently used media by audiences in their category. The listed below are the basic features:

WeChat (in Chinese:微信)

Link: https://www.wechat.com

Basic features:

1 All-in-one messaging app developed by Tencent.

2 A social communication platform and not just the Chinese Facebook.

3 Monthly active users:1.202.5 billion (Q1 2020).

4 Penetration rate among 16–64-year-olds (in China):78% (Oct 2018).

Xiaohongshu (also known as: little red book; in Chinese:小红书)

Link: https://www.xiaohongshu.com/explore

Basic features:

1 The most famous photo sharing media in China.

2 Originally as a cross-border e-commerce attracted a lot of attention, and gradually become a comprehensive platform.

3 Average monthly active users (MAU): 250 Million (June 2019).

4 Percent of users identified as female: 85% (June 2019).

TikTok (in Chinese:抖音)

Link: https://www.tiktok.com/explore

Basic features:

1 The first Chinese social platforms to obtain popularity abroad.

2 An interactive media with the short-video app.

3 Global Monthly active users: 800 million (Q1 2020).

4 China monthly active users:518 million (Q1 2020).

Weibo (in Chinese:微博)

Link:
https://weibo.com/newlogin?tabtype=weibo&gid=102803&openLoginLayer=0&url=https%3A%2F%2Fwww.weibo.com%2F

Basic features:

1 One of the most popular sites in China and is often considered to be a combination of Chinese Facebook& Twitter.

2 Different with WeChat, Weibo more emphasis social functio

3 Monthly active users (MAU): 515 million (Q1 2020)

4 Mobile monthly active users-94% (Q1 2020)

The reasons why here we engaged with different types of media are listed as follows: 1 aimed to absorb and take the merits of different types of media when communicating health information. Since different media forms have their communication advantages. For example, TikTok's videos are more convenient for information dissemination and more accessible to be accepted by people that do not want to read text. WeChat, as an instant messaging tool, can quickly connect people with their friends and relatives. Other forms of media also have their unique features for health communication. Therefore, it is hoped to include a wide range of media for the analysis of communication effects and design, so as to better serve the final design output.

3.5.1.2 Rationale for cases selection—specialised app selection

Specialised apps are also widely used as an additional channel for MCH communication. Such apps can be found on the Apple Store and Android market (Huawei Market Store, 华为应用市场). Under the Android system, different phone manufacturers have their app stores for users to download apps. Here, the Android Market has chosen Huawei, which has the highest market share in the smartphone market and is highly representative. Table 2 shows the top 10 apps with search results for the keywords "maternal health" in the two online stores respectively. One thing worth mentioning is that the app with shopping as its sole function has been excluded, as this study aims to investigate health communication rather

than commercial activities. Some apps in the graph appear duplicated (such as "MAMA") because most apps are available on both Android and Apple markets.

This research categorises these apps as 'comprehensive', 'community', and 'single function' (recording/diet/shopping). The subsequent detailed analysis includes six apps selected from these three categories. The comprehensive category typically refers to media with broad functional definitions. These media types do not emphasize a single functionality as their features, and users' impressions of their usage are not biased towards any specific functionality. Single-function apps refer to apps that attract users with a single functional feature. These apps may also have other functionalities, but they are primarily known for a specific function, which is also their main dissemination point. As shown in Table 1, single-function apps include recording/diet/shopping/inquiry. Community apps primarily focus on community as their main function, supplemented by other standard app functionalities. Although this category shares some similarities with single-function apps, it is separately classified due to its more comprehensive functional coverage.

Table 1 Download of top 10 MCH apps in Android and App Store.

Apple Store			Android Market		
Apps	Categories	Download	Apps	Categories	Download
MAMA	Comprehensive	78413K	MAMA	Comprehensive	59170K
QinBaby	Single function-recording/diet	62701K	MC Handbook	Community	3330K
BabyTree	Comprehensive	61040K	YouBaby	Single function-recording/diet	107M
MeiYou	Single function-recording/diet	54980K	PregnantManager	Comprehensive	4520K
Vaccine	Single function-recording	43270K	RiceMAMA	Single function-Shopping	4980K
MomBBS	Community	53890K	BabyTree	Comprehensive	57430K
RiceMAMA	Shopping	3280K	PregnentHealth	Community	4579K
Daote	Single function-inquiry	4570K	FetalHeart	Single function-recording	3210K

CuteFish	Single function-diet	4320K	DrAngel	Single function-inquiry	2870K
PregnantManager	Comprehensive	16780K	PregnantHome	Single function-shopping	1006K

Statistical data is sourced from the official app, with the statistics dated January 1, 2024.

Considering factors such as overall download counts, platform availability, and eliminating duplicate apps, a total of six apps were selected for detailed analysis. They fall into three categories: comprehensive - MAMA, BabyTree; single function - MeiYou, QinBaby; community - MomBBS, and MC Handbook. It is worth noting that, although these apps are classified simplistically here, it does not imply that their functionalities do not overlap. Taking the recording app MeiYou as an example, initially, its primary feature was to help women track their menstrual cycles, but it gradually incorporated other related functions as it continued to develop. However, because the app's core function remains recording, it is categorised as a recording-type app. Similarly, other analysed apps might have many overlapping features with other apps, but the classification is based on their primary promoted functions.

From the perspective of download numbers, comprehensive apps have a higher download count. This is primarily because comprehensive apps are more suitable to meet users' diverse needs. MomBBS, a leading app in maternal and child health communication, has the highest downloads and attention. BabyTree, another popular comprehensive app, entered the market at the same time as MomBBS and has many downloads. Next are apps with a primary focus on a single function, especially recording apps, which have also garnered much attention. Previous studies have shown that parents, especially when their children are young, have a strong desire to record and share their parenting experiences. The recording apps mostly revolve around children's growth, such as synchronising time and location in real-time when saving photos, making it easier for users to review their children's growth later on, attracting many users. QinBaby and MeiYou both fall into this category. Lastly, there are apps with community features as their primary selling points. These apps can be divided into two types. One is based on online communities, typically differentiated by topics such as pre-pregnancy discussions, homemade baby food, etc., with Mommy Community being a representative example. The other type of community model is based on geographical location, as seen in the selected six cases, such as the MC Handbook. These apps use the user's location to categorise them into regional group chats. While community features have been included in previous apps, the number of users who specifically download this type of app is relatively low.

3.5.1.3 Data collection

Data were collected from May to August 2020. There is no single, best way to collect webpages and mobile screens for data analysis, but the two methods used in this research (saving html pages and screenshots) are generally considered valid and appropriate.

3.5.1.4 Secondary research data analysis

The objective of this section is to analyse how internet-based media design impacts the communication of health information. As a multimodal tool, online media is "a socially shaped and culturally given semiotic resource for making meaning" (Kress, 2010, p.79). That is also can be understood as the combination of multimodal pathways (Bowcher, 2012, p.242). Multimodality pertains to conditions in which at least two input (senses) or output (medium/device) modes are involved (Pauwels, 2012, p.250). Some studies have been conducted on online multimodal texts for medical services (Usher & Skinner, 2010). Some of them from the perspective of mode applications of websites or homepages, describing different modes, such as writing (Kong, 2018), image (Garrick & Pendergast, 2014; Michelson & Valencia, 2016), and sound (Pennock-speck & Saz-Rubio, 2013). However, it is very rare to find any research that analyses modes of online multimodal texts by comparing inter-disciplines. Most of the recent research focuses on sociology and linguistics rather than design. Thus, this approach is adopted in this research to examine the design of maternal health media. Specifically, this study draws on the socio-semiotic multimodal approach (Bezemer & Dress, 2015) to examine modes combined with maternal health media. Further, this study adopts an integrated approach to examine modes via combining a set of theories from the social semiotic view, which includes the functionality of layout (Kress, 2010, p.45), visual grammar (Kress & van Leeuwen, 2006, p.79), and image-text links (van Leeuwen, 2011).

Interpretation is the challenge at the heart of qualitative research, as this is necessary to make sense of data (Spiggle, 1994). Interpreting data involves asking questions about their meaning and significance and making connections between different components and aspects of the data to increase our understanding (Vale, 2013).

The theoretical basis of relationship between image and text was utilised in the analysis process (Bateman, 2014). The principle of content analysis in this part also refers the TOOLKIT of the US department of health and human services (Centres for Medicare and Medicaid Services(CMS), 2010). It provides a detailed and comprehensive set of tools to help

researchers make written material in printed formats more comfortable for people to understand and use. The relevant suggestions regarding visual design and textual content mentioned in the TOOLKIT, i.e. cultural inclusivity and design readability, have been integrated into the three analytical aspects of Chapter 4: i) visual analysis, ii) design strategies, and iii) the impact for health communication. Based on the three forms of analysis, cross-synthesis was conducted on the meanings and implications of the design of the different media types. The analysis focused on the relationship between design features and the communication strategy. The main object of this research is to focus on aspects of the visual design of maternal media; a comparison analysis was conducted in the sections of visual analysis and communication strategies. Visual content and its context are the critical components in constructing the meanings in a design (Kress & Van Leeuwen, 2020), the multi-semiotic (employing a range of semiotic resources such as written language, speech, image, colour, layout, music and movement) and typically also multi- channel documents (e.g. visual, aural and increasingly also tactile communication) (Noble & Bestley, 2011, p.171).

3.5.2 Stage2-A: questionnaire

3.5.2.1-Questionnaires data collection

Child-rearing behaviour is an essential measure of whether or not the communication of MCH information is in place (WHO,2024). Therefore, it is necessary to examine the current Chinese attention to the MCH health information, evaluate the current main ways of users obtaining such information, and the main difficulties hindering the acquisition of information to inspire designers to carry out better designs to convey relevant health knowledge.

This survey is anonymous due to the open nature of the internet, as surveys are typically indiscriminately distributed to everyone. In order to collect data from the target group, this section included questions about participants' annual income and level of education in the demographic information section of the survey, enabling specialized analysis in later stages. Questions are designed for two types, closed-ended questions, and open-ended questions. Closed-ended questions were set up for judgmental purposes, asking participants for their opinions about maternal media and the effects of design and communication. Open-ended questions are very few since people usually tend to choose answers instead of writing a long paragraph.

3.5.2.2-Questionnaires data analysis

The questionnaire consists of three sections—demographic, health behaviour, and design understanding- covering four aspects—MCH information accessing, understanding, trust and taking action.

This research explores the correlation between users' socioeconomic status/education level, their media choice, and the worries about current MCH communication. From May to June 2020, I issued a questionnaire from WeChat, and a total of 592 questionnaires were recovered. 73.48% of responders identified themselves as females and 26.52% as males. This was expected in the China context, where females are generally responsible for childcare (Zeng & Hesketh, 2016). The age distribution of responders is relatively uniform, covering all age levels, with 30 to 40 age level (59.8%, n=354) accounting for the majority. Responders' monthly incomes between 2,000 and 4,000 Yuan (250 to 450 Pounds) were the main part (37.67%), while education level was concentrated in high school (39.36%, n=233) and undergraduate (42.74%, n=253). 60.14% of responders bring up their first child, and 33.61% of responders raise their second child. This questionnaire also includes questions about religion since religious beliefs may impact believers' daily lives, such as the vegetarian diet of some Buddhists, such as dietary requirements and daily routines. Details can be found in Table 2.

Table 2 Socio-demographic characteristics of respondents(n=601).

Items	Categories	N	Percent(%)
Gender	Male	157	26.52
	Female	435	73.48
Age	19 to 25 year-old	11	1.86
	26 to 30 year-old	124	20.95
	30 to 40 year-old	354	59.80
	41 or older	97	16.39

Monthly Income	under 1000 RMB(about 120 pounds)	49	8.28
	1000-2000RMB	198	33.45
	2000-4000RMB	223	37.67
	4000RMB or more	122	20.61
Education	Junior high school and below	86	14.53
	High school	233	39.36
	Graduate	253	42.74
	Undergraduate and above	20	3.38
Religion	Buddhist	33	5.57
	Christian	7	1.18
	Catholic	1	0.17
	Muslim	2	0.34
	Others	53	8.95
	None	496	83.78
Total		592	100

3.5.3 Stage2-B: Interview

3.5.3.1-Interview data collection

A key requirement of the interview guide is flexibility in developing a qualitative approach to interviewing. Unlike the fixed interview questions employed in quantitative survey research, qualitative researchers should be able to respond smoothly to various issues that emerge concerning the research topics (King & Horrocks, 2010, p.35). Therefore, it did not strictly define the interview questions; instead, many open-ended questions were set for interviewees to answer flexibly (please refer to Appendix B for the interview framework). Throughout the interview process, I remained prepared to make flexible adjustments based on participants' responses. In short, I did not adhere rigidly to specific question formats, but all questions were aimed at obtaining the desired types of data.

This second method—interview, aims mainly to explore the searching habits and visual preferences of the intended groups. Developing communication products that are truly accessible to the intended audience involves far more than graphic design considerations – users need, and intangible obstacles to access and understanding must also be considered. Thus, preliminary research into users' social and everyday practices and backgrounds is required to provide the designer with more in-depth insight into the intended users' needs and capabilities and to develop an empathic relationship with the users (Gibbons, 2018). So, unlike the randomness of the questionnaire, everyone participating in the interviews has had their background information reviewed in advance, confirming that they belong to the low-income and low-literacy group.

Participant Recruitment

In order to deeply understand the barriers to access MCH information of intended audiences (low-literacy and low-income groups), I chose 21 users including the urban/rural elders, urban/rural younger mothers and their husbands, and three doctors who have working experiences on Maternal Health Sector to do semi-structured interviews (Table 3). Lay participants were divided into five groups, the urban elders, the rural elders, the urban younger, the rural younger, and husbands. Although the targeted group is low-income and low-educated, China's unique urban and rural structure has resulted in many rural migrant workers in cities. Therefore, to diversify the samples, this interview also selected some urban migrant workers for investigation.

The participants were chosen based on three demands:

1. Per person monthly income equal or less than 3,000 Yuan/350 Pounds (According to the per capita disposable monthly income was 2,561 Yuan/300 Pounds in 2019, the National Bureau of Statistics (NBS)).
2. Education level equal to or under high school (68.2% Chinese education level only is a junior high school or below, NBS 2019).
3. Rural household registration (explanation seeing 2.2.1 second paragraph).

Table 3 A snapshot of user interview participants.

No. Participants	Age and gender	Monthly income level	Education level;Vacation	Background
1	54; female	low-income	senior high school; farmer	Caring grandchildren; most time spending on countryside; personal illness: presbyopia.
2	53; female	low	primary school; farmer	Caring grandson (5 months); because her son and daughter-in-law are busy at work, most of her time spending on the son's home for looking after the grandchild.
3	60; female	low	primary school; farmer	Caring grandchildren; illness: glaucoma.
4	55; female	low	primary school; retired worker	caring granddaughter: buddhist, so they follow the Teachings of Buddhism, such as not eating meat, and attach great importance to developing child's personal character and morality.
5	55; female	low	high school; retired worker	caring grandchildren; pay more attention to the children's diet and wearing, but only for the needs of food, clothing and warmth. There is no more knowledge of more health information.
6	52; female	middle	Secondary Vocational School; retired doctor	caring grandson (2 years old);be familiar with all scientific concept of raising children, also can carry out in the life, such as what nutrition should be complemented, as well as what characters should be developed in different period.
7	55; female	middle	high school; retired officer	caring granddaughter: in a sub-health state, so she pays special attention to learn the health information, also including how to raise healthy children.
8	48; female	high	high school; retired officer	caring her second child; because it is her second child, usually pay less attention to parenting knowledge. due to the ignorance before, her second child also have a certain degree of cerebellar hypoplasia, but because they did not notice it at the early age, they missed the best time to treat it.
9	29; female	low	Junior high school; work part-time	two children (son:3 years old, daughter: 6 years old); usually busy with work, occasionally take care of children, most of the time to the elderly care.

10	31; female	low	junior high school; unemployment	two children (son:9 years old, daughter: 4 years old); usually busy with work, occasionally take care of children, most of the time to the elderly care.
11	30; female	low	junior high school; unemployment	three children (son:3 years old, daughter: 5 and 8 years old respectively); in a sub-health state, so she pays special attention to learn the health information, also including how to raise healthy children.
12	29; female	low	primary school; work part-time	son:3 years old; usually busy with work, occasionally take care of children, most of the time to the elderly care.
13	32; female	low	junior college;work part-time	Two children (son:3 and 6 years old respectively); usually busy with work, occasionally take care of children, most of the time to the elderly care.
14	34; female	middle	junior high school; work part-time	two children (son:3 years old, daughter: 6 years old); in a sub-health state, so she pays special attention to learn the health information, also including how to raise healthy children.
15	33; female	middle	junior high school; work part-time	two children (son:2 years old, daughter: 7 years old); usually busy with work, occasionally take care of children, most of the time to the elderly care.
16	28; female	middle	high school; officer	one child:3 years old; rest day will take care of their children, more attention to children's education.
17	30; female	middle	junior high school; seller	one child:7 months; usually busy with work, occasionally take care of children, most of the time to the elderly care.
18	28; female	middle	high school; officer	one child: 2 years old; rest day will take care of their children, more attention to children's education.
19	32；male	middle	bachelor; officer	no much time for child caring.
20	34; male	middle	junior high school;work part-time	no much time for child caring.
21	29; male	middle	high school;work part-time	no much time for child caring.

*In the 2018 National Bureau of Statistics, for the income group, the low-income group refers to the group with a monthly income of less than 2,000yuan (250 pounds), the middle-income group refers to the group with a monthly income of 2,000-4,000yuan(250-450 pounds), and the higher income is more than 5,000 yuan(550 pounds).

Experts were recruited by email requests to maternal and child departments or hospitals. After the screening, three doctors were finally selected. All selected doctors had more than ten years of working experience in the related department and work in different areas, which could give us a deep insight into the industry status quo. The specific professional background is shown in Table 4.

Besides, because of the diversity of the intended research beneficiaries (see Chapter 2 Section 2.1), interviews were conducted with participants living in different geographical locations. Thus, the 21 participants and three experts come from three different provinces, Henan, Shanxi, and Shaanxi, located in the central part of China and are also the most representative areas with the lower-middle level of GDP and education (NBS, 2024). The main consideration behind this choice is that China spans a large geographical area, and the data from either developed/underdeveloped regions can be extreme (seeing Figure 4). Therefore, after considering this comprehensively, it was decided to choose three provinces with the lower-middle levels of GDP (NBS, 2024). Then, individuals from low-income and low-literacy groups were selected from these three provinces. This selection places individuals in the middle ground and makes them more representative.

Due to the travel limitations that were put in place during the COVID-19 pandemic, all interviews were conducted through the most prevalent online social software—WeChat. Each semi-structured interview lasted 20 to 40 minutes and started by asking the interviewees to introduce their backgrounds. The discussion followed to probe their information searching and reading habits before investigating their preferences for MCH media design. This was followed by asking them open-ended questions to understand their opinions on receiving related health information and how the communication process can be improved. They were also asked to highlight the weaknesses and the merits of their frequently-used media. This semi-structured approach to conducting interviews allowed for asking questions that enabled comparison of responses across all participants while providing the flexibility to probe in more detail certain vital aspects relevant to each stakeholder (Hair et al., 2008).

Table 4 Snapshot of expert interview participants.

Interviewee N	Professional background/area of expertise
Expert 1	Doctor of Town Hospital, responsible for inducing labour of family planning before 2015, now in the outpatient clinic in charge of maternal health examination, mainly aiming at the pregnant women after giving birth.
Expert 2	City maternal and child health hospital doctor, mainly responsible for pregnant women health knowledge dissemination, answer questions etc.
Expert 3	retired doctor in 2017. she has been an outpatient obstetrician for about 10 years and a surgeon for about 10 years.

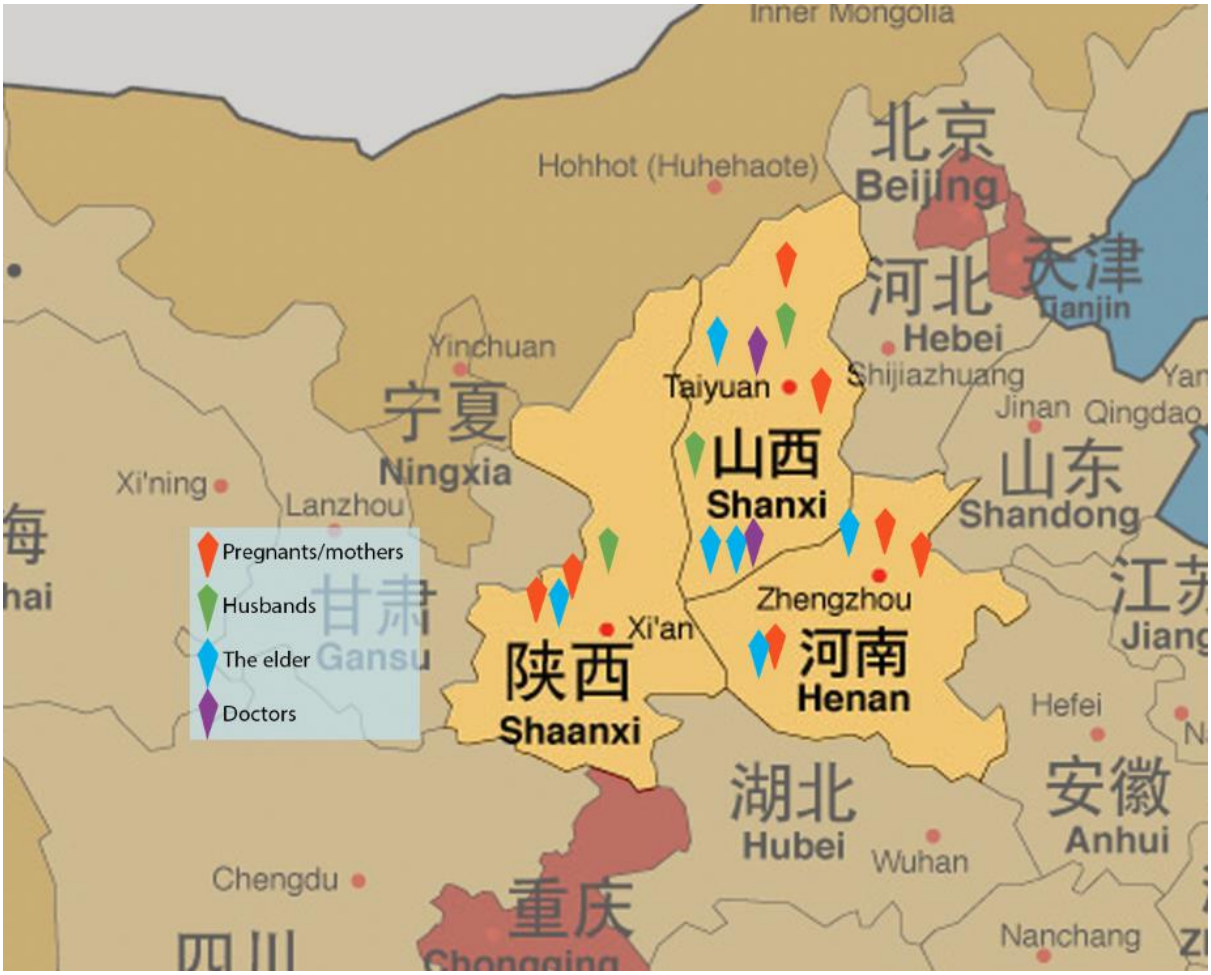

Figure 4 The details of interviewees 'location.

(this is part zoom in map, exclude other areas since there's none interview participants, the whole China map can take figure 3 as reference).

3.5.3.2 Data analysis

When considering the two variables of income and educations, results from data analysis show that the higher the education level, the higher the personal monthly income.

A chi-square test of independence was performed to examine the relation between monthly payments and the education level of all respondents. The results are displayed in Table 5, and significant relationships were found between socioeconomic status and education, X2 (1, N = 592) = 59.703, p = 0.000**.

The Questionnaire does not involve the derivation of complex logical relationships, and therefore, the results are mainly presented originally. According to the type of questions, the discussion will be centred on four areas: 1 accessing, 2 understanding, 3 trustworthy, and 4 taking action.

Data were collected through semi-structured interviews conducted remotely using multiple tools, including audio recordings and field notes.

Table 5 The relation between monthly income and education.

The Relation between Monthly Income and Education								
Items	Categories	4. Monthly Incomes(%)				Total	χ^2	p
		Under 1000 RMB	1000-2000 RMB	2000-4000 RMB	4000RMB or more			
Education	Junior high school and below	19(38.78)	33(16.67)	25(11.21)	9(7.38)	86(14.53)	9.703	0.000**
	High school	20(40.82)	91(45.96)	85(38.12)	37(30.33)	233(39.36)		
	Graduate	10(20.41)	72(36.36)	106(47.53)	65(53.28)	253(42.74)		
	Undergraduate	0(0.00)	2(1.01)	7(3.14)	11(9.02)	20(3.38)		
Total		49	198	223	122	592		
* p<0.05 ** p<0.01								

The Coding Process

Each interview was recorded and transcribed verbatim to help with the analysis using traditional qualitative data analysis 'coding' (Miles et al., 2013). The codes and categories used for the analysis are naturalistically derived from the text rather than being set by the researcher ahead of the study (Hsieh & Shannon, 2005). This analysis adopted the six-step thematic analysis method (Braun & Clarke, 2006) to summarise the context of the interview I had collected before. The definition of thematic analysis adopted in the present paper is that of a method that allows researchers to identify and organise relevant themes and sub-themes, which can then be used as units of analysis in subsequent detailed re-readings of a data set, through which researchers increasingly familiarise themselves with the data and explore the meanings associated with the concepts emerging from participant testimonies. The major operation of thematic analysis, therefore, is thematisation.

Upon completing the transcription, each text document was carefully examined, and first-level codes were assigned to various relevant topics discussed during the semi-structured interviews. Once this 'broad brush coding' (Siccama & Penna, 2008) was complete, the second set of narrower, more specific categories of codes was developed and applied to the relevant sections of all transcripts. This methodical approach saw the subsumption of first-level principles into second-level ones and therefore helped identify any patterns in the opinions of different participants. A close examination of these emerging patterns led to the development of key themes. To ensure that the emerging articles were relevant to the aims and objectives of

the overall research, coding was selected, as shown in Table 7. Table 8 demonstrates the process of secondary coding, during which the three primary themes have been clarified.

The research question was exploratory (Warner & Griffiths, 2006) since no previous studies had addressed the issue directly; therefore, the thematic analysis required a high degree of interpretation to fully grasp the signification emerging from participant testimonies. Specifically, the research question sought to discover the accessibility, obstacles, and views of the current media design of the intended users (Stieglitz et al., 2018). The following extensive discussion will refer to examples from the study above to examine the methodological progression of the six phases of thematic analysis.

The entire analysis process was coded manually (Table 6 shows the coding chart). Because the interview notes were originally in Chinese, considering the workload involved when translated into English, for analysis purposes and to avoid software identification problems caused by the inaccurate description in the early translation. After finishing the initial stages, the original materials were manually coded and translated into English. This way, participants' opinions were synthesised and analysed by identifying the most frequently recurring ideas across the interviews. A total of 3 main themes and nine sub-themes were identified. Because the intention behind choosing interviews was not to build a new theory or framework but to get a nuanced view of MCH information communication for the intended group, a descriptive approach was used to analyse interview data. A descriptive approach to analysing qualitative data is interpretive, where core themes and patterns 'emerge' from the data rather than conforming to pre-existing categories (p.11).

Table 6 Coding chart.

Research objective	Code(level1-initial)	Interview extract
No.1 Describe the factors that affect your MCH information accessing	operability work busyness eye diseases advice from neighbours and friends kindergarten teachers' tasks elders' advice personal health knowledge	Q: what are the factors that affect your accessing of MCH information? A: some suggestions are very troublesome. for example, making complementary foods requires a lot of ingredients and a long time, so generally I won't follow them. Besides, I don't know much about the benefits of those Suggestions…(participant 8) A： my work is always very busy, I will not pay attention to the MCH information unless my child was sick. I only seek advice online or from elders/doctors advice when I encounter problems that I can't solve…(participant 5) A:I am getting older and have eye illness, but I don't like wearing glasses.

		so I will give up when I see small font…(participant 3) ……
No.2 Views on content and design about your accessible MCH information.	disordered layout excessive ads excessive text confused pictures affair news occupied a lot of space casual visual path complementary push specific content too many icons dazzling picture messy comments unclear information resource	Q: what do you think of the MCH information you have been accessed? A: there's too much information on the the internet. I don't know which information is reliable, so I just judge them by my personal experience, but I really don't know how to improve it…(participant 15) A: I can't distinguish the information I was exposed to, so I just give up…(participant 18) A: I always see many advertisements when I learn about relevant information on the Internet, which causes me to have many doubts about the authenticity of the information. I am worried that they will push some unreliable suggestions for advertising. But I have no way to find more suitable information. (participant 10) A: Many articles are mainly written, but I only study in junior high school. To be honest, it is really big to read those articles which are all words. I don't want to read them after I glanced at them and found that they were all words. Densely packed. (participant 11) A：I feel that a lot of reading materials only writes about how to do, without explaining the reason for why not to do. to be honest, I generally have to figure out the reasons before deciding whether to implement them. if I don't know the reasons, I might quickly get rid of these suggestions. (participant 13) ……
No.3 the issues of current MCH information communication	knowledge gap between two generation information explosion scientific parenting	Q: what difficulties do you think exist in the current MCH information communication? A: there is limited information design for the elderly. I usually busy at my work, so the child is sometimes caring by elders. but I can't correct many of the erroneous parenting concepts of the elderly, and we often quarrel because of this. (participant 12) A: the channels are vary diverse, paper media, tv, the internet, new media, but that leads to information explosion so we often quarrel because of different thinkings. (participant 14)

		A： To be honest, I don't know much about scientific parenting, so I don't know what's wrong or unscientific. I hope there could be a comprehensive and targeted science books for me and maybe I can be more sensible. (participant 17) ……

The presentation of results must remain descriptive, as in the example cited above. Three common, overarching themes were identified personal motivation, visual representation and information source. Each article and the associated sub-themes (see Table 7) are presented in greater detail above, focusing on information accessibility around MCH communication. The three pieces were connected with the MCH information accessing, understanding, and trust, respectively, and the analysis discussion was conducted together.

Table 7 Final thematic matrix.

Primary theme	Subtheme	Codes
Personal motivation	personal illness education level interpersonal relationship	· Work busyness · Eye illnesses · elders/relatives' suggestion · Kindergarten teachers\ tasks · Health knowledge
Visual presentation	typography text picture layout information source	· Disordered layout · Excessive ads · Excessive text · Confused pictures · Affair news occupied a lot of space · Casual visual path · Complementary push specific content · Too many icons · Dazzling picture · Messy comments · Unclear information resource
Information credibility	generation gap choice obstacles	· Knowledge gap between two generation · Information explosion · Scientific parenting

3.5.4 Co-design

3.5.4.1 Preparing for co-design workshop

The whole fieldwork of this section was developed in three parts, the pilot study with 3 people on 20 Oct 2021, and two formal co-design workshops from 16th to 30th Dec 2021 with 7 and 8 people, respectively.

There are five inclusion criteria for the participant selection: 1 participants should identify as female; 2 they must have at least one child under six years old; 3 their family

monthly income must be less than 3000 RMB (about 350 Pounds, this is based on the standard of low-income people in China, NBS, 2023); 4 the highest education level is high school or below; 5 they have a specific user experience or willing to use the MCH apps.

Considering male users in this area (fieldwork location) are usually busy at work (Zhong et al., 2016), also considering the role that women play more in childbirth and child-rearing in the Asian context (Woollett et al., 1994; Li, 2020), and that is why only female participants were engaged in this workshop. There is also a lot of research that can support this phenomenon, which I have detailed in the Chapter 2 literature review section. Another thing worth mentioning is that all the participants are housewives and do not have paid jobs (at least most of them do not have permanent and stable employment). Caring for children and dealing with housework have already taken up most of their time. This is a common occurrence in many other areas of the Country. According to the Third Survey on the Social Status of Chinese Women published by the All-China Women's Federation and the National Bureau of Statistics in 2011, 24.9% of the rural female labour force was mainly engaged in non-agricultural work, and 37.8% of women who had returned to their hometowns after having worked outside the home were engaged in non-agricultural work (Minde Public Welfare Research Center, 2021). Family caregiving is the most important reason that rural women cannot participate in non-farm employment, and traditional Chinese gender roles significantly reduce the likelihood of rural married women participating in non-farm employment (Wen, 2019).

Participants were recruited locally and through personal connections. I contacted a relative living in the town where the research was conducted and introduced them to my research situation and recruitment needs. Then, by distributing flyers at the entrance of several kindergartens, a group of participants lived locally were recruited. Considering that I wanted the participants to contribute to the workshop in a stress-free environment and to increase the credibility of their sharing, I tried to avoid inviting people who were familiar with each other or with me. Therefore, the majority of participants were completely unfamiliar. It was necessary to recruit participants through local connections because they would be more knowledgeable about how to recruit people who could participate in the research. Additionally, having locals conduct the recruitment helped establish trust with the participants more easily, reducing communication costs.

Two workshops were held on weekdays afternoons when all participants were more flexible. At the beginning of both workshops, they had to fill out a brief questionnaire (see

appendix A) that covered fundamental demographic questions and their health behaviours inquiry. See Table 8 for 18 participants' demographic information.

Table 8 Participants demographic information.

Categories	No.	Vocation	age	Incomes (£) *	No. Childs(age)	Online health communication media using frequency
Pilot study		Full-time worker	9	500	1 (2-year-old)	Always
		Unemployed	7	300	1 (2)	Always
		Partime worker	0	400	1 (4)	Often
Workshop 1		Unemployed	5	300	3 (14;9;3)	Rarely
		Unemployed	8	350	2 (8;2)	Sometimes
		Partime worker	9	280	2 (6;3)	Sometimes
		Unemployed	1	280	2 (10;5)	Rarely
		Unemployed	3	340	3 (8;5;3)	Sometimes
		Partime worker	9	350	3 (7;5;1)	Often
		Self-employed	4	250	4 (12;9;5;1)	Rarely
Workshop 2		Unemployed	4	300	1 (2)	Always
		Partime worker	0	320	2 (5;1)	
		Unemployed	5	300	1 (2)	Always
		Unemployed	9	350	1 (2)	Often
		Unemployed	4	300	1 (6 months)	Always
		Unemployed	7	300	1 (3)	Often
		Partime worker	4	330	1 (1)	Always
		Partime worker	5	340	1 (1)	Always

*Incomes here means family monthly income per person. This is not a completely accurate number, because the exchange rate changes every day, the salary listed here is calculated based on the exchange rate of 9, that is, 1 pound =9 yuan, and I chose the integer adjacent to it to list here.

3.5.4.2 Workshops process

In Oct 2021, I conducted a pilot study with three participants to examine the design process. I want to highlight the revised part of this test. First, I found that if all participants are stranger to each other, it is necessary to leave 10-20 minutes of ice-breaking time at the start. I have also considered that if I were to organise a workshop with a larger group of people, I would need to allow more time for them to get familiar. So, I modified the workshop process to include introductions in the first 15 minutes and a chat and interaction between participants. Second, three participants sometime mentioned that they didn't know if their contribution was valuable. This is proved by the previous research conducted by Jagtap (2021), where low-literacy people usually lack confidence and be sceptical of their own worth. I have therefore noted that extra attention needs to be paid to such considerations as encouraging participants to speak their minds and opinions. Besides, minor communication and games issues were also found and solved.

3.5.4.3 Data processing and validation

The whole process was recorded, and photographs were also taken (Figure 5 shows the two workshops).

Figure 5 Above: the first workshop; below: the second workshop.

There are three types of data I collected from two co-design workshops. Questionnaires before the workshop were simply handled to understand the basic demographic status of participants. Another two data, participants' performance/design works, and my observation notes during the workshop.

Although the workshop involved three types of data, the overall sample size was small, so the data was processed by me alone. The data from the three sections are also interrelated and corroborate each other. After the notes and recordings were transcribed, thematic analysis was performed. I classified the concepts and presented them as themes in 6.2-6.5.

3.6 Ethical Concerns

In this study, the research related to ethic concern is mainly focused on the second and third fieldwork parts. Before the start of fieldwork, detailed data collection plan (including all process description, relevant materials—consent form, questionnaire sample, interview questions, co-design activities materials etc.) was submitted to the ethic committee, and the

permission was got in Mar 2020. In the investigation process, evidence (online data of questionnaire and informed consent of the interview) was retained. Questionnaire listed a notice content at the first page, only accept the statement (agreeing the data provided can be used by the investigator and participators have no right to withdraw the data as long as they submitted), this form would transit to next page. As for the interviews, a consent form and participant information sheet were provided to each interviewee before the data collection start. A consent form is one way of verifying ethical regulations and agreements between a researcher and an interviewee, which prevents potential risks in conducting interviews; others include informing participants about the anonymity of the interview, the use of data and other relevant information. Brinkmann & Kvale state that informed consent entails informing interviewees of the purpose, and features, and any possible risks or benefits from the research project (2015: 93). To guarantee the ethical issues, the author created and used a consent form that was fully approved by the ethics committee at Lancaster University. The consent form included information regarding i) confidentiality and anonymity of interviewees, ii) the use of interviews in the author's publications, iii) the right to withdraw interviewees, and iv) encryption of interview records within a specific time as stipulated in the university guidelines. Co-design workshop also adopts the consent form used in the interview. The activity will start only after all participants fully read, understand and sign the consent form. In addition, the activity flow specially designed for the workshop and the corresponding materials are also listed in detail and submitted to the school for review (materials seeing appendix C and Chapter 6).

3.7 Summary

This chapter discussed the broad, inductive approach I took in developing this piece of research. The methodology I used is mixed method qualitative research, which articulates a flexible research strategy to gather conventional data. In the preceding paragraphs, there is briefly touched upon several key points for research epistemology, methodology, methods and also includes the detail operation of fieldwork. To answer the research questions, I used a series of methods such as visual design analysis, survey (questionnaire and semi-structured interviews), and co-design.

The research methodology and methods described in this chapter were extensively utilised to collect and analyse the data considered in the following chapters (4.0 to 8.0). In the visual analysis study—chapter4, multiple examples from the selected media were critically analysed via a multimodal method. In primary research stage, the result was widely discussed

through thematic methods. All the data combined with the co-design workshop experiences, finally contribute to the research conclusion and practical works of this thesis.

By learning from the research methods of different disciplines, especially in the field of humanities and social sciences, it can bring a lot of inspiration for design research. Indeed, there are a lot of similarities between design process and applied research. The two share an obvious commonalty that both go through a process of identifying a problem, undertaking a series of steps to investigate that problem and provide a useful solution. In short, the function of this chapter is to combine methods at each stage in the research process, with the flexible, conventional and interconnected concepts to contribute to the multiple dimensions of this research design.

CHAPTER 4 Design Analysis of Maternal Health Media

4.1 Overview

This section focuses on analysis of maternal health media and is divided into two parts: 1) analysis of four types of media: TikTok interactive videos, Xiaohongshu (Little Red Book) picture sharing, WeChat social communication, and the Weibo social media platform; 2) specialised apps for MCH communication. For each media platform, the analysis consists of three parts: visual analysis, design strategy, and application in health communication.

4.2 Three Key Aspects

4.2.1 Design features

Design literacy or visual literacy in design practice is a fundamental concern for those involved in creating visual communication (Newman & Ogle, 2019, p26). Visual grammar (Kress & van Leeuwen, 2020) has played an important role in linguistic research, and it will also be integrated here. This analysis aims to examine the visual design of health communication media, in terms of improving communication for targeted groups. Through the creation of more fluid and open visual messages, the designer can attempt to engage the reader in a dialogue, to empower the receiver in the construction of meanings of form within a message (Noble & Bestley, 2011, p135). The visual analysis here includes two parts—the narrative of language and textual framing and visual design- to explore the current design of MCH communication media.

For each case the analysis is structured as follows:

1 Describing the layout of the main page;

2 Discussing the interactive pathway of selected media and its impact for audiences;

3 Analysing the combination of visual elements and text, to understand how they communicate with viewers;

4 Interpreting the potential main concepts from the analysis in terms of identifying the whole design arrangement;

5 Discussing the impact of design features for the information communication;

6 Considering how multi-modal design (image, gesture, etc. have specific affordances and differing semiotic means) is used to convey information.

4.2.2 Design strategy

The design strategy here refers to the meaning of the function setting, and its communication features. In a broad sense, design strategy is complex and includes various elements, including visual design, written material. Thus, how these modes are combined to transmit information and match targeted people's need is the focus of analysis.

The analysis was conducted as follows:

1 Identifying main functional features on the menu of the first page of each media;

2 Identifying the most prominent and most frequently cited features;

3 Exploring how different modalities interact and convey meaning in a holistic way;

4 Identifying whether the influence of cultural diversities has been fully considered and targeted to develop special design or functions;

5 Identifying whether, as potential information receivers, low-income and low-literacy groups are able to use relevant functions smoothly.

4.2.3 For health communication

Social media have changed and will continue changing the way we communicate health information (George, Rovniak & Kraschnewski, 2013). Smartphones are effective across a range of social learning and communicative contexts in health and healthcare: in communication, diagnosis, research, and improving personal health knowledge. The four examples in this section are recently developed examples of MCH communication and exist beyond the scope of official information channels. However, they do play a huge role in promoting the dissemination of health information (see 4.3).

The following aspects are considered in the analysis:

1 What are the characteristics of the selected media in health communication;

2 What are the current research for health communication activities on the selected media;

3 What are the effects of specific design features and strategies of selected media on health communication activities.

4.3 Part A: Social Media Platform

4.3.1 WeChat

4.3.1.1 Background

Tencent launched WeChat on January 21st, 2011, and is currently China's most popular social media (Wu et al., 2020). It was initially designed as an instant messaging app, primarily for mobile devices. At that time, Tencent had already successfully run a nationwide popular social media product called QQ (similar to ICIQ). In comparison with QQ, which was a product of stationary internet use, WeChat was specifically designed for mobile devices.

WeChat has experienced a dramatic evolution over the past ten years. Table 9 briefly reviews the development of WeChat features across its eight versions so far. Within this period, WeChat evolved from an instant messaging app to a fully-fledged ecosystem that provides a broad range of functions. Its instant messenger window can support text messaging, voice messaging, voice and video calls, location sharing, and more. In addition, users can update their statuses through Moments by sharing text-based posts, photos, videos, and links, which can then be viewed, liked, or commented on by their contacts, and these are similar to the functions of the Facebook timeline. Besides, it has recently integrated more functions, including audio/video conferencing, subscribed official accounts that provide articles, a payment feature, and step counting. It has become the "most pervasive" application in Chinese people's daily lives - with around 30% of mobile internet time spent on WeChat, which translated to almost a whole hour of use per day on average by the year 2017 (Ding et al., 2019).

Table 9 The 8 versions of function evolution in WeChat.

Years	Jan 2011 Version1.0	May 2011 V 2.0	Oct 2011 V 3.0
Functions' evolution	Set avatar and WeChat name; Send message; Send pictures; Import contacts.	Support mobile phone address book matching to find WeChat friends; Friend verification, QQ number find me, recommend me to QQ friends and other privacy settings; Support to recommend QQ friends and contacts friends; View nearby people; Receive QQ offline messages; Support mobile phone number registration WeChat; Voice notepad; Set a personalised signature; Chat support to send video.	shake; drifting bottle; Send a video message; Support traditional Chinese language interface; Groups can be saved to contacts; Support plug-in uninstall installation, do not disturb; Users in Hong Kong, Macao, Taiwan, the United States, and Japan are bound to mobile phone numbers.

Years	April 2012 V 4.0	August 2013 V 5.0	Sep 2014 V 6.0
Functions' evolution	Album function and circle of friends function; Photos can be shared to the circle of friends within WeChat; WeChat information can be sent to a group of friends; Photos and videos from WeChat can be forwarded to friends; Forward the current location to a friend; Star a friend; WeChat open interface, support sharing music, news and other content from friends from third-party applications; Login with a Facebook account; The English version was renamed to WeChat; The interface supports 7 languages; Support the use of overseas mobile phone numbers to accept verification codes for registration.	WeChat payment; Public number/service number(two type of accounts, usually been used as the public accounts); Evolutionary sweep.	WeChat small video, can be shared to a circle of friends or chat interface; WeChat card package, polymerisable coupons, membership cards, airline tickets, movie tickets, etc.; Can set the gesture password for WeChat wallet; Game Center revision.
Years	Dec 2018 V7.0	Jan 2021 V 8.0	
Functions' evolution	The main interface has been completely redesigned, which is more flat and clear and intuitive; Add a "Time Video", or you can give a friend's video "Crash" and tell him that you have been there; Like to change to "good-looking", you can browse the articles that friends think are good-looking in "Look and See"; Set a strong reminder in a single chat.	A new tab called 'My Status 'has been added. You can choose your current personal state as well as other people who are in the same state as you; New emojis, including animated ones that will "bomb" your screen, and the face expressions emojis are now larger and animated; A new in-app currency called "WeChat Beans"; The "Floating window" function of the article is updated; Can switch to dark mode to match system settings; Visual display when listening to songs; Improved the voice messaging experience and made it easier to swipe up to convert to text.	

4.3.1.2 Design features and strategies

The logo of WeChat (Figure 6) is an international, fresh grass green background with two white dialog box graphics. The design features of WeChat are similar to those of other types of social software. The homepage design looks like WhatsApp. The top part of the main page displays WeChat's name, a search bar, and a plus icon indicating more functions. The

main content is displayed in the middle of the screen, and four main functions are indicated at the bottom of the page: chat page, address book, discovery (moments, video numbers, live broadcasts, etc.), and personal information. Overall, the design of WeChat is accessible and inclusive in terms of engaging wide audiences, and there are different modes (the senior and child modes were added in 2021) to switch between for young people, senior people and even children.

The variety of WeChat features makes it possible for users to customise the ways they manage their social relations (Figure 7 shows app inner screenshots). In WeChat messaging, the system allows users to control the synchronicity of different chats. For chatting, the "Mute Notifications" option can be activated to avoid constantly receiving notifications of new messages in group chats, and the "Always on Top" option enables users to select some conversations at the top of the chat page. In this way, people can easily find these chats and notice any new messages from them without extra scrolling and searching. These two options assist users in delaying or prioritising communications with different ties based on their own needs.

An additional feature of WeChat is "Moments", which is a feature designed for users to share stories with their networks in the form of texts, pictures, and videos. In Moments, WeChat offers users options of categorising their contacts via customised tag descriptions and adjusting the visibility of each post to each category. These two options enable users to share a post with a target group or block some from seeing the post. Figure 9 shows the WeChat features mentioned above.

The Mini Program in WeChat can be accessed by sliding down the main page. This is a type of application that allows users to access and use services without the need to download or install a separate app. It provides a way for businesses and developers to offer a wide range of functionalities directly within the WeChat app, and also offers great convenience for audiences. At the end of 2020, there were about 600,000 MiniPrograms available on WeChat, spanning across categories including clothing, food, shelter and ticket booking.

WeChat is also popular with the public because of its rich emoticons and stickers. These non-textual elements in their communication are favoured by users in rural and urban communities alike (Zhou, Hentschel & Kumar 2017). As a complement to the text, emojis can either be solely graphical or contain both an image and text. Typically, there are one to ten characters in a single sticker, depending on the information it is trying to convey and whether the meanings of the text and image are aligned. Emoticons often take the form of visuals to ease emotions. Stickers also help users communicate when it is inappropriate to say something

or when people do not have an exact word in mind. In addition, the use of emoticons is also helpful to alleviate the access barriers for vulnerable groups, such as the elderly who cannot easily input text and the groups lacking in cultural literacy (Kaihlanen et al., 2022).

Unlike other popular social media platforms like Twitter, Weibo, or Facebook, WeChat is a relatively closed platform. It relies on a two-way communication mechanism between users. Communication between users only happens through mutual agreement. After a request is accepted and one becomes part of another's WeChat contact list, two users can chat and see each other's posts on Moments. There are multiple ways for WeChat users to send WeChat contact requests, such as searching by WeChat ID, scanning a WeChat QR code, or through shared name cards sent by other contacts. WeChat provides additional privacy settings for users to control who can access their Moments, even within their contacts.

In contrast, on Weibo and Twitter, people can freely follow others, see their posts, and initiate communication; on Facebook, people beyond one's contact list can often access one's posts (Ding et al., 2019). WeChat's Moments and chat features were designed mainly for personal use and entertainment, and they have become the most widely used WeChat functions. In mid-2014, 84.5% of WeChat subscribers used voice chat, 83.3% used text chat, and 77% used Moments (CNNIC, 2014). The Moments feature allows users to send their information to an unlimited number of people. Such information typically consists of pictures, which are limited to nine sent at one time, or links to news or other web-based articles or postings. The messages are usually accompanied by limited commentary. Those receiving the pictures or links can add comments. Pictures and messages usually include daily activities the user wishes to highlight, such as travel, family, pet photos, and brief social commentaries on current events. This kind of communication can be thought of as "one to an unlimited number of acquaintances (Harwit, 2017)".

Figure 6 WeChat LOGO.

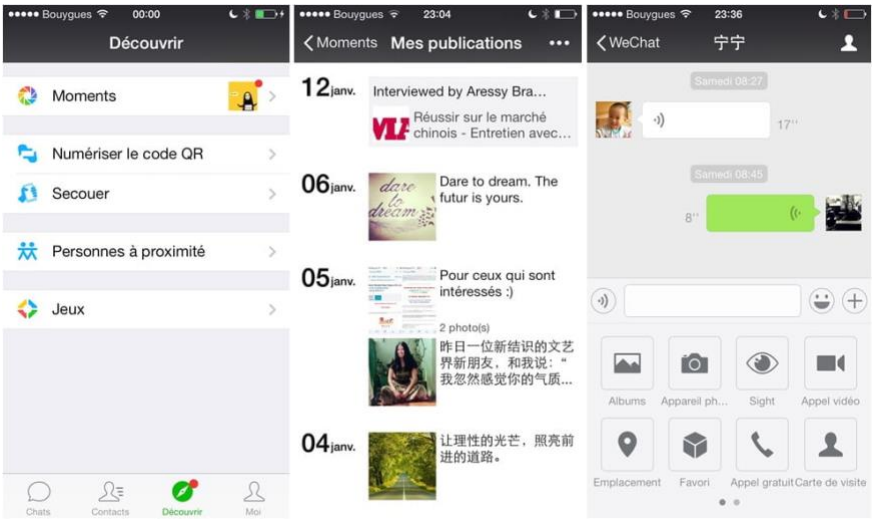

Figure 7 WeChat inner screenshot.

(left: personal information page; middle: friends circle-a social page; right: chatting page).

4.3.1.3 As a social communication platform for health information

As an asynchronous closed communication platform, communication through WeChat is more private than phone calls, emails, or other social media (Cui, 2016). WeChat has been pervasively adopted in China for both personal and work communications and is now also being adopted as a type of communication between healthcare professionals and individual health consumers (Ding et al., 2019). In a survey conducted in 2015 (Ross et al., 2004), about 50% of Chinese doctors communicated with patients using WeChat in the month preceding the survey, and this figure is even higher in Brazil at 87% and in Italy at 61%.

A study conducted by Ding et al. in 2019 explored WeChat as a medium for communication between patients and healthcare providers. In this research, Patient-Provider Communication (PPC) was reviewed to provide a psychological reassurance that the structure of the current Chinese health system does not provide. This method showed how personal communication channels positively contributed to healthcare experiences and outcomes, strengthened patient and doctor relationships, and provided patients with psychological assurance. In the end, the authors suggested that the use of WeChat filled a gap in China's healthcare system, where the relationship and the formal communication channels between patients and providers are lacking. To do so, various boundaries were negotiated and constructed by patients and doctors based on their personal interests, social norms, and

technological affordance. This personal approach to boundary maintenance differs from what was revealed in previous work where PPC was a mandatory institutional behaviour and required formal organisational support. Moreover, this personal approach also provides advantages that the institutional approach does not, such as direct communication between doctors and patients and potential responsiveness to urgent issues.

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For female-related research, Wu et al. (2020) used WeChat to conduct a research study on universal breastfeeding. In this context, WeChat was identified as an effective tool for promoting exclusive breastfeeding in early life, and health education can be used in addition to local breastfeeding promotion programs.

In short, WeChat, as one of the most widely used social media platforms in China, still plays a huge role in the dissemination of health information. This is mainly due to WeChat's closed communication strategy. People who can send or share information with each other only when they are online friends (which means existing in each other's address list) foster trust and a sense of reliability in information shared through these channels. In addition, WeChat's Mini Program provides a lot of convenience for users' daily needs. However, as mentioned above, the design of Mini Programs is streamlined, and the functionality needs to be more comprehensive than that of online platforms or dedicated apps to release the operational load. Many well-known comprehensive MCH Apps, like BabyTree, Mama, etc., with extremely simple and crude designs in the mini-programs. However, WeChat also has unique features

that many apps do not have, such as the endorsement of acquaintances and interaction in the circle of friends. All these are worthy of reference in future design.

4.3.2 Xiaohongshu (Little Red Book)

4.3.2.1 Background

Xiaohongshu, known as Little Red Book (in Chinese: 小红书; Figure 8), was initially launched as a social media and e-commerce platform. About nine years development after its establishment in 2013, it gradually became a complex platform, and it has been described as "China's answer to Instagram" (Jie & Lee, 2021). As of 2019, Xiaohongshu had over 300 million registered users, and the number of monthly active users was over 85 million (Statusta, 2022). 70% of its users are reportedly born after 1990, and nearly 90% are females. The app allows users and influencers to post, discover and share product reviews, for example, travel bloggers post content regarding tourism and leisure destinations, food bloggers like to post recipes, and fashion bloggers always share their daily outfits.

Figure 8 Xiaohongshu LOGO.

Figure 9 Xiaohongshu homepage screenshot.

(left two pictures are home page screenshot, can see lot of posts; right two pictures are sellers home pages).

4.3.2.2 Design features and communication strategies

Xiaohongshu's logo mainly has bright red as the background and matches three white Chinese words-小红书 (the Chinese name). While the media position of it is the same with Instagram, both are picture sharing platforms, the whole design features and layout are slightly different between them. Unlike the main page of Instagram, which has only one main line to show the content, the main page of Xiaohongshu has two main lines to display content, with an average of about four posts per page (seeing Figure 9). As for the layout, there are five icons at the top of the home page. The first mark on the left side is the record function, where users can record their voice, mark locations where they have been, record text and photos. The second icon is the list of people you follow, where you can see their latest news and posts. The icon in the middle is the main page displayed after entering the app, which means Finder, where users' personal needs will be analysed, then accurately push the content that users may be interested. On the right of Finder is the function—Nearby, which could help users quickly connect with other people around. The last function on the far right is searching for icons. At the bottom of the main page, five main icons respectively represent the homepage (corresponding to the Discovery at the top), mall (selling products), post (different from personal recorder I mentioned before, this function is open access), message (comments and any other notifications and interactions are here), and personal homepage (display users' posts and the system setting).

This homepage design is very similar to the Western social app Instagram. Both prioritize visuals with images as the main focus, and text complements the images, making it relatively brief. The characteristic of such social apps is "a picture is worth a thousand words." For example, dishes photographed before meals, interesting moments during travels, group photos of family reunions, etc., are all produced as symbols. By sharing these symbols, a virtual "persona" is created on social networks, attracting the attention of viewers.

The design style of image-based social platforms has numerous advantages, which is why its rapid rise in quickly capturing user psychology. According to a quantitative experiment on social media and loneliness, image-based social media functionalities may reduce feelings of loneliness while increasing happiness and life satisfaction. In comparison, text-based media usage has much poorer effects. In the attention-scarce digital economy, images provide a quick and effective means of communication and expression. Their use brings greater happiness to users. These findings explain the nature of loneliness in contemporary digital society and why such apps can rise rapidly in a short period. Just like Xiaohongshu, which went from the

establishment to becoming China's largest lifestyle-sharing platform in just five years (established in 2013 and became the top platform in 2018).

One of the special functions of Xiaohongshu is a recommendation; here, it refers to people sharing their own user experience and recommending products or services to this platform, and others could imitate such actions or experiences. The positioning of Xiaohongshu is similar to sharing an encyclopedia, where people can find almost everything they want—from life experience to academic learning, as well as beauty and health- covering almost every aspect of ordinary people's lives. Unlike Instagram, a single photo-sharing platform, users in Xiaohongshu can share photos and videos (up to 5 minutes) with text captions and hashtags on their timelines. Visitors and followers can 'like' or comment on posts.

The relatively single-line communication mode results in one of the characteristics of Xiaohongshu in information transmission, that is, it has a large number of key opinion leaders (KOLs). KOLs usually refer to influential figures on social media and celebrities in fields, which also are treated as fundamental to maintaining Xiaohongshu's works. Many Chinese consumers trust the opinions of their favourite KOLs more than those of their peers. Under the model, Xiaohongshu has even drawn Western celebrities such as Kim Kardashian and KOLs from other social media platforms in China, such as Weibo, WeChat.

4.3.2.3 Through pictures sharing health

Many studies on Xiaohongshu are from the perspective of marketing. Fewer studies have been done on health communication on this platform. However, what is clear is that this app also plays an increasingly important role in the health field. As a free and easy-to-use app, Xiaohongshu has attracted health professionals who use hospital-specific and dedicated accounts and groups. For example, healthy weight loss and healthy meals are both hot health topics in Xiaohongshu, attracting more than 1.09 million and 380,000 discussions, respectively. Search for key keyword 'health' could find that there are 29 health-related bloggers with more than 100,000 followers.

After the outbreak of COVID-19 at the end of 2019, Xiaohongshu launched an anti-pandemic psychological assistance platform on Feb 10th, 2020, providing 24/7 free psychological counseling to frontline medical staff, patients, and the general public who are affected by COVID-19. Searching for keywords such as "heart-warming action" or "psychological assistance" in the Xiaohongshu app will bring users to the relevant page to make an appointment with a relevant institution for a one-on-one free psychological

consultation. It is worth mentioning that to support the consultation needs of frontline medical staff, each institution will send consultants with experience in professional medical communication. The activity has attracted more than 1,000 professional counselors since the outbreak of the pandemic (Loo, 2020).

As one of the most popular Chinese social media platforms, Xiaohongshu has received wide public attention. In this regard, KOLs play a prominent role in sharing their own experiences, popularising medical knowledge, and promoting the spread of health information among users. The push technology of this app has also made great contributions to user engagement. While privacy leaking issues and, excessive pornography and sexual innuendo still exist. In addition, because Xiaohongshu is still a new media that has emerged in recent years, the current research focuses too much on the discussion of its market value rather than other aspects. In my opinion, Xiaohongshu, as a social software with a high usage rate and a large number of health information sharing and KOLs, can be analysed from the perspective of health communication in future studies.

4.3.3 Weibo

4.3.3.1 Background

In August 2009, Sina, the leading Internet content provider and portal in China, launched ‘Weibo’, currently the most popular Chinese microblogging site and an important information source for Chinese people. Weibo has been the fastest-growing social network in the world (Huang & Sun, 2016). The daily active users of Weibo have reached 224 million by Sep 2020, across most provinces in China (Figure 12).

Figure 10 Weibo LOGO.

Figure 11 Weibo homepage screenshot.

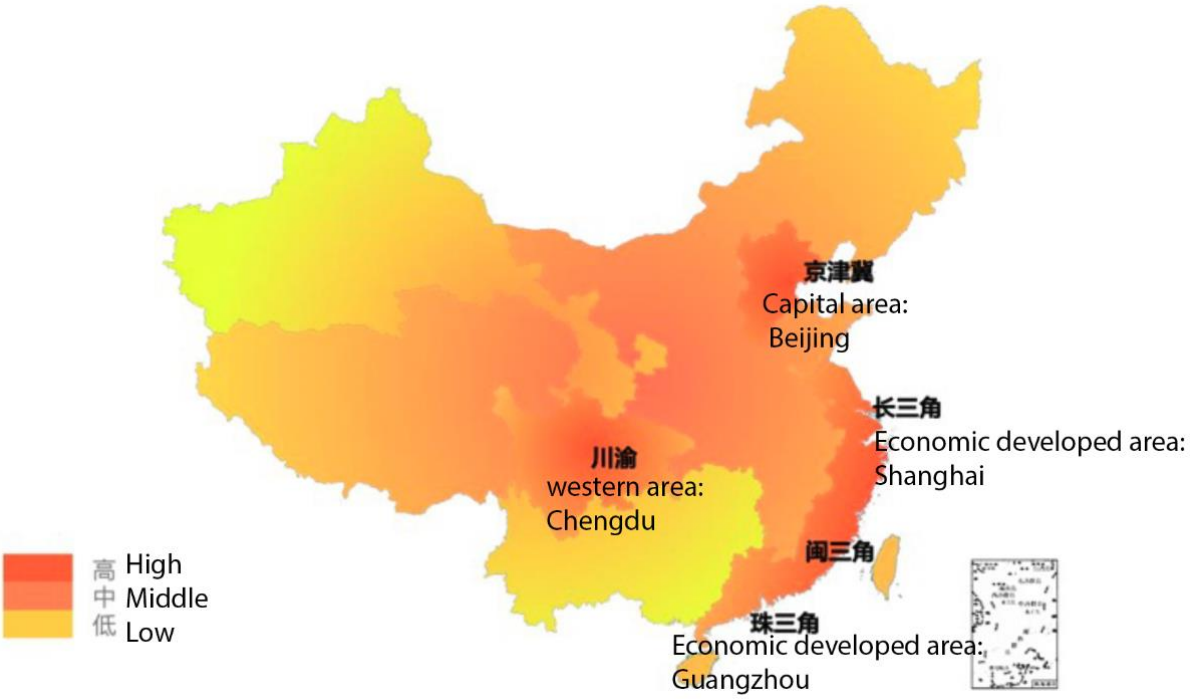


Figure 12 the users' distribution of Weibo.

(from red to lemon yellow means users' density from high to low)—Weibo 2020 User Report, available on: https://data.weibo.com/report/file/view?download_name=4a774760-40fe-5714-498e-865d87a738fe&file-type=.pdf.

4.3.3.2 Design Features and Communication Strategies

The slogan of Weibo is finding news anytime and anywhere (in Chinese: 随时随地发现新鲜事), and it is visually represented through its branding. As shown in Figure 10, the logo is a stick figure of an eye, as if staring at everything that happens in this world. Click the app, the layout is similar to Twitter, and the main screen shows all kinds of news (Figure 11). At the top of the page, the two icons in the middle are Focus and Recommendation, respectively representing the bloggers you have been following and the recommendation content. On the top left side is a camera icon, which allows users to operate their personal video channel. This function is similar to TikTok, but it does not attract many users since Weibo is still a text-based social media platform. On the second icon from the right is a conspicuous red envelope. People can click it to participate in games and earn a certain amount of money. As it is not a major feature of Weibo, the participants are also slightly few. On the top far right, there is a "+", which is widely used in various social media to indicate further function. The function here is the same with others; the inside allows users to post text, pictures, and videos. At the bottom of the homepage, five assistant functions are, respectively home page (which I just introduced), video channel, Discovery (another major function of Weibo, which includes the hottest discussion), Messages (all the following and private messages can be found here), and Personal Section were including users' frequently visited accounts, favourites and personal posts.

From the perspective of visual design, Weibo's style is similar to Twitter's but with many differences. In terms of layout and organization, Weibo's layout is more information-dense. This reflects the fast-paced nature of Chinese social media, which simultaneously displays popular topics, multimedia content, and advertisements. Additionally, in terms of functionality, Weibo is rich in features. It often integrates multimedia content, allowing users to share images, videos, and live broadcasts. To cater to Chinese aesthetics, Weibo incorporates the colours red and yellow, which hold significant cultural importance in China (typically symbolizing auspiciousness). Furthermore, Weibo has added numerous emojis, stickers, and meme culture that resonate with the Chinese user base.

From the perspective of communication, Weibo allows its users to post or share messages optionally with links, pictures, or videos attached. It provides users with quick, direct, and multi-modal modes of communication (Keenan & Shiri, 2009). Combining the features and functions of Twitter, Facebook, and Bulletin Board Systems (Han & Wang, 2015), Weibo allows users to post 140-character updates and enables them to share and discuss topics of

interest with a network of followers in real time. Users subscribe to other users' posts to receive their updates. Then, they can express agreement, show support, exchange ideas, and diffuse information via the retweet function (Recuero, Araújo & Zago, 2011). Metaxas et al. (2014) indicated that people retweet when the message is interesting, trustworthy, informational, or something they agree with. In a word, the internet, especially social media, is becoming increasingly important as a source of information for public health issues since it provides free and immediate access to large volumes of data (Tao et al., 2020).

Similar to Xiaohongshu, there are also a lot of KOLs on Weibo. Within this platform, they are often referred to as V-users, since they usually have been verified by the platform so their profile photo usually with a small and golden v-icons, meaning 'verified'. V-users occupy the core or gatekeeping positions and thus have more control over the information flow through the channels from one node to the other embedded in the network (Han & Wang, 2015). According to Han's research in 2015, V-users tend to follow each other rather than following back to their non-V followers, whereas non-V-users tend to follow V-users rather than following other non-V-users. This pattern further supports the findings through other centrality measures about the central role of opinion leaders in networking. It also partially reflects the status-seeking intention of regular Weibo users or the 'fans culture' that drives the growth of the 'Web.'

In general, Weibo's design style, compared to Xiaohongshu and WeChat, resembles more of an open community. Here, users can share images, videos, and long/short texts, and they have the freedom to choose the type of content they share based on personal preferences without excessive constraints. The inclusivity of this design is reflected in both content and users. This is a key reason why Weibo has consistently ranked as the top app in terms of social media downloads and usage. Fewer restrictions attract a larger user base. This inclusive design style also proves to be responsive during major unexpected events. A recent example is the COVID-19 pandemic. Shortly after the outbreak in China, related topics emerged on Weibo. As the situation developed, Weibo became a crucial platform for official information sharing. Users sought help and expressed their concerns through Weibo during this period. The open community design of Weibo provides a platform for communication for different channels and demographics, contributing to a certain extent to the equitable development of online networks.

Openness, inclusiveness, and rich types of communication media make the design style of Weibo a natural platform for information exchange. However, the other side effect of too much content is that too much information will lead to inadequate supervision. This is also the most widely criticized point of Weibo, and there is still no very effective solution mechanism.

4.3.3.3 Health information in the social media platform

Sina Weibo, similar to Twitter, is the most popular online microblog platform in China. The special feature—trending topics, makes it an appealing communication tool for public health promotion, especially in response to sudden public crises, such as SARS in 2000, H7N9 in 2014, and the recent COVID-19 crisis. During the COVID period, many patients faced difficulties accessing offline healthcare services. The strict lockdown policy was found to cut off the patient's social support network, preventing them from seeking help from family members. The ability to seek information and help online is essential, especially for those with young children or older adult members during the pandemic. A high proportion of female users were seeking health information and help for their parents or for older adults at home. The most searched information included accessing medical treatment, managing self-quarantine, and offline to online support. Weibo once again contributes to health information-seeking behaviours during the outbreak and highlights the importance of paying attention to the information needs of vulnerable groups and the role social media may play (Zhao, Basnyat & Hu, 2020).

Besides, as a present of the "drifting dandelion" pattern of the network, V-users usually dominate the dissemination of health information (Han & Wang, 2015). The term "drifting dandelion" was first introduced by Han and Wang in 2015. The two authors proposed a model where hot topics or Key Opinion Leaders (KoLs) act as the core, connecting to a group of audience or sub-hot topics like the seeds surrounding a dandelion. Due to its resemblance to a dandelion, it is referred to as the drifting dandelion model. As the centers of information diffusion, news media, well-known journalists, and medical professionals attracted a lot of feedback and discussions based on the messages they posted. The relationship between V-users and non-V-users presents a 'spider web' pattern, which indicates that V-users hold the 'centers' on Weibo to decide what can be shared and to which extent it can be shared among other nodes included in the Web. Non-V-users tend to follow V-users rather than other non-V-users, so this pattern also partially reflects the status-seeking intention (p.73) of regular Weibo users or the 'fans culture' that is driven by the growth of the 'Web.'

In recent years, the traditional one-way provider-to-user communication has been elevated to a two-way conversation on Weibo, which depends a lot on social network development. Social networks provide an appropriate approach to improving the health communication environment. First, the social network records who are looking for what kind

of information they need and from whom they receive it. By identifying and targeting influential/KOLs/V-users in a social network, health information providers may achieve a large-scale chain reaction of influence driven by word-of-mouth, with a small marketing cost (Cha et al., 2010). Identifying influencers in the network can also guide ordinary users to find out where to start in order to meet their information-seeking needs. Second, the network structure on Weibo can help with customisation of health information feeds to match the behavioural pattern of regular users, or to call attention to medical services that are not being used.

However, communication and information dissemination on Weibo remains uneven. For example, Weibo is more popular among the young than the old, and it is also easier to access in the economically developed areas (Han & Wang, 2015). In the statistics of 2020, about 48% of users were born after 1990, and 30% of users were born after 2000, which means more than 78% of users are about 30 years old or below. Less research pays attention to the specific effects of user age and regional distribution. Secondly, although Weibo provides online health consulting services, there is no research to evaluate its content and quality. It is certain that Weibo, as a timely interactive media, has many advantages in the dissemination of health information, such as a large amount of information sources, timely and effective interactive feedback, and numerous well-known V-users. However, the disadvantages of Weibo are also very obvious, such as the rampant spread of unverified information, celebrities accelerate the spread of rumours, lack of effective design methods to help ordinary people filter information etc.

4.3.4 TikTok

4.3.4.1 Background

TikTok, known in China as Douyin (Chinese: 抖音), is a video-focused social networking service owned by Chinese company ByteDance Ltd. It hosts a variety of short-form user videos, from a variety of genres, including pranks, stunts, tricks, jokes, dance, and entertainment with durations from 15 seconds to three minutes. TikTok is an international version of Douyin, which was originally released in the Chinese market in September 2016 and then transferred to an international version—TikTok (Figure 13) and launched outside mainland China in 2017. Since it launched, TikTok rapidly gained popularity in East Asia, South Asia, Southeast Asia, the United States, Turkey, Russia, and other parts of the world. As of October 2020, TikTok surpassed over 2 billion mobile downloads worldwide.

Figure 13 TikTok LOGO.

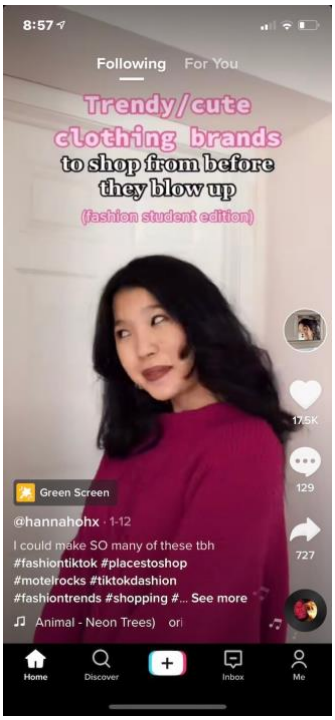


Figure 14 Inner screenshot of TikTok.

4.3.4.2 Design features and communication strategies

The logo of TikTok is conspicuous, with a black background and a noted figure in white color. The visual symbol is consistent with the media orientation of TikTok itself, both rhythmic and stimulated. Open the main interface, which is similar to the mobile app of other social media (Figure 14). At the top of the screen are four main functions: scanning QR code, following, recommending, and searching. The middle screen displays various videos in a linear narrative way. There is a row of small interactive icons on the right side of the main screen, from top to bottom: adding attention, giving a like, comment, favourite and forward to others. There are also five icons at the bottom of the page, which are the home page, moments, post video, message, and personal information. TikTok's design style is predominantly black, both for its logo and inside pages, combined with loud and dynamic videos. From the page design Douyin, its design style is distinctly perceived, centered around video sharing as the sole focus.

All other functions serve this purpose. In competition with other social media, TikTok became popular due to the capabilities it provides to easily generate and share short-form videos, including elements like music, animation and visual effects (Wang & Lee, 2020). In addition, TikTok is expanding its coverage of topics on many aspects of daily life, such as beauty and makeup, education, cooking, wellness, and technology. Educational healthcare content has also become an important part of TikTok's content ecosystem (Southerton, 2021).

In the past, the user experience of watching online videos did not typically involve social interaction with other users (Fang et al., 2018). Online video platforms like TikTok achieved this by incorporating more social media affordances from a design perspective to facilitate user interaction, improve user experience and enhance user stickiness. For example, the broadcast live audio-video the Danmaku in TikTok, features a form of social media derived from the ACG (animation, comics and games) subculture (Peng et al., 2016). "Danmaku" (弹幕) is a Japanese term that translates to "barrage" or "bullet curtain" in English. It is widely used in the field of video. It is usually used to describe subtitle-like text that can be sent by the audience at any time and seen by other viewers (p.252). That enables users to post comments synchronously while watching videos, and the posted comments immediately appear over the videos in the form of commentary subtitles. This affordance motivates users to engage and greatly increases their social presence, immersion and intention to continue use (Zhou, Zhou & Wang, 2019).

Social presence enhanced by appropriate affordances is a key component for building "humanness" into interactive information systems (Lankton et al., 2015). Social presence and immersion are key components of user engagement with social media (O'Brien & Toms, 2008). Especially in computer-mediated environments, achieving an immersive user experience is an important goal (Shin & Biocca, 2018). Prior studies reveal that social presence and immersion can increase user satisfaction and the stickiness of immersive information systems (p.2800). For example, Fang et al. (2018) investigated the Danmaku website and reported that social presence was positively associated with the intention to revisit. Focusing on TikTok, Wang and Lee (2020) confirmed the positive effects of social presence on the intention to adopt a technology.

In addition to social presence, immersion is another significant determinant of social media engagement (O'Brien, 2016). The concept of immersion refers to the feeling of being engaged with, absorbed in and engrossed by a continuous stream of virtual stimuli (Grinberg et al., 2014). Individuals are likely to experience a sense of immersion in video-mediated virtual

environments. For example, immersion is widely viewed as a key component of the user experience in video games. Given that immersion induces positive psychological states, a sense of immersion has often been created or leveraged in contexts where a concentration of attention is desired, and it also engages with social media design since the operator tries to attract more users.

The user's sense of immersion when using short video apps can be enhanced by several affordances. Nowadays, short video apps such as TikTok use artificial intelligence (AI) technology to make personalised content recommendations (Neyaz et al., 2020). An AI-powered recommender system can accurately engage users' interests by analysing their profiles and pushing relevant content to them (p.59). A recommending affordance encourages the user to browse continuously and explore new content, while the ongoing stimuli create an immersive virtual environment (Shin, 2019). Moreover, the live streaming affordance creates a virtual space where direct interactions are possible between the broadcaster and the audience, and this, too, fosters a user's sense of immersion (Zhao et al.,2020). Short video apps, although not initially designed for health communication, possess affordances that influence users' access to health information (Song et al., 2021).

4.3.4.3 Interactive video— a way for health communication

Although leveraging social media for healthcare purposes is not new, the boom in short video apps raises some relatively new chances concerning users 'health information behaviours in regard to short video apps. Oh et al. (2013) suggested that the emotional support gained from health information seeking on social media can enhance users 'self-efficacy in managing their health problems. Among the various forms of social media, video-based ones are conceived to be advantageous for disseminating health information. According to Cameron and Chan (2008), health information in visually rich modalities has the advantage of being able to attract audience attention and illustrate key points. Compared with textual information, video information is more vivid and easier to approach, elicits stronger emotional reactions (Rus & Cameron, 2016), and motivates users to take action in regard to their health (Feng et al., 2021).

During the COVID-19 pandemic, a growing number of health professionals and organizations (e.g. the World Health Organization) have started using TikTok to spread health information and medical knowledge to the public (Basch, Hillyer & Jaime, 2020). The TikTok hashtags medicine and doctor have been viewed 1.4 billion and 6.7 billion times, respectively (Comp et al., 2021), and videos with the hashtag coronavirus have received 93.1 billion views

(p.369). Because video-based social media platforms are extensively and increasingly being accessed by users to seek online health information, many healthcare professionals are suggesting that there is an urgent need to integrate video-based social media platforms and apps such as TikTok into health communication activities (Eghtesadi & Florea, 2020).

With short video apps, health information can be presented using rich modalities (e.g. text, image, audio and video), and it can be disseminated via various technological features such as commenting, chatting, following, liking and livestreaming. These affordances make it easy for users to use short video apps as a way to search for and receive health information. However, despite the bright side of video-based social media, users may experience some problems when seeking health information there, where information quality is a significant issue. According to a systematic review by Zhang et al. (2015), the overall quality of online health information is problematic. Dozens of studies have assessed the quality of health information in YouTube videos about a broad set of diseases, such as diabetes (Leong et al., 2018), cancer (Aydin & Akyol, 2020), stroke (Szmuda et al., 2020) and systemic lupus erythematosus (Ng et al., 2020). These studies reveal that the quality of health information varies from very poor (Aydin & Akyol, 2020) to fair (Szmuda et al., 2020) to good (Ng et al., 2020), depending on the disease in question. Another survey of coronavirus-related videos on TikTok shows that 36% of the videos were about prevention and precaution, 15.4% of that quoted credible information from reputable sources, and only about 4.3% of that posted misinformation (Basch et al., 2020). Liu et al. (2019) stated that despite concerns over the general quality of the information found in video-based social media, it could be very beneficial when professionals and experts design accurate and appropriate health messages to complement user-generated content and target the right audiences.

However, besides the positive aspects of leveraging short video apps for healthcare, previous studies have also reported some negative effects. For example, some scholars have noted that TikTok positions itself to focus on quirky videos rather than on serious professional content (Wang & Lee, 2020). In this regard, the perceived credibility of TikTok may affect users' willingness to continue using it to a certain extent (Song et al., 2021). While TikTok, as the hottest social media in recent years, can promote the dissemination of health information to a certain extent, and healthcare professionals can use this as health communication channels. They can be proactive and flexible by using such short video apps to reach health consumers better, especially for young online users. As research indicated that credibility perception plays an important role in facilitating the long-term use of short video apps as a health information source. Thus, it is particularly important to strengthen the supervision of health information

disseminators. For example, it can learn from the verification regulations of Weibo, like adding official medical certification to certain accounts. Public health authorities and institutions could be proactive in producing and running short-form videos that provide timely and accurate information on epidemics, disease control and public health crises in order to better combat health misinformation and disinformation. We see that a number of official healthcare organisations and professionals have recognised their value and have been using them as an important means of sharing health information and educating the public. For example, the Provincial Health Committees (PHCs) in China have begun to adopt TikTok to engage with local citizens and disseminate health information (Zhu et al., 2020). In March 2020, the World Health Organization joined TikTok to fight coronavirus misinformation and publish scientifically credible health information to promote health literacy and health beliefs during the global COVID-19 crisis (Pollard et al., 2020).

From an interactive design perspective, TikTok also needs to provide more affordances to facilitate user engagement, especially features that contribute to the users' understanding and engagement about health knowledge (Song et al., 2021). Compared to traditional online health information sources, such as search engines and online health communities, TikTok can provide users with a more engaging experience, especially through their livestreaming affordances, and they can bring health information publishers, disseminators and users closer together and promote more direct communication possibilities, thus helping to create a community of health consumers with a stronger sense of belonging. In addition, the developers of TikTok should refine the algorithms to deliver precise recommendations, including content and source recommendations, in order to satisfy the information needs and preferences of health consumers and increase their continuing use of these apps as a source of health information. Some gamification elements, such as medals, certifications and ranks, could help users more accurately identify relevant health information content and sources. In addition, the platform should better monitor the credibility of content, especially health information posted by unqualified creators, in order to curb the spread of distorted health information at the source and provide a cleaner platform for users (p.2124).

4.3.5 Section summary

This section explored the use of social media for health communication. Specifically, four social media platforms were selected for thematic discussion of their design features and use in health communication. Special attention was paid to app design, with examination of the

adopted visual and communication strategies from the perspective of design, and user experience. During this exploration, there was also discussion of the accessibility of these social media platforms considering the targeted group's health behaviours.

Moreover, the chapter highlighted the important role played by health communication specialists in actively rearranging information routes to facilitate information transfer. For example, they may discover circular patterns of information flow and redesign the means of health information delivery. Establishing multiple powerful nodes can help all intended recipients receive health information in a timely fashion (Han & Wang, 2015). For example, the effectiveness of KOLs/V-users in spreading information can be harnessed to accelerate the dissemination of health-related information among ordinary users.

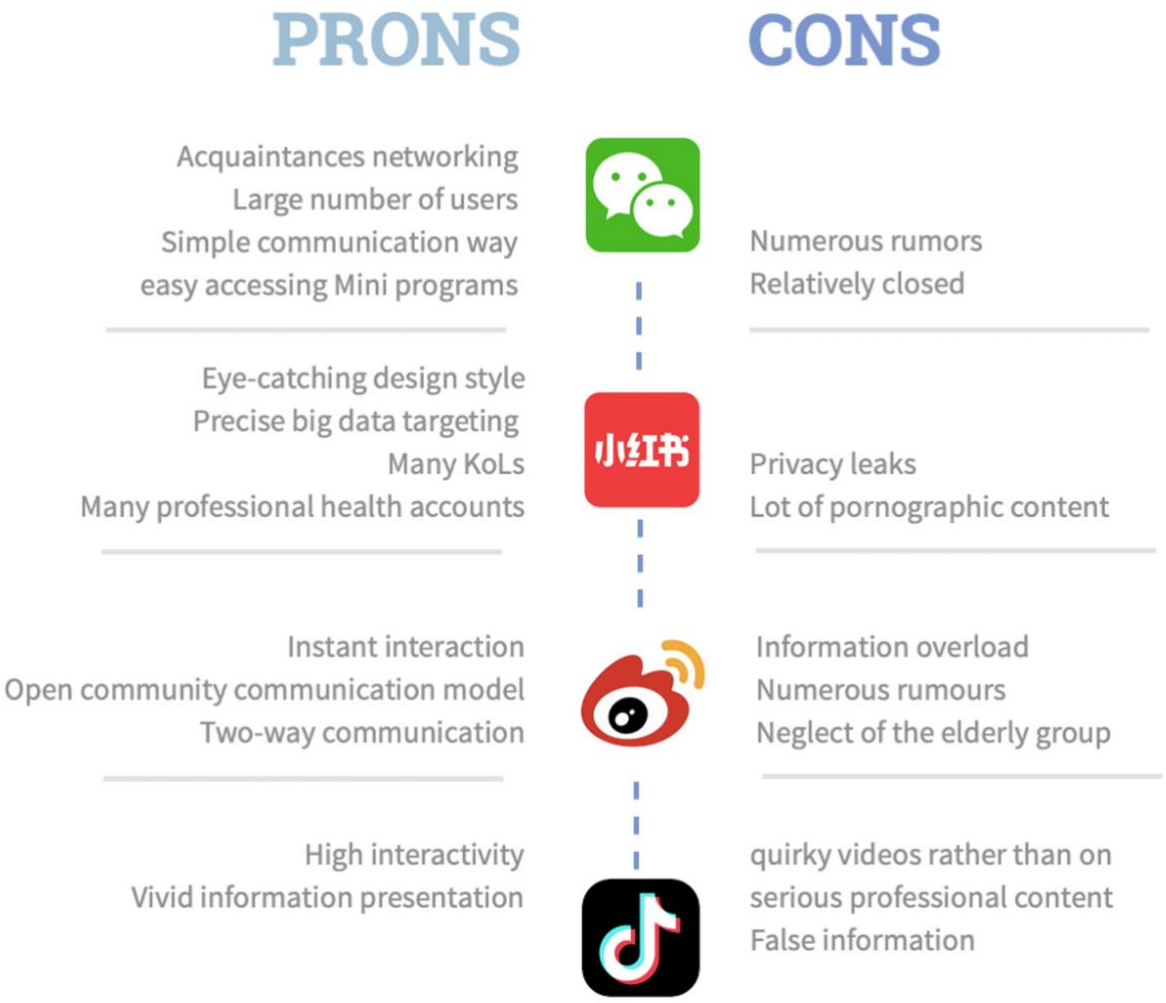


Figure 15 Highlights of each media key features.

The analysis of the four social media platforms shows their great potential for future MCH communication design. The features are highlighted at Figure 15, we can see that

WeChat is a powerful tool for networking with acquaintances and for sharing information among acquaintances. Employing such a tool in MCH communication could make users more confident about the information they are exposed to through acquaintances' endorsements. However, effective design patterns are required to prevent transmitting unreliable information. As for Xiaohongshu, the app's precise content push and visual content are two points that can be learned. Accurate content push can better lock content that most concern users and improve communication efficiency. Visual content can be harnessed as part of multi-sensory communication to stimulate the user's memory, thus improving communication efficiency. Regarding Weibo, the platform's open community allows users to communicate with other groups without barriers. The huge amount of online communication also allows many people to receive timely feedback, which also has great reference significance for improving the efficiency of health communication. Finally, TikTok, a platform that is more entertaining than educational, mainly focuses on the dissemination of information through short videos, which might be helpful for people with dyslexia those with a low level of education, or those those with eye diseases.

As is the case with all two-way interaction and decentralized communication channels, all of the social media platforms considered in this analysis (Weibo, WeChat, Xiaohongshu, TikTok) are conducive to a somewhat fragmented but often effective sharing of health information. Functions like sharing, giving a like, and replying are used to maintain the flow of health messages. Sharing, as a form of one-to-many communication, highlights the degree of information reach on Weibo and TikTok. The heuristic mode of retweeting makes information sharing a simplified non-analytical process that is based on simple decision rules. Giving a like and replying (or leaving comments) constitute one-to-one communication modes. The systematic mode of giving a like and replying makes evaluation and deliberation a comprehensive analytical process that is based on careful elaborations. Thus, the impacts of social media mainly exist in terms of viral reach, which is sensitive to negative appeals and nonprofessional authority (e.g., bandwagon effect) (Liu et al., 2017). Of course, these modes of communication also have obvious negative effects. The media platforms analysed above are widely criticised for the unreliability of the information they transmit. A vast flow of unreliable and unconfirmed information floods the internet, which poses significant problems for people with low levels of discernibility. In addition, while most users of these forms of media are young and female, there is also great demand for such media among other groups, such as the elderly and children. In particular, COVID-19 has increased the proportion of people using the Internet to obtain health information. In short, it is vital for future MCH communication design

to focus on harnessing the potential of these media platforms while addressing their disadvantages.

4.4 Part B: Specialised Apps

4.4.1 Visual design and strategy analysis

4.4.1.1 Visual design

The logo designs of the six apps are all relevant to pregnancy or baby, which can be seen from their logo (Figure 16). MomBBS features a silhouette of a mother on a bright red background. In the centre, a white silhouette depicts a long-haired mother touching her pregnant belly. Similarly styled is MAMA, with a logo design resembling the shape of a uterus, a white circular form. In the middle is a red silhouette of a small fetus, surrounded by a circle of numbers representing the weeks of pregnancy. Different numbers, combined with a gradient of pink, blue, and purple, symbolise the changes during pregnancy. The design of the MC Handbook is more concise, featuring a silhouette as well. A bold, elegant white line runs from top to bottom through a pure pink background, outlining the shape of a pregnant belly. QinBaby's logo design is well-suited to its name, focusing on babies. A light green sapling grows on an orange ground, giving a lively feeling. Similarly styled is BabyTree, with two simple sketches of a large and a small figure standing together. The two figures closely connected resemble a mother with her child. The most distinctive logo design belongs to MeiYou. "You" in Chinese means Grapefruit (柚), which is the main pun in its logo. The logo features a simple and direct design of a pomelo, with the words "Meet You" at the bottom, a homophone for the Chinese "MeiYou." In summary, from a visual perspective, it can be observed that the six selected apps coincidentally use bright colours as the main tones for their logos, especially shades of pink and light yellow. The use of bright colours gives a sense of sunshine and cheerful psychological hints. It can also be interpreted as an expectation for the new life they nurture and a positive mood. In terms of imagery, except for MeiYou, the logos of the other five apps are silhouette representations related to women or babies, or they feature graphics with similar symbolic meanings (such as the small sapling of QinBaby).

Figure 16 From left to right: MomBBS, MAMA, MC Handbook, QinBaby, BabyTree, MeiYou.

In terms of homepage design, all six apps have relatively standard and conventional designs, adhering to the typical framework of general apps. This includes a vertical reading mode featuring the main visual field, functional icons, news, hot topics, online consultations, etc. Typically, there are 4-5 main icons at the bottom of the page, guiding users to different main functional pages, generally including the homepage, shopping, recording, discovery, and personal information. Figure 17 provides screenshots of the homepages of the six apps. It can be observed that the designs of the relevant pages exhibit a high degree of homogeneity, with similarities in functional layout, page tones, and other aspects. In terms of colour tones, among the selected six apps, pink tones dominate the majority (5 out of 6), with one app primarily using orange-yellow tones. In comparison to social media platforms, specialised apps have limited flexibility in style design, resulting in a very similar visual presentation.

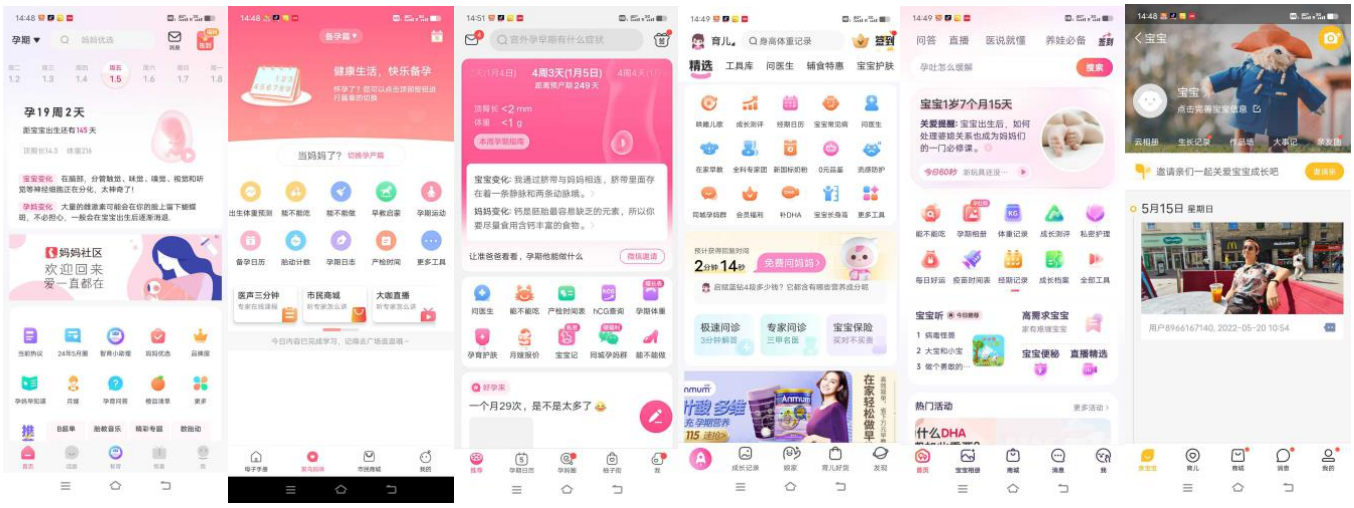


Figure 17 Homepage screenshot of six selected apps.

4.4.1.2 Function design

As specialised MCH apps, all the selected objects are multifunction, and can cover most part of users' needs. The horizontal function comparison is shown in Table 10.

Table 10 Horizontal comparison of 6 app functions.

MCH apps	Functions											
	Experts inquiry	Online communication	Local community	Baby records	Early education	Shopping	Recipe	Maternal care	Video assistant	Live streaming	Family inviting	Searching
Baby Tree	√	√	√	√	√	√	√	√	√	√	√	√
QinBaby	√	√		√	√	√	√					√
MeiYou	√	√	√	√		√	√	√			√	√
MMbbs	√	√	√		√	√	√	√	√			√
MC Handbook	√		√	√	√	√	√	√	√	√		
MAMA	√	√	√	√	√	√	√	√	√			√

It can be seen that the selected six apps share many similarities in terms of functionality. Comprehensive apps still have the most comprehensive features, while record-keeping and community-focused apps each have their emphasis. However, it is worth mentioning that the functions of live streaming and family member inviting are less common among the apps. Live streaming has become a popular way of selling products in China in recent years, with platforms like TikTok being well-known examples. In the context of maternal and infant apps, live streaming often involves experts and doctors promoting health information, focusing on selling specific products. The family inviting feature allows users to invite other family members to download the app and share pregnancy/infant data. Typically, family members invited include husbands or elderly members of the household. This phenomenon brings attention to an interesting observation that, at the current stage, specialised apps seem to be designed primarily for women. Indeed, as women are the primary subjects in the processes of preparing for pregnancy, being pregnant, and giving birth, it is reasonable for apps to target this group as the main audience. However, partners, as important components of the family structure, do not seem to have been considered in the design of these apps. While there is only

one physical body going through pregnancy and childbirth, it involves more than one individual. Partners, as well as older family members (as emphasised in the literature review, where it is highlighted that, in the Chinese context, older people often participate in child-rearing), play crucial roles throughout the entire process. However, in this study, the majority of the apps (4 out of 6) appear to overlook the involvement of other individuals in the process.

As an important feature, the search function has also been individually examined. This is one of the few ways in the app where users can actively pose questions to find answers. Another option is to consult with a doctor online, but this service is free. Using the keyword "What to eat for pregnancy" as the search query, tests were conducted in the search bars of five apps (excluding MC Handbook). The layout of the search results page on the Mommy Website is considered the most reasonable (Figure 18). The first thing on the page is an official answer (similar to a Chinese health encyclopedia on Wikipedia). Following the vertical reading order, one can find the official pregnancy guide, containing scientifically filtered and authoritative health guidance information from the app. After that, there is an interactive Q&A section among users. Finally, there is a forum section for user discussions, where users from different regions share their experiences with pregnancy and childcare. From an overall layout perspective, it can be said that the arrangement is very reasonable. Official authoritative information is placed at the forefront, allowing users to quickly access reliable health information in a short amount of time. Subsequently, user interaction and communication are used to ensure user engagement. This arrangement significantly reduces the time users spend discerning information, saving them time costs. It is also very user-friendly for those with weaker discernment abilities. However, in the other four apps, using the same keyword for searching reveals that although the layout design of the search results pages is carefully crafted, the content, upon closer examination, consists mainly of Q&A among users or posts published by users. Unlike the Mommy Website's search page, none of these four apps' search interfaces include official authoritative health information or popular science content. This design increases the time cost for users to discern information and, inadvertently, creates obstacles for users with lower cultural literacy to obtain information.

Furthermore, during the process of organising materials, a distinctive phenomenon has consistently existed, namely, almost all apps engage in product promotion. They either set up dedicated icons (at the bottom of the main page) or directly display advertisements. This makes almost all apps appear lively as they pile up numerous elements, including feature bars, ads, and forum communities, all on a single homepage. Only QinBaby's page maintains a relatively simple layout among the six apps. The homepage features only the main recording function

and a portion of ads, while the remaining feature bars and forum content are not placed on the main page. This is because in mainland China, apps are generally free, and users have not developed the habit of subscribing to paid memberships. Therefore, for apps to generate profits, they need to explore other avenues, with selling products and displaying ads currently being the two most common methods.

Figure 18 Searching page of five apps—MeiYou, MAMA, BabyTree, QinBaby, MomBBS.

(Exclude MC Handbook, which cannot be found).

In 2017, iResearch and QinBaby jointly released a report on maternal and child health. The report emphasised that among app users, only around 20% (the total number of users is not provided in the report) reject various forms of advertisements. In contrast, the remaining users have an open attitude towards ads. Among these users, over 80% regularly make monthly purchases within the app, and their spending standards are generally higher than average. Simply, these users are more willing to spend more money to purchase quality items. However, it is worth noting that the report mentions that these consumers are generally residents of economically developed areas in third and fourth-tier cities along the southeast coast. Therefore, there is some uncertainty as to whether this consumption attitude can reflect the target group's attitude toward advertisements in this study.

4.4.2 Health communication for low-income and low-literacy people

Through the analysis in the previous section, the basic health communication situations of the selected six apps have been discussed. In this section, we will delve deeper into the characteristics of the low-income and low-education level groups, exploring whether these six

apps meet the health communication needs of the target audience. If they do not meet these needs, we will also discuss areas for improvement in the future.

4.4.2.1 Targeted objects

The serving objectives of the selected 6 apps can be discovered through official searches. Table 11 presents the definitions of the target audience for the 6 apps, and the relevant descriptions are all sourced from the official introductions of the apps.

Table 11 Selected samples serving targets.

MCH Apps	Service Object
MAMA	It mainly serves the parents of pregnant women and 0-3 years old babies.
BabyTree	It mainly serves the parents of pregnant women and 0-3 years old babies. It is mainly a family group that is ready for pregnancy, already pregnant, and has given birth (0-6 years old baby), and the current stage is a micro-core group of pregnant mothers and treasure mothers.
QinBaby	The target audience is families, gathering family users by sharing child growth records such as baby photos and videos.
MeiYou	Among Internet users, young women with middle and high income levels are mostly located in cities above the third county level, and the age is mainly 15-35 years old.
MC Handbook	Female users in need of maternal and infant knowledge.
MomBBS	Mothers with pregnancy, pregnancy, and childcare needs.

While all apps provide descriptions of their target audience, it is evident that these descriptions encompass a broad range of people. Relying solely on these contents cannot determine whether the apps' designs match this study's target audience. Therefore, I conducted a horizontal comparison by combining the app's design features with the information retrieval characteristics of the low-income and low-education level groups. The three characteristics of the target audience extracted here—lack of health awareness, poor understanding of complex concepts, and low income—are all summarised in the literature review, detailed in sections 2.1.2 and 2.1.3.

4.4.2.2 For low-income and low-literacy people

Firstly, due to limited education and income, the target audience generally lacks health awareness. This necessitates that apps focus on simplicity and user-friendly interfaces during the design process, thereby reducing users' difficulty using the software. To achieve this goal, apps need to provide clear instructions, visual cues, and reminders for essential health-related actions. Particularly, when designing relevant communication content, it is important to

consider incorporating educational features to increase awareness and understanding among the targeted users gradually. In this regard, the selected six apps perform well. All apps prompt users to select their status, such as preparing for pregnancy, being pregnant, or already having children, the first time they open the app. This selection enables specialised information push and page customisation based on the user's status, ensuring that users can quickly access the most relevant information to their needs. In terms of visual design, users can navigate clear linear paths without obstacles. As shown in the figure above, the visual segmentation and functional layout of all apps are very clear, allowing users to find the information or functions they need easily.

Additionally, offering personalised feedback and encouragement to motivate users to adopt healthier habits is also necessary for a group that lacks health awareness. The benefit of doing so is that it allows timely user feedback collection to update and iterate the current communication strategies. However, the selected six apps lack this functionality, as there are no built-in feedback channels within the apps.

Secondly, individuals with low levels of education tend to demonstrate a more pronounced limited understanding of terminology, necessitating visual communication over text to aid their reading. This requires that apps use simple and universally recognisable icons and symbols in their design. Specifically, apps can choose to incorporate voice-guided instruction or audio cues to enhance comprehension. Additionally, breaking down complex information into digestible, step-by-step visuals can be helpful. Alternatively, implementing a clean and intuitive interface with minimal text, and providing options for audio assistance or language preferences can accommodate diverse users. Upon a detailed examination of the selected six apps, no voice assistance feature was found in any of them. Furthermore, visually designed graphics can effectively help users understand relevant knowledge. During a random reading of an article pushed by the official accounts of the six apps, it was observed that five of them incorporated hand-drawn or real-life illustrations alongside short text, effectively conveying health information. MeiYou was the only app where an official push article could not be found, and most posts within the app were Q&A or discussion posts from users in different regions, making it impossible to evaluate the use of visual graphics in this context. Additionally, video functionality is another efficient feature for promoting understanding, and it appears in four out of the six apps (except QinBaby and MeiYou), with two of them also having live streaming capabilities (MC Handbook and BabyTree). It is important to explain the difference between video and live streaming functions briefly: videos are pre-recorded, while live streaming is usually in real-time and more interactive. Although videos may lack the strong

interactivity and immediacy of live streaming, their convenient dissemination mode can attract a considerable number of users, thereby achieving the goal of health communication. From the above functional analysis, it can be observed that many apps have done well in supporting health communication, especially with the emergence of some popular features (live streaming), which adds effective channels for the dissemination of health information.

Thirdly, the target audience of this study also exhibits the characteristic of low income. To align with this characteristic, it is required that apps prioritise simplicity, accessibility, and functionality that addresses practical needs. One crucial consideration is that individuals with low income typically have lower-end smartphones, necessitating the optimisation of the app to minimise data usage, as users with limited income may have restricted access to data plans. Implementing data-saving features, such as offline modes when possible, is essential. Upon examination of the six apps, it was found that none of them have offline modes. All features in these apps require an internet connection to function. Besides data considerations, it is also necessary to ensure that the app can run on devices with lower hardware specifications to accommodate users with budget smartphones or older devices. As shown in Table 12, the memory usage of apps in the Apple App Store is generally larger than that in the Android market (except MC Handbook). However, even so, the overall memory usage of the six apps is not substantial, with the largest being BabyTree at around 250MB. This level of memory usage is feasible even for smartphones with the smallest capacities available on the market (currently commonly 128GB).

Table 12 The storage of selected apps in Android and IOS platform.

Platforms	MAMA	BabyTree	MC Handbook	QinBaby	MeiYou	Mom BBS
Android	97.9MB	57.6MB	61.9MB	146MB	28.9MB	73.9MB
IOS	229.7MB	249.5MB	46.9MB	165MB	233.1MB	107.9MB

4.4.3 Summary

Based on analysis of the social media platforms, it can be concluded that they can be effectively used to meet users' needs by customising their interface settings and providing information based on users' pre-pregnancy/pregnancy/postpartum status. Various multimedia channels, including illustrations, videos, and live broadcasts, complement each other in disseminating maternal and infant health information through multi-sensory experiences.

Features like online communication and local community functions facilitate the gathering of similar interest groups for centralised information exchange.

However, the analysis also reveals challenges, including uncertainty about the effectiveness of these platforms in health communication for the target group of low-income individuals with lower educational backgrounds. Additionally, concerns arise regarding content credibility and overconsumption-oriented design. Hence, further research incorporating user feedback is necessary to truly understand the user experience and address these issues.

4.5 Chapter Summary

In the past decade, online media have not only changed the distribution patterns of health-related information and the communication modes between patients and healthcare providers, but also drawn a great deal of attention among researchers studying the distribution of health information, the diffusion of health-related information and misinformation, the public reactions to health events, and more. Studies focusing on online media for health communication have been increasing annually, providing insights for public health surveillance and supporting the development of health policies (Tao et al., 2020).

Effective strategic communication is based on the convergence of "senders" and "receivers", whereby differences between the two begin to disappear. An effective design framework is especially important for engaging stakeholders and improving the effect of health communication.

This chapter has shed light on the status of current maternal media, and thematically discussed the benefits and drawbacks of different types of communication. Special attention has been paid to the design of social media platforms and specialised apps, with comprehensive analysis, from visual design to content presentation, to health communication strategies. Particular attention has also been given to analysing the characteristics of the target audience, and the role and impact of corresponding media design in health communication for this group. Ultimately, it was discovered that existing media still face certain challenges in meeting the target audience's need for maternal and child health knowledge.

Firstly, among the social media platforms, WeChat is the most frequently used in China, with many people using it to share various forms of health information. However, the biggest issue with this platform is the abundance of rumour and the inability to verify the authenticity of the information content. Similar problems exist on Weibo, which also plays a significant

role in health communication in China, while also suffering from an excess of rumours. TikTok and Xiaohongshu, two predominantly visual forms of social media platforms, are used to distribute a plethora of health information. But their short and fragmented dissemination model makes it difficult for individuals to systematically understand specific knowledge points.

As for specialised apps, six representative apps were chosen for core analysis, considering factors such as download volume and functionality. The results reveal that almost all of the apps contain a wealth of content, leading to severe homogenisation issues. The most widely used apps on the market remain the ones created first (MAMA, BabyTree), while apps designed for a single function have relatively few users. One significant consequence of homogenisation is an excessive amount of health communication content with weak targeting.

Furthermore, based on the data analysis, it was found that many apps prioritise network community functions over official health information dissemination, directly impacting the authority of the disseminated content. Additionally, selling products remains the main purpose of these apps, with all six of those selected having specific e-commerce features and numerous advertisements.

In summary, both social media platforms and specialised apps possess various issues when used for communicating maternal and child health information to low-income and low-literacy groups. Therefore, to improve the design of health communication, it is necessary to engage with the audience to collaboratively address the existing issues and explore solutions.

CHAPTER 5 Health Behaviour of Low-income and Low-literacy

5.1 Overview

The previous chapter discussed the development of health communication and design in social media and specialised mobile apps. Four social media platforms, WeChat, Weibo, Xiaohongshu, and TikTok, were analysed from three perspectives: design features, communication strategies, and as tools for health communication. As for the analysis of the specialist MCH apps, about 73 apps (the list seeing appendix D) were considered, based on their visual properties, functions, and content development. Then, the ten most downloaded apps in mainland China were analysed in terms of the relation between supply and demand among low-income and low-literacy people. Finally, it was concluded that social media is the most frequently used tool and attracts the most attention for disseminating health information. While specialised apps can transmit professional and practical knowledge, they are also full of advertisements and are commercially oriented. These issues raise concerns among consumer and may lead them to doubt the professional information found on such apps.

To further the analysis of MCH communication, this chapter focuses on low-income and low-literacy people in China as the primary subjects to examine their health behaviour in terms of four main aspects: access to, understanding of, trust in, and response to MCH information. This analysis draws on data collected from questionnaires and interviews during fieldwork conducted in the spring of 2020. This chapter aims to identify the targeted users' characteristics, provide references for further understanding their health behaviour motivation, and propose design communication guidelines and frameworks.

5.1.1 Research questions

As the first fieldwork stage, this part was mainly conducted around two aims:

·Knowing the relationship between income, education and health behaviour

·Understanding the health behaviours and reasons behind low-income and low-literacy people, in order to meet the above aims, two questions were proposed:

·What are the characteristics of low-income and low-literacy people?

·What are the reasons for specific health habits among low-income groups?

5.1.2 Amis and objectives

To solve the problems above, there are three objectives:

·Developing a broad understanding of the demographic background, and its relationship with health behaviours through questionnaires

·Understanding the process of low-income people when then accessing, understanding content trust, and taking action about health information

·Then summarising the problems encountered by users in this process and further understanding the reasons behind the behaviour through the 1v1 semi-structured interview

5.2 Health behaviours for low-income and low-literacy people

5.2.1 Overview

Income and literacy limitations affect the ways in which the categories of users considered in this study access and understand health information. This reports on the four main findgs concluded by the questionnaire and interview. The participants in this fieldwork varied in terms of income, literacy etc. and focused on the issues that emerged in the questionnaire, and most were targeted users' group characteristics. I narrowed down the fieldwork focus and invited 21 people into the next stage for the semi-structured interview. There is a slight difference between the two methods. Firstly, the questionnaire is more general for learning the users' health status and behaviours, while the interview tries to get a deeper understanding of the motivation behind particular behaviours; secondly, the different concerns of the interview—motivation. Questionnaire—demographic info, using habits and health behaviour. Thirdly, the logic relationship—the discussion is the questionnaire's extension, which aims to clarify the ambiguous points of the questionnaire, as some questions need more explanation. For example, the reasons for choosing social media instead of professional apps to acquire health knowledge are varied, which is difficult to quantify in a questionnaire. So this part does not explicitly analyse the answers to each question. Instead, it integrates the questionnaire and interview data for thematic analysis and extracts some characteristics as the analysis focus of this section.

5.2.2 Personal motivation and accessing

Demographic in terms of users' accessing MCH media, the top three choices are the Internet (25.33%), TV programs (17.39%) and books (17.11%), other options including hospitals (16.15%), consulting elders (13.77%), magazines (6.18%) and other approaches (4.07%). This result corresponds to China's current national trends. Due to the widespread popularity of the Internet and smartphones, Chinese people's convenience of accessing the

information on the Internet has reached an unprecedented height (Cyberspace Administration of China (CAC), 2019). TV programs are the second most popular choice for participants to access MCH information. In recent years, the number of Chinese TV programs has been significantly expanded to include health and wellness programs. It is estimated that 34 provincial satellite TV networks in China have 109 health-related programs (Xinhuanet, 2019). Such programs are usually in talk show style, and the host conducts face-to-face talks with experts (doctors/medical professors/other professionals) and gives specific health recommendations. Professional books are the third top choice for ordinary users to obtain MCH information. The advantages of this approach are apparent— accessible, credible, and professional. However, the cost of each book (ranging from 30 to 50 yuan (4 to 6 pounds)) is also a financial burden for some low-income people. Therefore, as the table shows, only 1.76% of respondents with under 1000RMB monthly incomes chose this item, far less than other high-income groups. Hospitals and other institutions, elders and other relatives, magazines, and other approaches are the least four options for most respondents.

Via the internet obtaining MCH information has become the first choice for many people (Figure 19), with only 6% of the respondents having yet to use it.

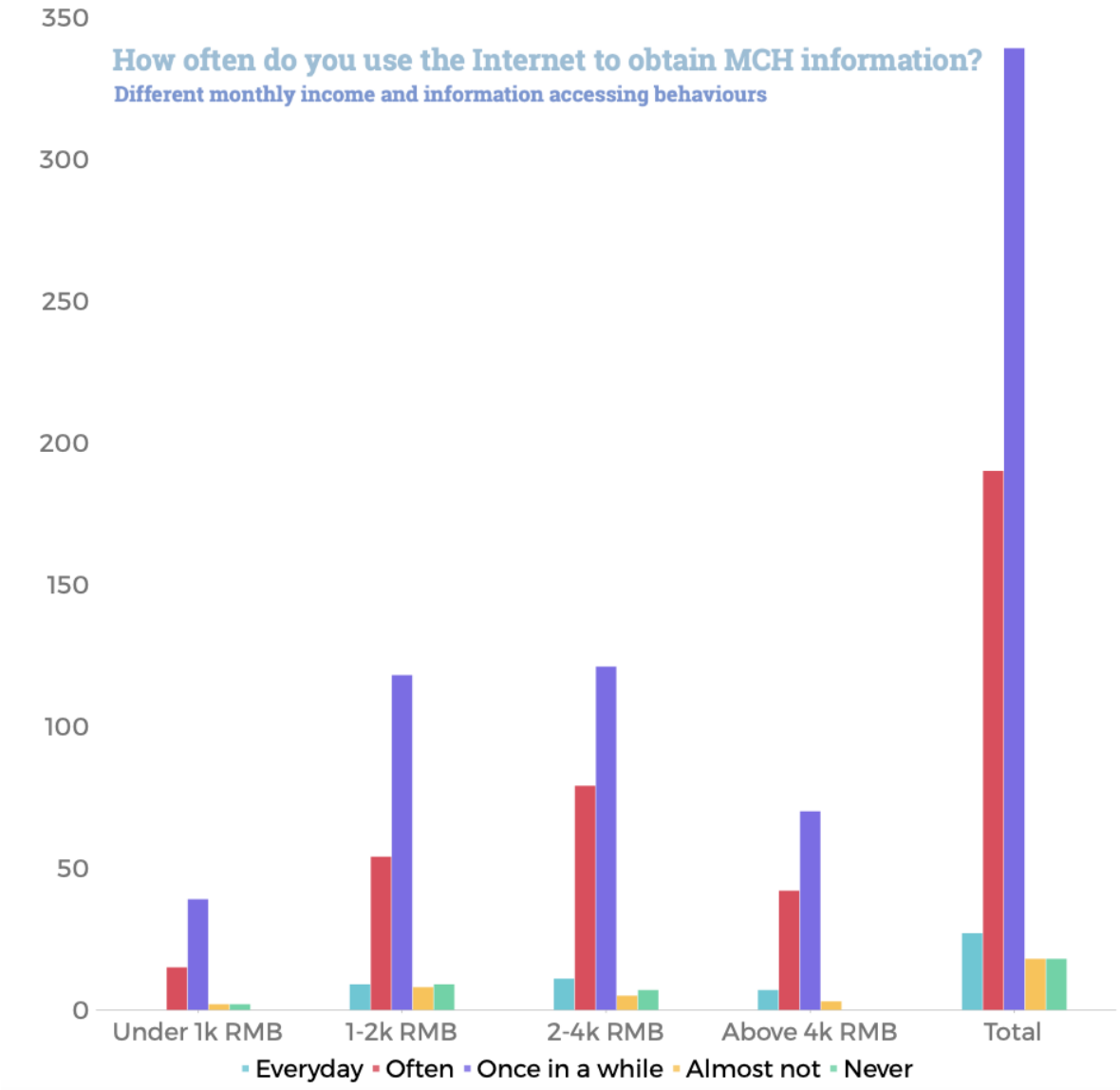


Figure 19 Frequency of the internet utilisation.

In terms of which way to obtain MCH information (Figure 20), nearly half of the people prefer web page searching, and about one-third of people choose social media like Weibo/WeChat, while only one-fifth prefer specialised apps. It is clear that low-income people responses are different from higher-income people ones in this term.

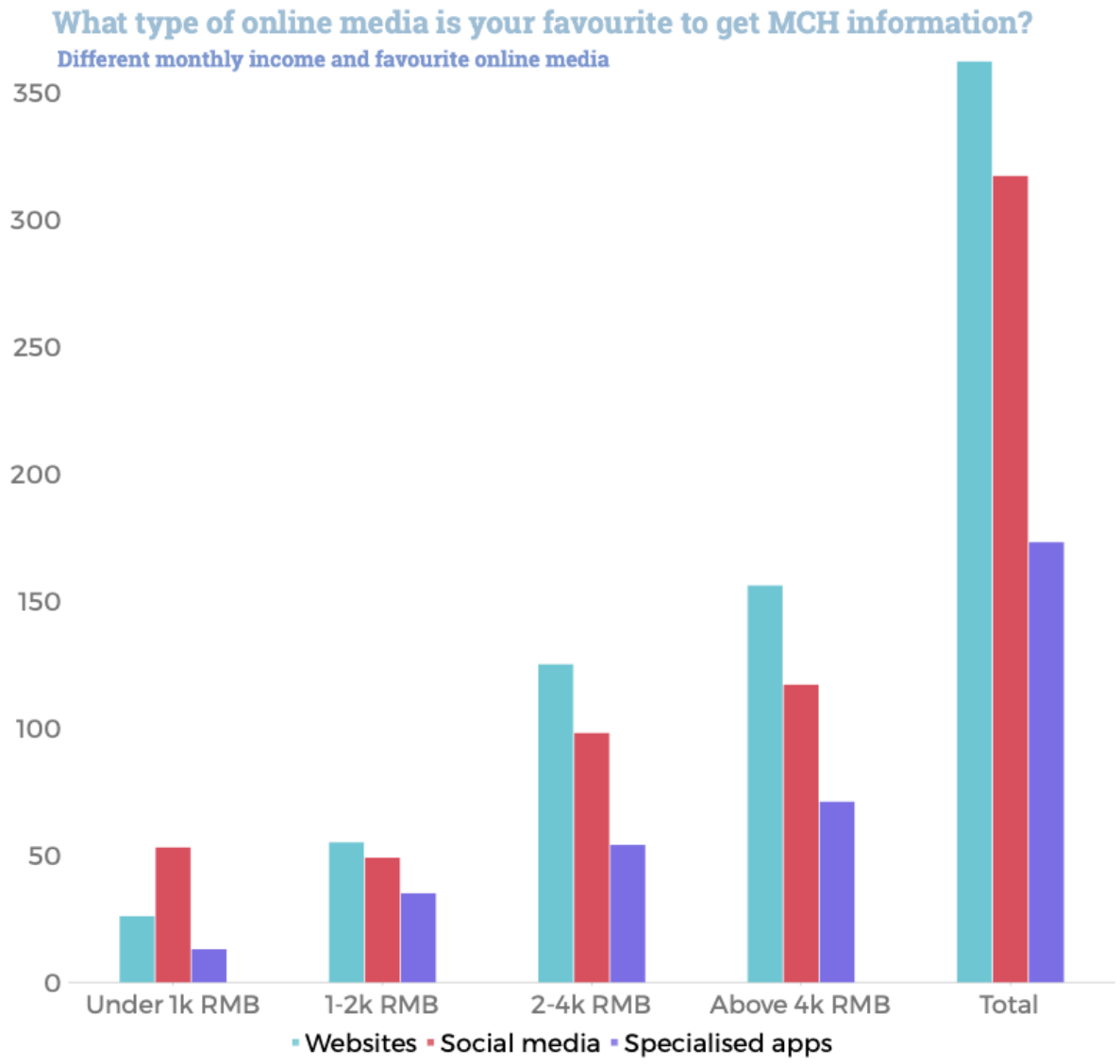


Figure 20 Favourite online media.

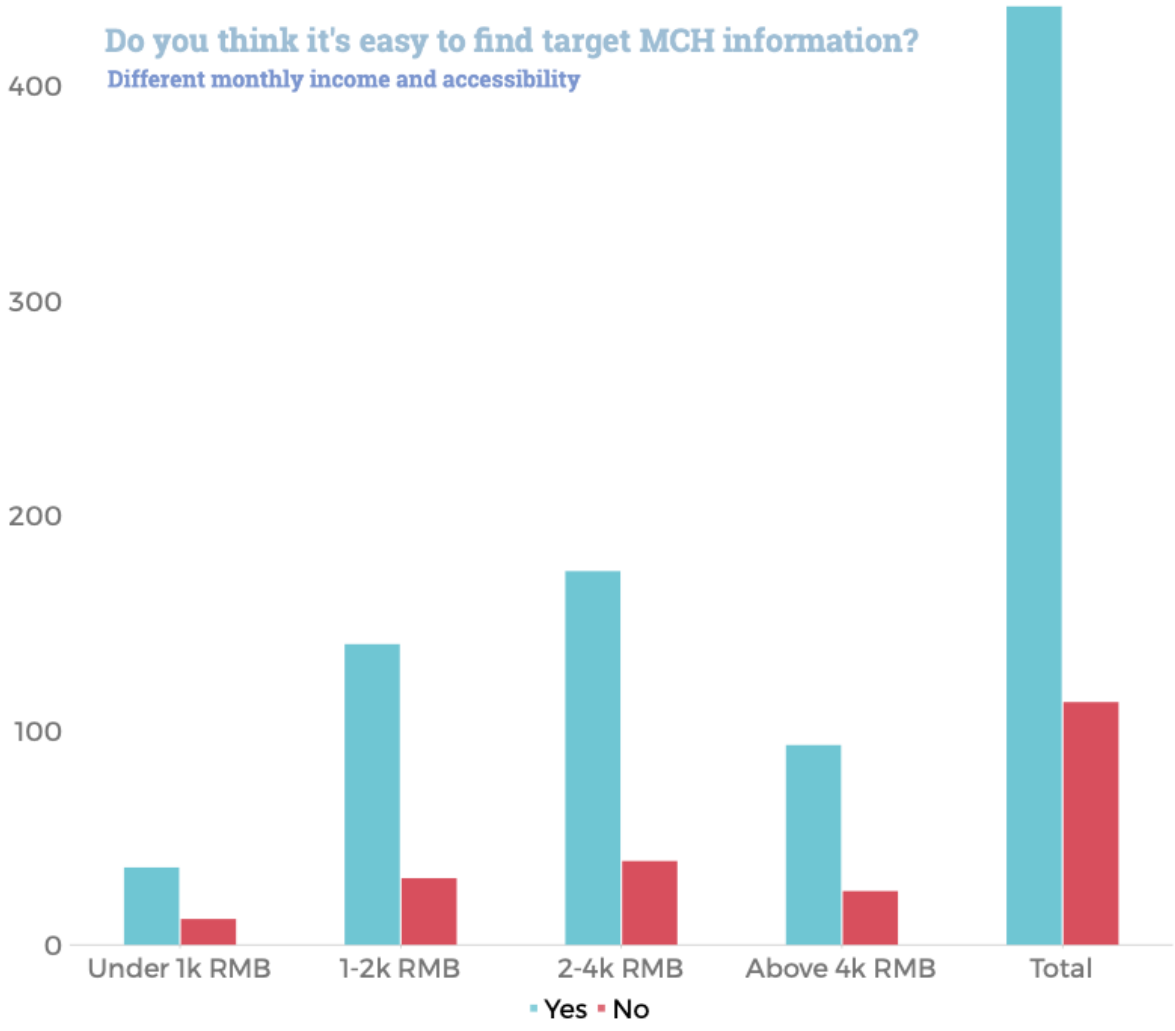


Figure 21 The accessibility of MCH information.

More than 70% of people believe that it is relatively easy to obtain MCH information, and the choice tendencies of different income groups are pretty consistent (Figure 21). While nearly 20% of people think it is challenging to obtain the desired information. Elusive terminologies, needing help knowing where to look for wanted details, and the search result not matching personal situations are the top three reasons.

Users are faced with many choices when obtaining maternal information. However, due to the issues of information redundancy caused by information availability and pervasiveness, it is also difficult for most people to critically validate the information they have been exposed to. This kind of uncertainty about information reliability involves online communication and recommendations from medical professionals and elders. In particular, the contradiction between online information and advice from the elders is self-evident. The decline of the

elders' ability to keep up-to-date scientific knowledge is the fundamental hindrance when giving reliable advice to the young generation (Vaportzis et al., 2017).

Previous studies confirmed that low-income pregnant women preferred receiving health information from family (Lewallen, 2004). At that moment, the low prevalence of the Internet and concerns with privacy and security may be the two main reasons preventing people from getting such information online (p.204). This behaviour contrasts with the preferences of the general public for whom the Internet is rapidly becoming a common source of health information. It is a kind of a gold mine for health information seekers, the traditional norm of soliciting input from a medical professional in person now considered only sometimes practical (Afful-Dadzie et al., 2016). In March 2020, the 4G coverage in Mainland China was estimated to exceed 98%, and home broadband coverage is up to 91.8%. Besides, the low price and multi-functional features are also important factors contributing to the wide popularity of mobile phones. According to statistics (Peng, 2021), the smartphone ownership rate in China is over 97% for 18-34-year-olds and 96% for 35-44-year-olds. The high level of internet access and the popularity of smartphones make accessing the Internet very easy for most people in China. Therefore, this study was conducted assuming that participants would have easy access to all types of information online. Questions related to accessing MCH information via the Internet were also set in the demographic section, and 79.73% of participants reported having often used that before. In recent years, the outbreak of COVID-19 has also accelerated the research development in accessing online health information. Related research, including by Torous et al. (2020), explored how digital health increased the access and quality of mental health during the pandemic period. Health information is expected to be available online in China and other countries worldwide, both for rich and poor people. The report from Pew Research Center (Fox, 2014) also shows that in the US, 72% of adult internet users search online for information about a range of health issues.

So, it is not remarkable that the internet is the top choice for my questionnaire respondents to get health information. This is especially true when they encounter minor issues like how to make food for children. Moreover, the two reasons for this choice are the convenience of accessing and getting the answers anytime, anywhere, even if most need to know what is correct.

Besides, television is another effective way for users to get MCH information. As I mentioned in Chapter 2, various TV programs cover almost all aspects of people's daily lives. One of the highlights of such programs is that medical or health background experts and scholars often be invited to broadcast professional knowledge to broad audiences. Also, many

women in low-income families in China are often unemployed, and the essential part of their daily activities is caring for children and doing other household chores (Ding et al., 2012), often while watching TV, which is a key medium through which they gain health knowledge, more so than for people in full-time employment.

A ranking question was designed to explore users first choice when they try to find MCH relevant recommendation/advice/information (Figure 22). Internet, hospitals, and consulting elders are the top three choices. It is reported that, due to China's shortage of medical resources and the uneven distribution of urban and rural resources, many Chinese people do not have family doctors (Wu, 2016). Therefore, more people will go online to retrieve relevant information in sudden daily situations.

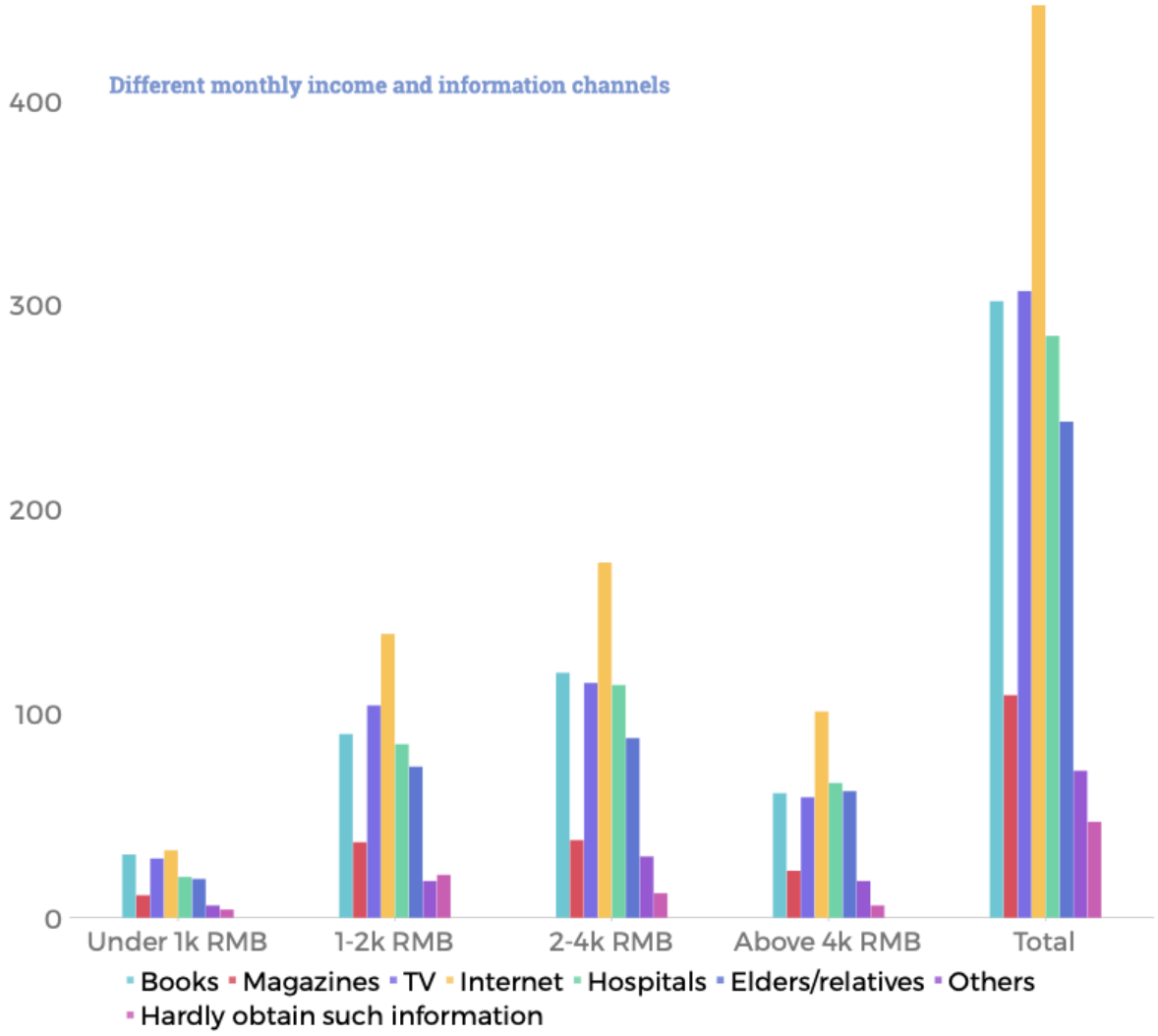


Figure 22 MCH information accessing channels.

P3: I like to use social media to find out MCH-relevant information. Because I think online media is very reliable and used by many people. People are not idiots, right? At least most people are not.....

P8: Specialised apps are good. I have been Meiyou (an MCH app) for several years, and it keeps track of my periods ..... but I rarely use it for anything else, either .....

Moreover, consulting elders is also an option for many people. Previous studies have shown that many low-income and low-literacy people feel unconfident and prefer to trust others because they believe they are more reliable (Alesina & Ferrara, 2000, p.38). It is a sign of low health literacy, which is deemed essential in the context of seeking online health information. According to most definitions, health literacy includes evaluating health information from different sources. In my research, the low-income and low-literacy people (income less than 2500 RMB/300 Pounds per month, education level is or under high school) have relatively low health literacy compared with other groups (income and education are higher), and they usually have a negative attitude for accessing health information. This is also consistent with the research in 2012 by Richardson et al., who took the data from the 2007 Health Information National Trends Survey (HINTS) to monitor the relationship between ethnicity/race and economic status in health information seeking, confidence, influence, and trust. They summarised that people with relatively low income and education often do not actively seek health information, and their motivation to change is also lower.

P1: It is not a big deal (caring for children) ..... keep it that way .....

P15: My parents have helped me with two kids, so I am pretty experienced with the third one now .....

P3: We live together (with the elderly) ..... We are too busy at work to look after the kids, so it is common for my parents to give us a hand .....

Moreover, cultural factors influence people's access to health information. East Asian society has a long history of young women being reluctant to seek sexual and reproductive health information since the traditional Chinese value system does not let them speak openly about sex. Women can be particularly vulnerable to sexual and reproductive health risks based on the context. The study by Liu (2012) gives essential insights into the behaviour of how young Chinese women communicate regarding reproductive topics and could find that young participants acknowledged that culture plays a vital role in Chinese society. Moreover, Zhang

(2014) found in her study that participants would likely seek sexual health information from interpersonal sources (e.g., best friends). This is confirmed by Rittenour and Booth-Butterfield (2006), who found that college-aged students usually discuss sexual health topics with their peers and feel comfortable about them. Also, Zimmerman (2018) found that low-income women tend to obtain reproductive information from informal sources. It can be seen that it is not uncommon for women from different age cohorts to seek this type of information from their peers. Siebold (2011) found that adolescent women trust their mothers and peers as trusted sources of sexual health information. Whitfield et al. (2013) found that adolescents find informal sources such as best friends and mothers as the most valuable information for sexual topics. All the listed research could be substantial proof that low-income and low-literacy Chinese people are more likely to seek reproductive health information (including maternal health information) from family and friends than from doctors in daily life.

P10: I do not usually go to the hospital if the problem is not severe. Just ask my mum and friends, they have experience...and they will never screw me over...

P13: Going to the hospital to see a doctor will cost money ... and waste a whole day… I only earn very little per day, so .....

P14: I do not think there are many problems that need to see a doctor, who raises children so delicate ..... The old saying goes, Children raised carelessly live healthier lives…

Personal health reasons were also mentioned as having a significant impact on knowledge of maternal and child health:

P19: My eyes are uncomfortable. I cannot stare at my phone for a long time; that screen is so harsh feeling ..... So, what I watch most often are videos. I especially like TikTok, the videos on it are not too long, I do not get tired of watching my eyes, and I feel I can learn something .....

P21: I would not say I like reading long texts. Of course, I went to primary school and can read, but I do not like reading at all… I feel like getting dizzy after a while .....

5.2.3 Content presentation and the understanding

About 20% of respondents think they have a complex understanding of the MCH information they had obtained (Figure 23). People with a monthly income of less than 1,000-yuan account for the most significant proportion. In other words, the group with the lowest income has the weakest ability to understand the MCH information they are exposed to.

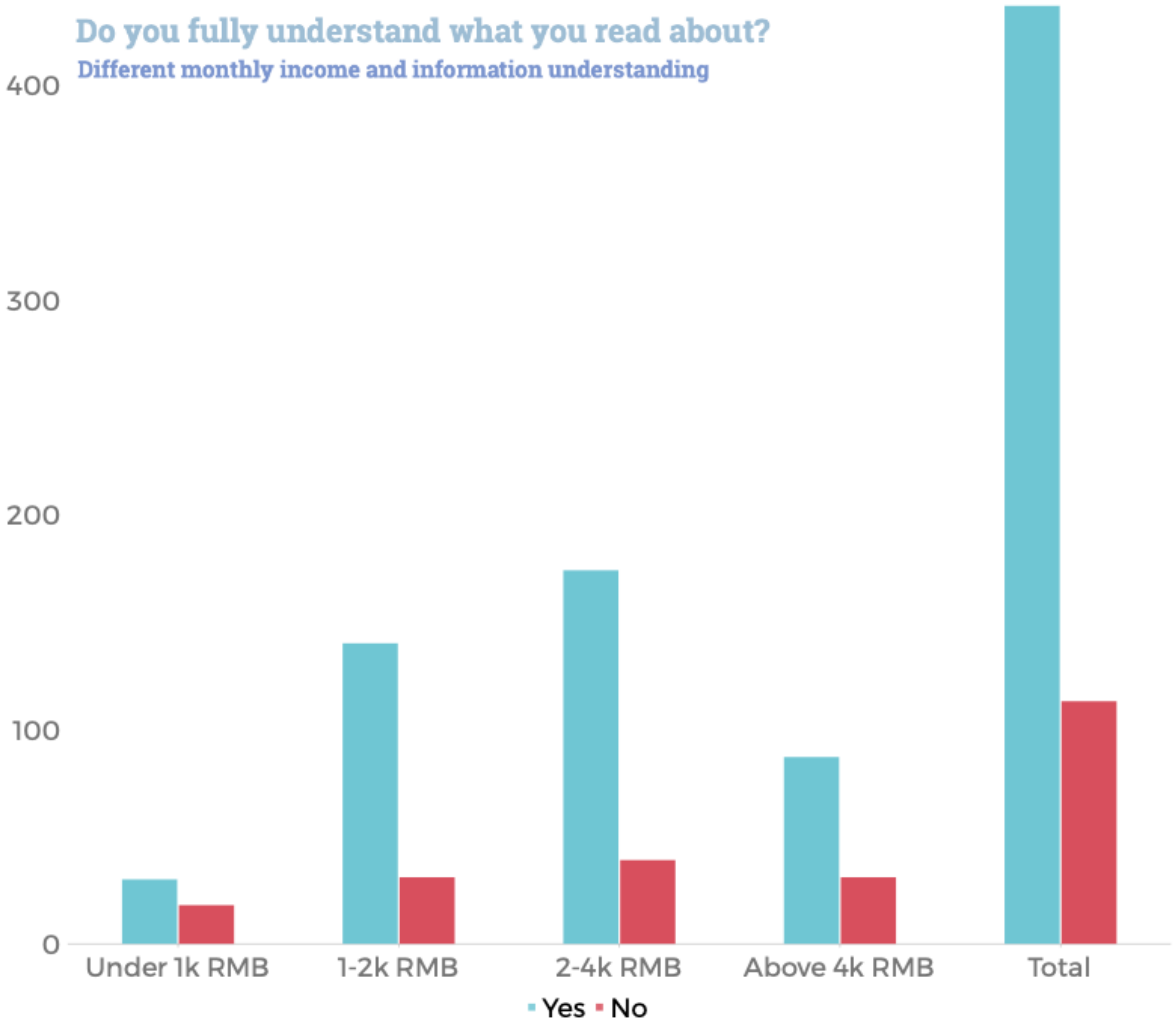


Figure 23 The understand of MCH information.

Although many people choose the internet as their first solution when meeting MCH problems. More than half of the questionnaire respondents think it does not solve their problems, and 25.51% cannot get the desired information. The reasons for this are varied. They consider that as much as 76.85% of Chinese people are reported to have limited health literacy (Health People, 2020), compared to the reported proportion of 43% in the UK (NHS). Health information needs to be easy to understand. Especially for low-income people, receiving health information in a simple yet informative manner is essential for health promotion (Lim, Kim & Park, 2015; Nomura et al., 2021).

P13: I am just looking at the internet to see what is going on, but I am still looking for my mum when I have a real problem because the internet is full of people selling things, and who knows what they say is true or not.

P20: Last time I searched for what to do when my child has a cold, the results came out a bunch of results, and oh my god, I was dizzy after half a day of reading… many people also exaggerated the disease, as if the person will die if not immediately go to the hospital for an infusion .....

P21: Every time I searched, a bunch of people came up, saying everything, reading half a day as if I had not read it, and sometimes even more confused .....

The three most widely cited reasons for the question - factors affect understanding of the health information - are 1) lack of knowledge of terminology/expertise, 2) impracticality of the advice provided (not realistic), and 3) suspicions of the messenger (feeling that the doctor/internet information exaggerates the actual situation). As for Reason 1, poor design of content and visual images and lack of explanation for notions are two main reasons. As I analysed in the previous chapter, current MCH media mainly aim to serve people with a certain level of income rather than people who need extra attention on universal language in the presentation of content. Also, many websites do not present content in a way that is relevant to the context, and the content presented on many websites is not well-sourced, which can lead to a sense of mistrust.

P2: I have only used the app Meiyou, which is used to record the time of my period, but it is not very useful. For example, I cannot record the results of my medical checkup afterwards, and there are many impracticalities in their features. They recommend advertisements all day long, all of which I cannot afford to buy .....

P4: Sometimes I read scientific articles, and I think they make much sense ..... but when I get to the end, and there is advertising that recommends products. I guess what they said earlier might be exaggerated to get me to buy something too. I do not believe it after seeing a few of them.

P5: I do not think anything is wrong with the design. Maybe it is because I am not educated .....

Reason 2 (the information provided is impractical) refers to situations where the user cannot find the relevant guidance that meets the requirements. Even though there has been extensive research on how scientific medical research outcomes should be disseminated to general people by following health journalism protocols, a direct reason people hardly access their desired information is that they need help finding it. Although there are more than 100 MCH websites on Google and 800 specialised apps on the app store, there is still space for improvement. As mentioned in Chapter 4, most of MCH media are commercially based and few English-version media are designed by the government or NGOs, which means the targeted users of the mainstream MCH media are the people with a certain level of financial freedom

rather than low-income people. Thus, as a result, low-income people need help finding their desired information.

P7: Every time I search for something, a bunch of answers come out ..... For example, the last time I searched for making supplementary food for my 6-month-old son, there were many suggestions, but none of them was practical, many of them suggested buying things that were either imported from foreign countries or shrimp or other things that I usually cannot afford to eat. I cannot believe it, so I cannot do it. These suggestions are for people who are better off, not me. I need help finding recipes for my children....

While the government and specialist institutions such as hospitals have policies and services, these are primarily for severe diseases rather than general health maintenance. For example, there is a free-spending national policy on Down's syndrome, and screening mechanisms for other types of illnesses are well established, but resources for communication and monitoring of general health and wellbeing are scarce. In addition, there is a considerable lack of primary healthcare promotion for people in rural areas.

Regarding primary health science in their daily lives, participants stated that:

P9: We take some medicine when we are sick or go to the hospital to see the doctor. But I don't know if there is any other activities or policies for improving basic health…

5.2.4 Trustworthy information

About 60% of people said that the information retrieved online occasionally solve their problems (Figure 24). These data are the typical situation for all four different income levels. As for people who think online information can hardly solve their problems, the most significant proportion was constituted by the under 1000RMB income group.

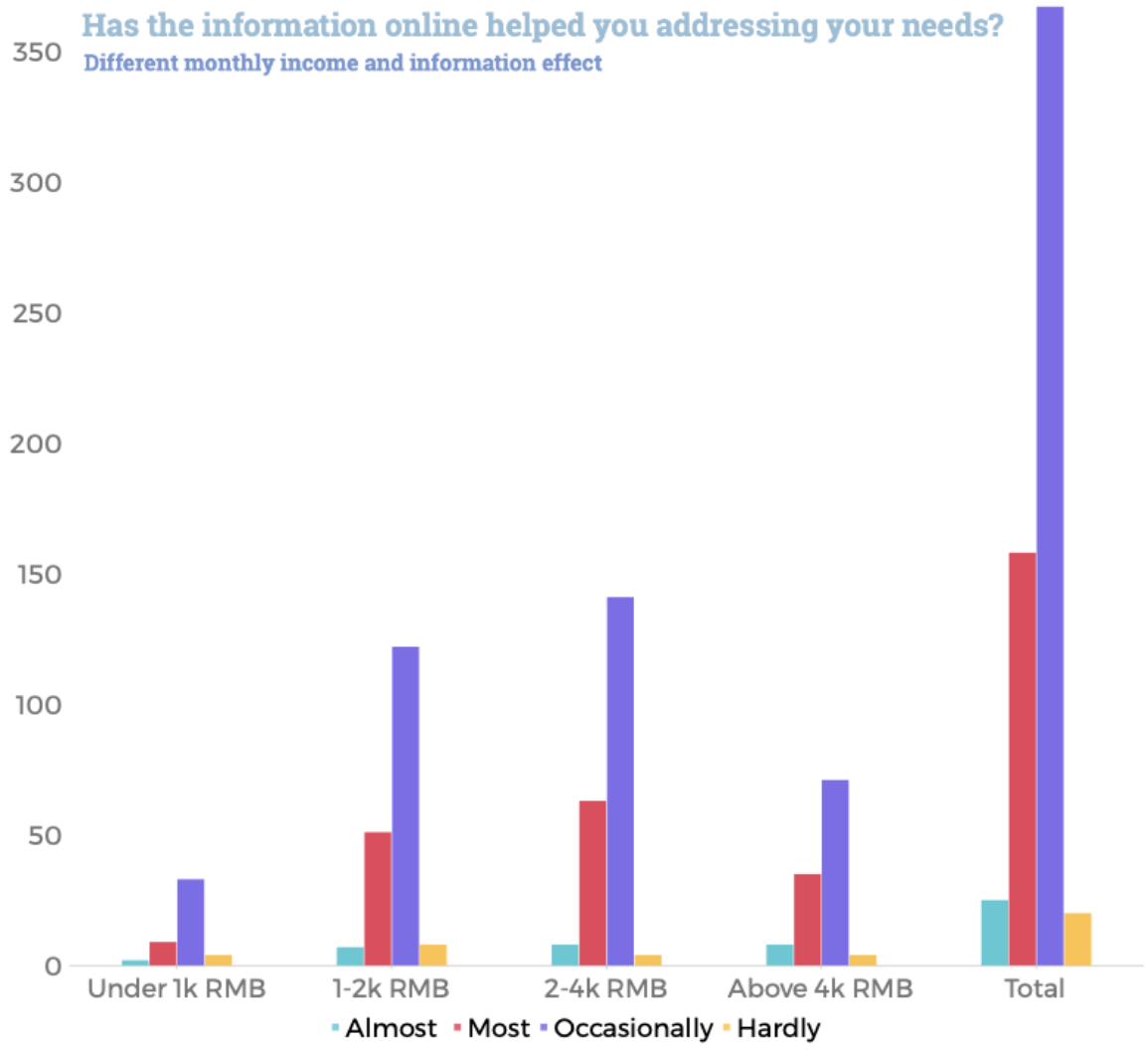


Figure 24 The effect of online information.

This group of data (Figure 25) is more interesting than the previous one. Though most people choose online learning health information, a significant number of them (over 90%) believe it in part. Combining the data in the above table, it can be seen that most respondents have a high degree of network utilisation. However, the complexity of online information makes it difficult to distinguish between correct and false, which is also a severe problem.

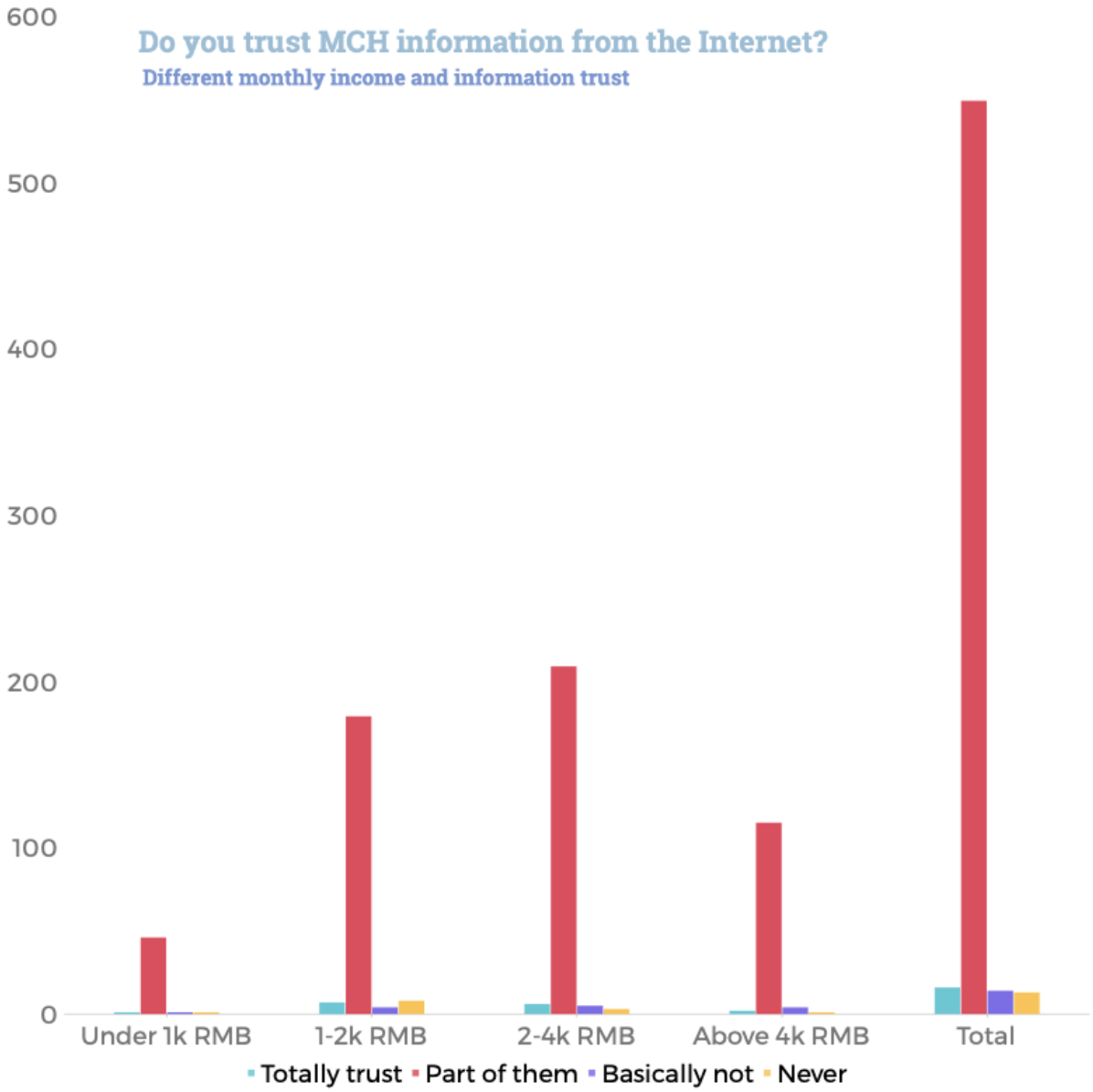


Figure 25 The credibility of online MCH information.

Half of the respondents trusted the MCH information from traditional institutions such as hospitals (Figure 26). The main reasons they listed were 1- the doctor's explanation was not clear enough, 2 worried that the hospital adds unnecessary consumption to earn money.

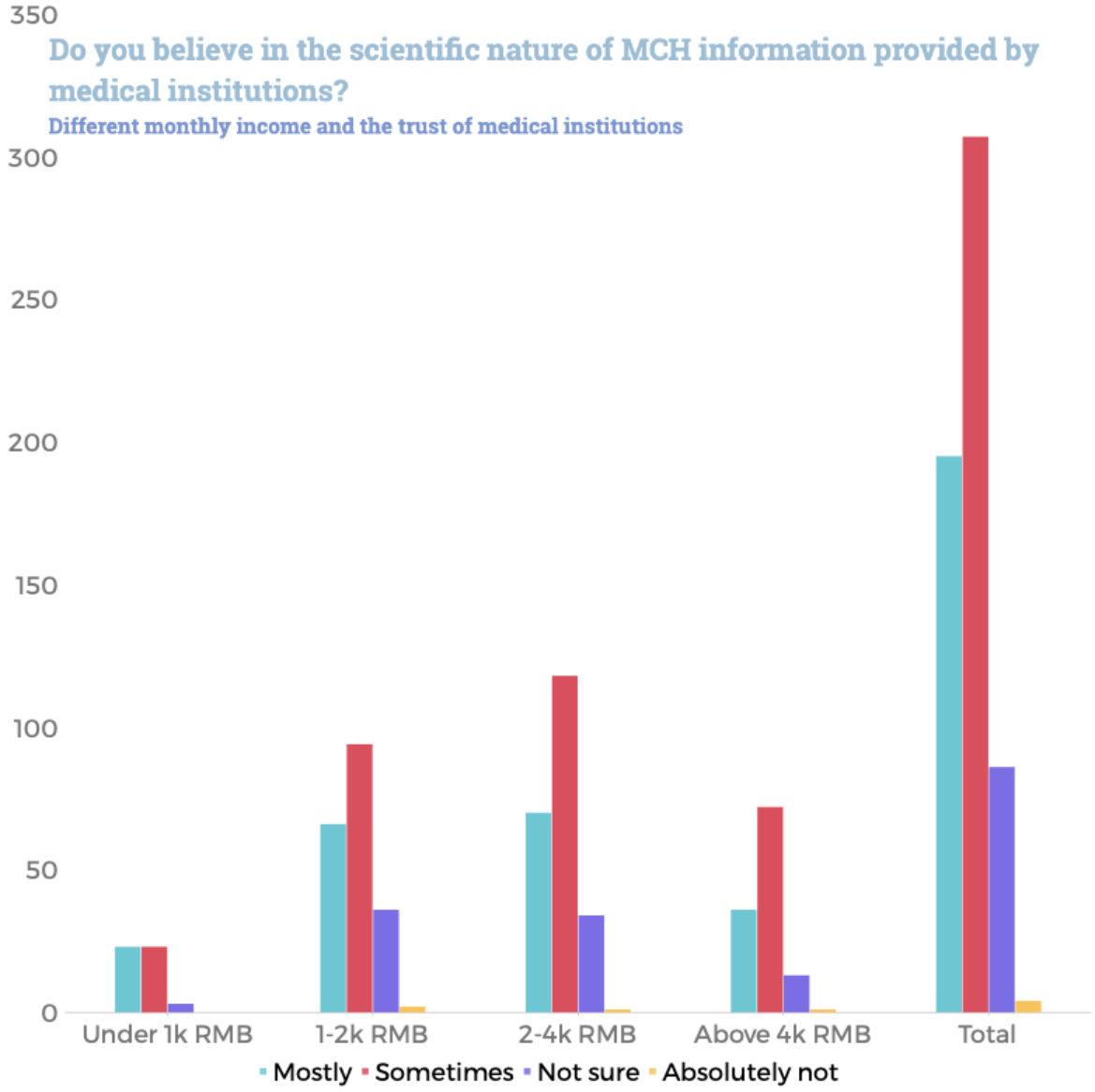


Figure 26 The credibility of medical institutions.

In recent years, there has been a dramatic increase in the number of consumers seeking online health information (Ball & Maxmen, 2020). Online health information deserves particular attention because studies on the content of health-related websites have highlighted inaccuracies that raise concerns about the quality of the online health information encountered by consumers (p.374). The limited accuracy of information is often the result of one of the distinctive features of the Internet, that is, anyone can potentially publish health-related information (Sbaffi & Rowley, 2017).

Online health information seeking, thus, poses several significant challenges to health information users, as it requires them to actively evaluate a vast amount of often unverified

health information on the Internet (Oyebode et al., 2021). As a result, people needing help with evaluating online health information may be exposed to wrong or incomplete information related to adverse health outcomes, such as low participation in screening programs or low adherence to treatments. More attention must be given to the quality of online health information and, in particular, people's ability to evaluate it (Ball & Maxmen, 2020). After the outbreak of the COVID-19 pandemic, studies show that we have entered an unprecedented "infodemic," characterized by pervasive misinformation (p.374). The term "infodemic" was coined by the WHO (2024) and refers to the "over-abundance of information – some accurate and some not – that occurs during an epidemic." while most of the internet health information is authored by professional, governmental agencies, research institutions, medical centres and individual professionals (Ambre et al., 1997), a lot more also come from sources that although well-intentioned, tend to misinform, mislead and persuade users in their quest to sell their products (Cotten & Gupta, 2004).

This phenomenon breeds mistrust and brings credibility issues regarding the source or the websites from which information is sought. The public health sector must engage with these technologies, which allow organisations to maximise impact and reach while spending less money and using fewer resources. Organisations promoting products that may have detrimental effects on health are already vigorously pursuing digital avenues, reaching the broad and potentially vulnerable audience as described in ref. (Oyebode et al., 2021). Online false news stories spread faster than real news become common sense for the public (Vosoughi, Roy & Aral, 2018).

The spread of health-related hoaxers is not new. However, the advent of the Internet, social networking sites (SNS), and click-through-rate (CTR)-based pay policies have made it possible to create hoaxes "fake news", publish at a larger scale and reach a broader audience with a higher speed than ever (Levine, Lipsitz & Linder, 2016). Misleading or erroneous health news can be dangerous as it can lead to a critical situation (de Jong et al., 2016). In 2020, Science Popularization in China published a debunking report from the Chinese Academy of Sciences, specifically addressing the misconception that administering too many vaccines at once would burden a child's immune system. Dispelling claims that vaccination could harm children's immune systems, the report emphasized that such notions were unfounded rumours. For instance, a 2023 survey on vaccine uptake among 2377 rural children revealed that only 35.93% received the flu vaccine, and the vaccination rate for pneumonia was 16.58%. This study reflects the low vaccination rates for common childhood vaccines. While the reasons behind these results are undoubtedly multifaceted, it's undeniable that vaccine-related

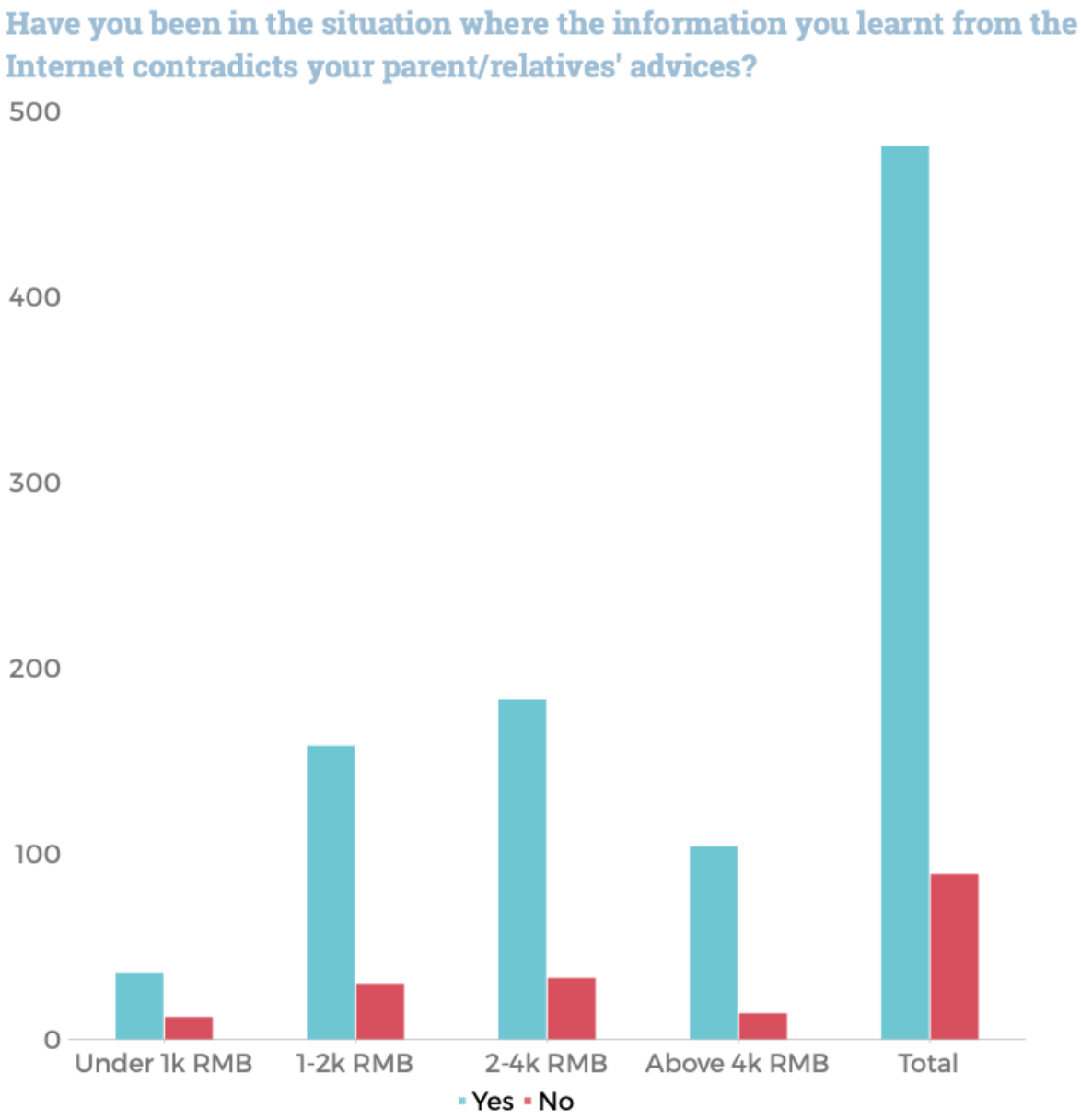
misinformation plays a significant role. Moreover, misinformation can spoil the credibility of healthcare providers and create a lack of trust in medicine, food, and vaccines (Dhoju et al., 2019).

P11: There are many WeChat groups where people often share health information, but I do not know if it is true, so I just scan it .....

P12: Oh, there are all sorts of things to say, I do not know who is correct, but I had better be careful to be on the safe side .....

Trust was repeatedly mentioned in the questionnaire and subsequent interviews. In the question—to what degree do you trust the information online? 92.74% of respondents thought only a part of the information online was reliable. Another noteworthy point is that 81.25% of participants had previously experienced MCH information on the Internet, contrary to their parents' advice. On the question of whom you prefer to trust, 32.26% of them chose to trust the Internet, 40.71% chose to trust their elders, and the rest decided to trust their evaluation. It seems a common situation for people worldwide that the participants believe that online health information can only be partially trusted. This has led to several studies to test the reliability of specific information using trust or trust as variables (Plantin & Daneback, 2009). In this study, distrust of online communication is also reflected in the fact that online information often conflicts with the advice of elders, and users can only make judgments based on their own experience. It is a challenge for low-literacy people.

Many respondents chose consulting elders when they met issues, the rich experiences of elders can be a reference, and convenience is the top three reasons (Figure 27). Even more interesting was that 81.25% of respondents said the online advice was contrary to the elders' view. Only 15.03% of respondents said they had experienced less or no such problem. The reason may because the elderly usually only use social media and are not very active in keeping up to date with health information (Chinese Academy of Social Sciences, 2018). There are two main reasons for this phenomenon. First, their physical qualities, such as eye diseases (WHO, 2019), make them unable to read articles with small font sizes and long paragraphs. Secondly, many elders generally have lower literacy and they might not be confident with the dynamics behind social media and new modes of communication (Moyer, 2013, p.47).


Have you been in the situation where the information you learnt from the Internet contradicts your parent/relatives' advices?
500
400
300
200
100
0
Under 1k RMB
1-2k RMB
2-4k RMB
Above 4k RMB
Total
Yes
No

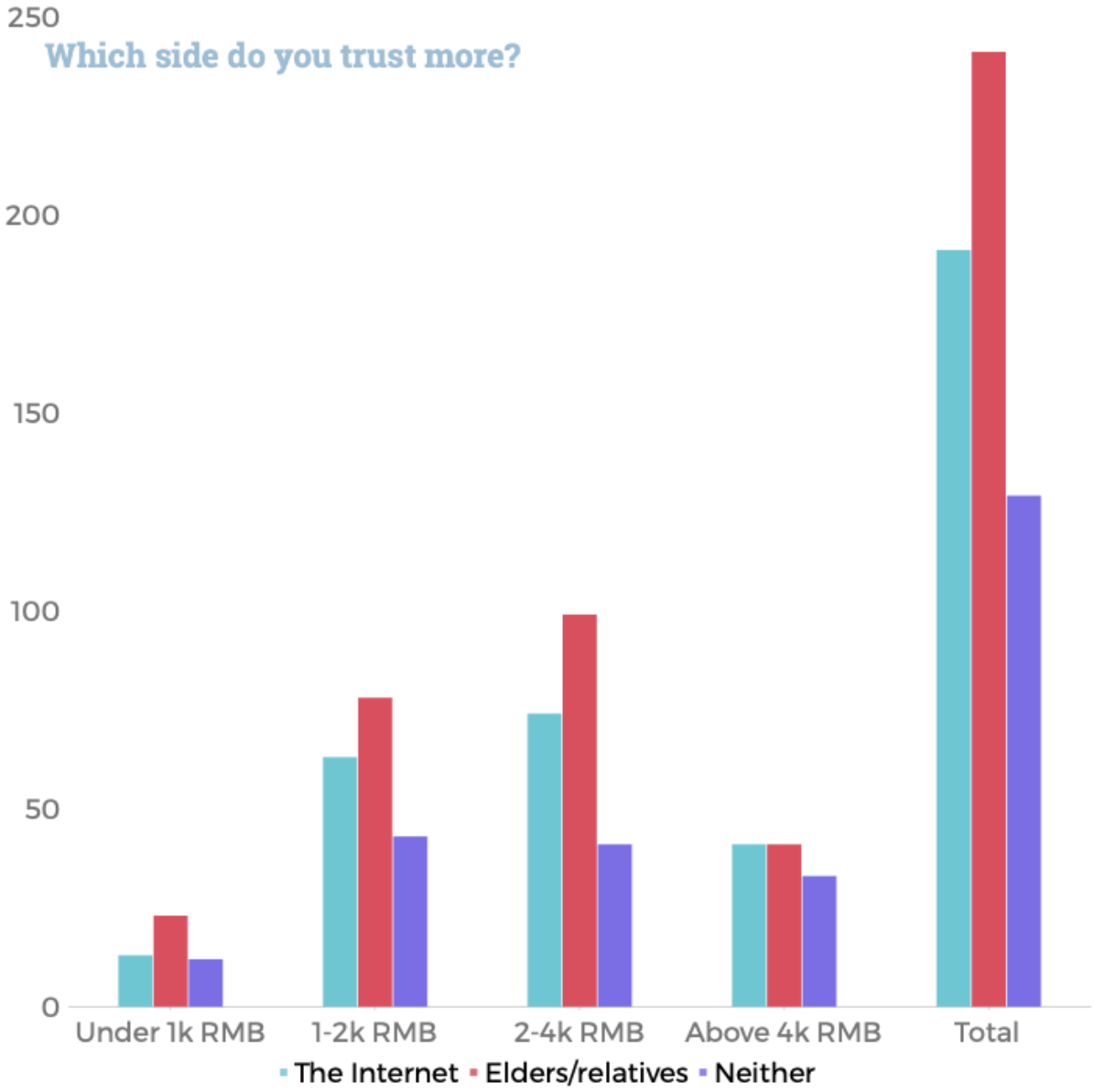


Figure 27 Above: advice conflicts; below: which side do the users prefer to believe.

P16: I consult my mum often, but sometimes she gives me advice that I do not think is appropriate. For example, the internet says that the scientific way to recover from delivery is 60 days, but my mum insisted that I have to take 100 days off work, she said it was the right thing to do. There was much debate when I was raising my child, and it is suitable for young people to understand the science and health knowledge that is always discussed nowadays. However, there seems to be little science for older people. We often work outside and sometimes cannot take care of children, so the elderly care more, but the elderly do not know anything and have often spoiled them. We are also speechless.....

P17: Every time the child is at home, he is fine, but as soon as he goes to his grandma's home for a few days, he develops many bad habits. It is useless to communicate with the elderly. They do not think it is essential and do not know what to tell them…

Moreover, COVID-19 has accelerated the development of social media and health information dissemination to some extent. Twitter, Weibo etc. trending social media have harvested a large amount of relevant research (Tsao et al., 2021). There was a consensus that website design, clear layout, interactive features, and the owner's authority had a positive effect on trust or credibility the power of the owner had a positive impact on trust or credibility and advertising had a negative result (Sbaffi & Rowley, 2017).

P5: Those people on the internet are trying to trick us into spending money on products, and when I see the ads, I think it is just for making money paid to say those things .....

P9: I don't believe what they say sometimes when they exaggerate the situation to sell a product. Whenever I see an advertisement, I feel unbelievable, and people dare to say anything to make money.

In the question—top 5 reasons why distrust information on the Internet, people's answers are:1 incomplete information, 2 contraries to conventional perceptions, 3 inability to find relevant information, 4 inconsistency with reality, and 5 difficulties in judgment. People with low health literacy will give higher ratings to low-quality websites and lower ratings to high-quality websites than those with high health literacy. Overall, people with lower levels of education are less able to assess the quality of online health information and place less trust in the news than those with higher levels of education. In addition, many current studies have evaluated the health literacy of their audience based on the participants' evaluations; the most significant disadvantage is that if the participants do not have a correct knowledge of their health literacy, the self-evaluation given is not informative. In addition, there is a lack of common standards for defining and testing health literacy (Diviani et al., 2015).

In addition to distrust of online information, participants also showed doubt of other authorities' sources of MCH communication. For example, only a third of the people in the questionnaire fully trust the information provided by the authorities (hospitals). Several guidelines and checklists have been developed for improving the quality of online health information dissemination, for example, by the Standford Persuasive Tech Lab, the Health on the Net Foundation (HONcode), Web Médica Acreditada, and Centrale santé (Netscoring criteria). These tools can be helpful for Web designers and health information providers to develop high-quality health websites. At the same time, users could use the guidelines as evaluation criteria to assess online health information (Diviani et al., 2015). However, these criteria are likely known and adopted only by specific population segments, resulting in disparities in people's ability to evaluate online health information. The knowledge gap hypothesis, for instance, states that as a result of increasing mass media exposure, individuals

in the higher socioeconomic strata of society tend to acquire information faster than people in lower ones. So, the gap in knowledge between the two tends to increase rather than decrease. It is likely that traditionally disadvantaged groups—such as those with lower education or health literacy—will be at higher risk for disparities in this context (Sbaffi & Rowley, 2017). Moreover, the bots in social networks significantly promote unsubstantiated health-related claims (Diviani et al., 2015). Researchers have tried developing automated health hoax detection techniques but had limited success for several reasons, such as small training data size and lack of consciousness of users (Choi & Nitto, 2013).

P10: Alas, I have not read many books, have no idea about many things, and blindly live .....

P12: I also want to live a better life (healthier life), but I do not know how to do it. It is very troublesome, and I also do not have money .....

5.2.5 Taking actions

Although low-income and low-literacy people have a low level of health literacy, responses show a strong demand for health information during the interview sessions. They agreed with learning about information to live healthier lives and recognised scientific knowledge's usefulness. However, many potential factors prevent them from promoting their health behaviour. As mentioned above, difficulties in accessing the correct information (seeing section 5.2.2), and the poor design (seeing chapter 4.5) of MCH media are two main reasons.

P18: I do not have time to learn about it systematically, so I just read a little bit ..... There is much information, so I read it aimlessly, and I do not understand it most time…

P20: I find the illustrations that children watch interesting, as well as the safety education videos, all of which are quite interesting. I would not say I like reading articles that are too long.

One of the most mentioned words during their interview was income. They are susceptible to spending because of their limited budget.

P5: I do not have much money. I have to care for two children and my husband only earn 4,000(500 pounds) a month, but also to support the two children, who are in school ..... It is quite limited income and most of the time, can only provide the family with food and clothing…

P9: Scientific MCH information is absolutely good. My family relatives are wealthy, and their child is precious, from good food and reasonable use, but that is because they are rich, and I am poor, nothing can get up .....

According to a report by China's National Bureau of Statistics (NBS, 2023), the average disposable income of rural residents in China was 18,931 Yuan (about 2000 Pounds) per year, and about 30% of their total income is spent on buying food. The rest is for housing, clothes and other daily expenses. As a result, low-income people are particularly cautious about how they spend their money. According to the CMA report (2015), low-income people tend to share an aversion to risk and a desire to maintain control over their finances in the short term (Pysmenna & Anderson, 2022). Much research also underscored how residents desired health, but income and economic barriers prevented them from maintaining a healthy lifestyle and diet. They perceived a lack of power to affect community conditions impacting their lives, such as decreasing crime, enhancing safety, or improving their health. Participants were acutely aware of the importance of eating healthy and being physically active, but their choices were often limited to unhealthy survival strategies. This is in line with the findings from research by Banerjee and Duflo (2007), who note that people living in poverty usually do not plan for the future in the long term because their income does not allow them to do so.

Besides, studies suggest that most mental health apps in commercial marketplaces do not conform to clinical guidelines (Camacho et al., 2022). Some may even offer dangerous recommendations, such as one application that advises people experiencing a bipolar manic episode to drink hard alcohol before bedtime to assist with sleeping (p.12). Most of these non-evidence-based apps may likely distract patients and cause them to delay seeking care. Meanwhile, many apps do not respect the privacy of personal health information, and the price of a free application is often buried in a complex privacy policy requiring college reading comprehension—that price being the right to market and sell your data. Indeed, there are exceptions, as a handful of safe, evidence-based, and valuable applications exist. Still, these practical applications may be too difficult to find among hundreds of more complex applications. Finding these practical applications, furthermore, is a challenge for both patients and clinicians (Torous & Roberts, 2017).

5.2.6 The role of husbands

There have been many previous studies that have shown that husbands are chronically absent in childcare. However, as an essential part of the family, I still invited three of them to conduct interviews to try to understand their needs for MCH information from their perspective.

P3: I work over provinces and only go home once a year for the Chinese New Year. I usually contact my child by video to see if they have eaten well and slept well. I do not usually go home if it is not a big deal…

P7: I check the kindergarten homework every night, and sometimes I take the child with me when my wife is cooking. However, I find that he seems to be afraid of me and does not talk to me or play with me much. I am trying to figure out what to play with him. Moreover, I found that nowadays, kids want to play with my phones and watch videos, and it is useless to scold them .....

P13:I work locally, and I pick him up from school every day. His mother is a housewife with no job and no income. After dinner, we will play for a while, mainly because the kindergarten teacher has set homework to complete. But sometimes I do not know what to do with him. A day at work is also quite tiring.....

Responses from the interviews show that on a day-to-day basis, husbands generally play a lesser role in child rearing but are usually involved in monitoring and decision-making, for example, checking the children's homework, taking care of daily expenses, etc. Fathers also do not tend to engage in seeking, accessing, or reviewing MCH material/information.

5.3 From the perspective of experts

An expert interview was conducted along with a user interview. As MCH communication stakeholders, experts could offer related experiences from a different perspective to users. Thus, three doctors were selected for the experts' interview; all of them were obstetricians. The three are from hospitals and health clinics at the township level in China, and the patients they work with are predominantly low-income and low-literacy.

5.3.1 The less developed a primary healthcare system

In 1986, the *Ottawa Charter* (The Ottawa Charter for Health Promotion is a significant international agreement that emerged from the First International Conference on Health Promotion held in Ottawa, Canada, in November 1986) for health promotion proposed enabling people to increase control over and improve their health and well-being by ensuring healthier, sustainable environments where people live, work, study and play. Subsequent WHO global health promotion conferences have reiterated these elements as key for health promotion. It is common sense that getting preventive care reduces the risk of diseases, disabilities, and death. However, after years of development, millions in China still need recommended preventive health care services.

E1: The government is still doing an excellent job in primary healthcare. There are subsidies for monthly maternity check-ups, and low-income households can apply for reimbursement. Pregnant women can also use folic acid for free. All the basic protections are in place.

E2: (The same basic health care coverage as above) ..... Although the primary healthcare system is in place, some basic health communication still needs to be improved. So many people come to the doctor without knowing anything, and you have to spend much time explaining it to them and then not always been understanding it .....

E3: I have been working for over 20 years and have seen all kinds of people. I had even met a woman with six months pregnant and just come to the hospital for the first-time maternity check-up. This is ridiculous. It is a fact that the primary healthcare system is sound and covers all major diseases. However, many patients still seem inattentive to daily health care, which needs strengthening.

The report Healthy China 2030 launched by China State Council shows that health is at the centre of the country's entire policy-making machinery. China has a three-tiered system for healthcare delivery: health organisations and providers operate at the county, township, and village levels in rural areas and municipal, district, and community levels in urban areas. Strengthening the capacity of the primary healthcare system—mainly the rural village clinics, town health centres, and urban community health stations and centres—has been a priority of the reform. The government has made significant investments and issued policies to attract and retain qualified health professionals in the primary healthcare system.

E1: The government's policy is indeed quite good, and there have been subsidies for primary health care staff. However, they are not enough. The gap between urban and rural areas is so vast that few people are willing to work in rural areas. There need to be more people, and there is a lack of basic communication means, so the problem persists…

Problems with everyday access to primary healthcare still exist. The quality of care given by primary healthcare providers is often deemed inadequate. From 2005 to 2015, the proportion of healthcare services provided by primary care decreased by 7%. In 2010, 5.6% of the doctors in township health centres had a formal medical education (five years of medical school), which increased to only 10% in 2017. Incentives to attract and retain more qualified health professionals in the primary care system are essential to improve the quality of care. In addition, the fee-for-service payment system in hospitals gives hospitals an incentive to attract and retain patients who could otherwise use primary healthcare providers. The quality of primary healthcare has remained relatively low, primarily because of the inadequate training of healthcare providers. Besides, the cost of medical care is still increasing due to incomplete reform of public hospitals, including ineffective utilisation of the payment system. Inefficient use of health resources is prevalent mainly because of overuse of healthcare and uneven distribution of health resources. In a sentence, healthcare delivery and financing systems are fragmented because of constraints in the governance structure.

E1: In fact, most primary health care workers are not very well educated. Most of them are from villages, they used to be barefoot doctors, but now they have changed their profession to become health care workers. There is no way to raise the requirements for this, only a few people are willing to do the work, and raising the conditions will make no one do it…

Building a well-coordinated and integrated health system based on primary care and an evaluation system based on health outcomes is needed to develop the health system in China further.

5.3.2 Personal motivation

In general, the doctors felt that the patients had a positive attitude towards the doctors and listened carefully to their suggestions. However, the decision to follow the advice depends on whether the doctor has thoroughly explained sufficiently.

E1: Patients are usually very cooperative and seem like they listen to whatever we say. But they do not practice excellent hygiene habits, probably due to their environment and income limitation.....

E2: They will do what I ask them to do as long as I can explain fully why they have to. If not explain sufficiently, they may ignore my advice. It happens everyday. I have no idea, you cannot image how many patients I have to meet every day, it is impossible to describe adequately to everyone, which is a big problem…

E3: For example, we all know that baby's meal cannot mix with adults, and I always told pregnant women and their families. However, there is always someone who does not care about it, and they ignore what I say and prepare the same diet as babies and adults unless I spend about half an hour explaining to them that infants who eat adult spices will burden their kidneys thus affect babies' health.

Besides, there are also objective factors mentioned:

E1: I once had a pregnant woman complain to me that every time they had a medical check-up, they had to take a four-hour bus ride, which was too much trouble, so they did not want to come. When it comes to some minor problems, they deal with it at home by themself, take some medicine from clinic or anywhere else…

Because people can only have medical expense insurance in designated hospitals, which may be far away from where they live, that is to say, sometimes people live in remote areas, and it can take up to 3 hours or more to travel by bus to a designated hospital. Some patients may give up because they do not want to spend too much time on transportation.

5.3.3 Irregularity of medical care service

For long periods, many medical staff in rural areas were the so-called barefoot doctors who provided primary care to many people. "Barefoot doctors" refers to a group of primary healthcare providers in rural China who received basic medical training to address the shortage

of healthcare professionals, especially in the countryside, during the mid-20th century. The term originated during the Chinese Cultural Revolution (1966–1976) and was promoted by the Chinese government. Later in 2004, this form was abandoned. Most of them underwent basic medical training, took the professional test, transferred to the formal medical staff at a primary healthcare institution and were paid by the government. However, as we can see, rural doctors usually see a large number of patients each day. Hence, the average communication time per patient is short, and a statistic shows 8.5 consultations per day per doctor in rural China in 2020 (Department of Planning, Development and Information Technology, 2021).

E1: I think the communication between the doctor and the pregnant woman is very problematic. There are so many people in the clinic daily, and the average patient may only have 2 minutes to talk, so there is no time to talk too much. Besides, they can only remember a little when they speak too much…

E2: It is a hectic day, and there is no other way to share the workload as so many people are coming in for advice on minor issues…

As for the traditional health communication way like leaflets, due to the limited budget, hardly a primary hospital or healthcare institution can pay extra money to print such materials. Also, the doctor dictates the consultation process, and there needs to be a complete online system to record the patient's condition, making it easy to follow up on the disease.

E1: There is no such promotional material at my hospital. The process is straightforward, consulting the doctor and then taking medicine. There are no other promotional materials for science or health awareness.

E2: There is no such thing in my unit. There is no extra subsidy…

5.3.4 Community as a unit to spread health information

Lack of income and power contributed to stress and fear, which is shown to force often people living in under-resourced communities to prioritise survival over their well-being (Pysmenna & Anderson, 2022). The loose community structure in rural China also does not provide support to those who need it (Wilson, 2012), and urban communities that are less economically developed tend to have worse health conditions and health outcomes than more developed ones (Kawachi & Kennedy, 1999; Pickett & Pearl, 2001; Pickett& Wilkinson, 2015). Economic poverty significantly impacts pregnancy outcomes, child development, general health conditions, and mortality rates (Hotez, 2008).

P1: Nowadays, most young people are not in the countryside anymore. There are not many people farming. Most of them work outside, and older adults and children are left behind in the country. We take care of them to keep they are well-fed and clothed…

P2: We live in a cheap area and cannot afford to rent an expensive house. There is no neighbourhood committee, just ordinary houses. Only the good neighbourhoods have that organisation but our place is too cheap to have these .....

5.4 Trust as the Inner Drive

The studies above have repeatedly emerged that the general public has a great deal of mistrust in the health information they are exposed to. As noted in 5.2.3, many current studies have examined trust in online health information among low-income, low-literacy populations, and the results also show that most people did not trust the information they are exposures to. However, being distrustful of online information requires sufficient competence to make a judgment, which is even harder to achieve. While most existing studies have been conducted in other parts of the world, the specificity of the Chinese context, is relatively under-researched. This study, therefore, aims to address this gap.

P4: Oh, don't they always say in the news that many people are cheated online ..... There are so many scammers there that we need to find out if it is true or not, so to be honesty it's really hard for me to trust someone or trust something online, but sometime I will trust them all, it's quite hard for me to have a uniform standard to help me filter the information .....

P5: I do not know either; I just read it , it's hard for me to make a judgement.....

5.4.1 The four main aspects

Some people consider the quality of medical information on the Internet valuable (Sandvik, 1999; Hellawell et al., 2000), while some feel it is poor (Doupi & Lei, 2002). These contradictory results are not surprising when we consider the large number and variety of sources for medical information on the Internet. Because of this problem, criteria for evaluating Internet health information quality have been developed by several organisations (Winker et al., 2000; Eysenbach et al., 2002). These criteria take into account not only website content (quality, reliability, accuracy, scope, etc.) but also form (design, aesthetics, interactivity, use of media, etc.), accessibility (fee for access, navigability, functionality, etc.), credibility of sources, and confidentiality policy (Kim et al., 1999; Winker et al., 2000). Until now, however,

the impact of these criteria on the design and the use of health information websites has been relatively weak, as no concrete guidelines for designers exist.

P8: Some software has too much stuff on it… It is too messy, I cannot see useful information...a bunch of icons, many of which are useless to me, it is too annoying to look at...

P10: I would not say I like the live chat function on MCH apps..... A group of people who do not know each other are talking over there, I do not want to join at all anyway, and it is annoying to watch .....

P13: A lot of the information is not suitable for me ..... We have different customs in different regions, and I see that some of the advice given on Meiyou (an MCH app) is for everyone, so it is not suitable for me .....

5.4.2 Income as the most considered factor

One of the words frequently mentioned by the participants during the interview was money. A common perception is that any activity proposed by MCH media would cost money, which affected their action plans.

P5: I am just too poor ..... cannot help it, so I cannot do many things. I have to think about how much I am going to spend on everything now .....

P8: We know many things are good, like hobby classes and supplements, but we need more money. Everything for kids is expensive, and with three kids in my family, I do not have extra money to spend on improving the living standard .....

5.4.3 Trustworthy design features/information source/media

There is currently a deluge of websites providing health-related information on various topics to a growing number of consumers. However, the lay user is often challenged to determine the quality of the information provided by one site from the other. One fact is that, to date, there is no competent international or Chinese reviewing body that validates the quality and reliability of MCH. Lee et al. (2014) found that participants wanted to navigate the internet through improved systems supporting their health information-seeking activities. They identified that some design features could impede access and wanted health professionals to guide consumers to credible online resources.

P9: I find articles with detailed expert explanations particularly credible. With great experts as a promise, that would be more trustworthy…and it would be more believable if there were pictures of the experts...

P12: I can trust those who do not sell products .....

P13: It would be good to explain what kind of people the advice they give is for. Otherwise, I always think it is for urban people with higher income than I .....

5.4.4 Government/policy/institution

One of the widely criticised aspects of China's healthcare system is that doctors can receive a premium on the revenue from the sales of medicines. Although this phenomenon lacks specific statistical data support, searching for keywords on the web reveals many related news reports. Many Chinese hospitals also display slogans prohibiting red envelopes and corresponding reporting hotlines. In order to curb the development of this phenomenon, the National Health and Family Planning Commission of China issued the "Red Envelope Ban" in 2014, prohibiting doctors from accepting red envelopes from patients. However, even after the ban, many reports and news discussions on this issue still indicate that the problem persists. As a result, to increase their income, many doctors will prescribe medicines to patients they do not need to improve the hospital's income and, therefore, their income. This phenomenon has long existed in Chinese hospitals, and although the government has stepped in to combat it, the results have not been significant, and incidents continue to happen (Song, Bian & Zheng, 2018). This is one of China's leading causes of tension between doctors and patients. Although the rate of complaints against doctors in China is globally low, the relationship between doctors and patients in China is significantly problematic (Zhou et al., 2017).

P1: The doctors sometimes prescribe me substantial amounts of medication that cost much money, but it looks as if I do not have to take that much ..... They are all there to get a kickback.

P3: The hospital is a pit ..... I do not go there if I can, anyway

E4: My brother had a slight cold and went to the hospital for a month, and he was gone. The hospital gave us many prescriptions to sell their medicine, and in the end, we owed a lot of medical bills… I usually do not go to the hospital if the problem is not serious anyway. I do not trust doctors either unless they do not sell drugs anymore.

5.5 Summary

In general, the internet is currently the primary source of MCH information for the targeted groups. However, the public has different views on accessing, trusting, and using such information. Most people are somewhat sceptical of the credibility of information provided by doctors, hospitals, and other authentic institutions via the internet. This reflects the ongoing tensions between doctors and patients in China. Hence, it is necessary to clarify why the public has such a low level of trust in online MCH information, why they use MCH apps, why they cannot easily understand MCH information, and what their social media usage habits are.

Firstly, personal motivation is the most important factor affecting whether individuals are willing to take the initiative to obtain MCH health information. Therefore, engaging with the public and inspiring their passion for engagement is key to promote healthy communication that supports healthy behaviours.

Secondly, the design of media (visual design and content) influences users' attitudes towards continuing to use apps. However, due to the limitations of the questionnaire and interviews in this study, I was not able to delve into this aspect in greater depth. As a result, it was not possible to understand the audience's perceptions, needs, etc., regarding the design of communication relating to MCH Communication. This point will be addressed further in the next chapter, which is on co-design.

Thirdly, many people face obstacles to understanding the information presented to them online due to its complex nature. One of the biggest reasons for not actively using specialist apps is that users think the information they contain needs to be better tailored to their needs. For example, many of the recommendations focus on selling products, while others require paying money or taking classes, both of which are problems in low-income areas. Of course, commercial apps aim to make money rather than improve the welfare of disadvantaged groups. Therefore, this problem may need addressing with more generous government subsidies or the establishment of businesses/associations with a charitable nature. In brief, today’s health system requires equitable health literacy and good health information.

Fourthly, in the Chinese context, intergenerational communication plays an important role. Older people often participate in parenting but are often overlooked in media design. The participants of this study noted that the relevant apps rarely consider the needs of the elderly and the problems they may face using such technology. If the involvement of this group is neglected, the immediate consequence is a growing gap in maternal and child health literacy between generations and family conflicts.

Fifthly, individuals with limited health literacy may be misguided by unreliable sources of health information and struggle to navigate health-information-seeking behaviours (HISBs). Low health literacy has been associated with poorer health outcomes and poorer use of healthcare services. During the interview, participants expressed a preference for using social media over professional health apps. The main reason for this is that social media enables interaction with familiar people and timely feedback, thereby providing a sense of personalisation. Essentially, the trust they feel is in the people with whom they interact on social media, rather than with the media type itself.

As for online health information, the lay user often struggles to distinguish between the quality of information provided by different sites. To protect users from sites that offer unreliable and unsafe information, there must be a competent reviewing body that rates and ranks the quality of the information provided by each site. To address this situation, several articles have been written with the aim of guiding users in accessing accurate information from reliable websites (e.g. Hesse et al., 2005). Although this approach is laudable, there is a greater need to protect consumers from unreliable sources of online health information. Therefore, a standardised framework could be implemented for evaluating and ranking the quality of online health information sources to aid consumers in their choices (Afful-Dadzie et al., 2016). Promoting the correct and scientific dissemination of MCH information requires collaboration among individuals, society, national policymakers, and designers.

All in all, users are provided with many options when seeking maternal information. However, due to information redundancy issues caused by information explosion, it is difficult for most people to distinguish between what they read and hear. This uncertainty concerns both the information they are exposed to online and the advice they receive from hospitals and elders. The information encountered online often contradicts the advice proffered by elders. The struggles faced by the elderly in keeping up with scientific knowledge leaves them at a disadvantage (Vaportzis et al., 2017). Hence, future research could examine how the inter-generational information gap might be bridged through more efficient design and how the credibility and communication efficiency of different media can be enhanced.

This section mainly lays the foundation for the subsequent research steps. Specifically, a broad perspective was taken to identify the target group's habits in accessing maternal and child health information and the basic situation of disseminating relevant information on MCH in China. Based on this analysis, it was identified that my target group, the low-income literacy group, does indeed face certain barriers to accessing maternal and child health information, as will be discussed in the next co-design workshop chapter that follows.

CHAPTER 6 Co-design with low-income and low-literacy people for generating MCH media

6.1 Overview

Chapter 5 explored low-income and low-literacy people's health behaviour in terms of how they access, understand, and trust information. It revealed that people of low income and low literacy are less likely to actively seek out health information. Multiple participants in this study also repeatedly noted that poor design and communication strategies have led to their preference for social media rather than specialised apps for accessing health-related information. This section builds on these findings by reporting on the design workshops involving a wide range of participants to co-generate new ideas for desirable designs of MCH communication media and communication strategies. There are four main sections in this chapter. The first part (6.1) provides an overview, including the research questions, aims, objectives, and methods adopted. Then, 6.2 discusses people's use of online media to obtain health information based on my observations. The following section, 6.3, constitutes the core of the whole research, as the participants collaborate to generate designs. This sheds light on their honest thoughts and their requirements for the ideal MCH communication media. Next, 6.4 presents reflections from the perspectives of the organiser and the participants for a well-rounded rethinking of the whole process. Finally, as was more fully discussed in Chapters 4 and 5, the literature shows that the income and educational gap between the workshop organiser and the participants may lead to relatively little contribution from the participants and ultimately affect the data collection. Therefore, Section 6.5 outlines engagement strategies for how to activate this specific demographic of participants by mitigating the potential power dynamics and barriers and encouraging them to share their experiences and ideas openly.

6.1.1 Research questions, aims and objectives

This activity aims to explore research participants' desirable MCH media through co-design workshops. It also provides insight into the barriers that might influence their co-design participation.

To achieve the aim, three objectives are outlined here:

1 To observe users' experience on MCH media and summarise user preferences, behaviours and expectation;

2 Work with users to generate the MCH app via various games, prototyping, etc.;

3 Based on group features concluded in the previous chapter and fieldwork, to understand the reasons influencing people's engagement in the co-design workshop.

The research questions of this chapter are:

RQ1 What challenges and barriers do users encounter when using MCH communication media (apps & websites)? ---presented in 6.2

RQ2 What are desirable features and design strategies of these apps with low-income people?--- presented in 6.3

RQ3 How to better co-design with low-income and low-literacy people who participate in co-design workshops for the first time? --- presented in 6.4 & 6.5

6.1.2 Reference for this study

The characteristics of co-design as an approach, and the specificity of applying this method in the Chinese context have been described in Chapter 3.

In addition, as part of this particular studies, gender differences and roles should be considered, as they can have a significant impact on the organization and outcomes of co-design workshops. As noted in chapter 2 section 2.1, in fact, gender roles do play a role in the way different family members approach MCH communication as well as, more broadly, childcare and child rearing responsibility. From a cultural perspective, gender differences can have a significant impact on co-design workshops. The different gender roles within families and economic status can noticeably affect participants' mindsets. Therefore, in the specific design of the workshop, I will focus on women, who are the primary labour force responsible for caring for the household and children. In terms of cultural literacy, since the founding of the People's Republic of China in 1949, there has been an anti-illiteracy campaign to promote basic knowledge i.e. reading and writing. By 2020, the compulsory education coverage rate for primary and lower secondary schools reached 94.8% (People.com, 2021). As a result, low-literacy and low-income individuals in China are able to read, comprehend, and edit text. From a cultural perspective, the current development in China reveals a significant binary structure between urban and rural areas. Specifically, many rural people have migrated to urban areas in search of higher salaries (Lyu et al., 2019). Therefore, considering this characteristic, this research is also conducted in the gathering places of rural migrant workers, making it convenient for participants to attend the workshop. From a socioeconomic perspective, although many low-income individuals have migrated to cities, the problem of information

barriers still exists. They lack sufficient economic or social foundations to access health information that matches their needs in major cities (Green & Haines, 2015, p.65). As a result, their health conditions still face certain challenges. Additionally, the majority of them are engaged in basic work, making it difficult for them to engage in collaborative design activities in their daily environments. Finally, in terms of the political system, China's grassroots healthcare system is not yet fully developed. It is evident that China's unique national circumstances and geography prevent it from unilaterally adopting approaches from other low-income countries and regions. Its specific cultural background and situation still warrant specific studies.

There are four reasons for the choice of this method. Firstly, it allows for a more participatory and inclusive design process. Secondly, the targeted group often face challenges when it comes to health communication, such as limited access to healthcare services, difficulty understanding health information, and cultural and linguistic barriers (Shieh, Broome & Stump, 2010; Guerra-Reyes et al., 2021). By involving these populations in the design process, co-design can ensure that health communication materials are relevant, accessible, and easy to understand. Thirdly, it allows for a more empathetic and human-centred approach to design. By working closely with end users, designers can gain a deeper understanding of their needs, preferences, and challenges, and develop solutions that are tailored to their specific context. Fourthly, it also helps to build trust and relationships. By involving these populations in the design process, designers can show that they value their input and perspectives and are committed to creating designs that meet their needs. This can help to create a sense of ownership and investment in the design outcomes and increase the likelihood that the health communication materials will be adopted and used effectively.

The following sections describe the structure and findings from the co-design workshops conducted in this study.

6.2 User Experiences of MCH Media

After an initial ice-breaking and introduction, aimed at making participants feel more familiar with each other’s, I started the user experience by observing MCH media using—with selected websites and apps. The tasks I chose are five— 1-describes the first impression; 2-thematic searchings; 3-shopping tests (including online shopping & expert consulting); 4-communication tasks (including physical examination recording & community connection); and 5-scene mocks. The discussion here is around RQ2 in 6.1.1.

RQ2 What challenges and barriers do users encounter when using MCH communication media (apps)?

This activity aimed to give participants a buffering time to familiarise themselves with what they have to design at the next step, along with the observing of a designer from a different perspective to add supplementary of participants' performances.

6.2.1 User experience observation

The primary purpose of this section is to offer the perspective of the designer to examine whether the target users have any obstacles in using the software on a daily basis and what type of health knowledge they are interested in. The same usage observation was carried out at the start of both workshops, with Table 13 shows the detailed content.

Table 13 The user test themes and specific tasks.

No.	Themes	Requirements
	First impression description	Giving a well-rounded comment about the visual, layout etc.
	Thematic searching	Complementary foods; postpartum caring
	Shopping	Milk powder shopping; Online consulting
	Communication tasks	Recording physical examination; community connection
	Scene mocks	Mock daily using scenes

I took my laptop, iPad, and smartphone to the workshop with pre-downloaded Apps-BabyTree, Mama.com and QinBaby apps, and several saved MCH website pages. Participants were asked to execute the tasks listed above using mobile applications and then using web pages. In addition to the recording, notes were taken to record issues that I thought deserved further discussion (Figure 28 shows the process).

Figure 28 The process of using observation.
(two pictures are from one workshop).

6.2.1.1 Using motivation and ages

Age as a variable can also have a very important impact on the study results. In this study, as mentioned in section 5.2.2, the most direct effect of age is motivation to use MCH media. The older the person is, and the more children they have, the less likely they are to use MCH media. This is quite understandable, as they have gained enough experience from their previous parenting to be more confident when faced with questions and problems.

In both workshops, especially the first one, three people were older than others (over 30 years old) and had more than two children each, and they made it very clear that they had limited use of MCH media. They had enough experience raising a second or even a third child, so they had no ideas or desire to improve their health awareness and behaviour. Interestingly, however, several of them made it clear that they were often not sure what they were doing wrong and would change if they knew exactly what needed to be improved. However, they did

not have the time or inclination to take the initiative to understand and correct their unhealthy behaviour. Thus, they used such media infrequently, only when encountering a problem they could not solve. The search media they used is limited to web-based, just as they say, *"app seems over our need and also takes a lot of storage, so we usually do not download it…*".

6.2.1.2 Information overload

There is a trend where web pages and apps are crowded with a lot of information, giving the feeling that designers want to tell everything to viewers (Geissler et al., 2001). Similar design styles in all kinds of apps include some with single, focused need apps. As I have analysed in Chapter 4 before, information overload is also evident in the MCH apps. However, it is not an effective mode of information communication for all audiences. The weaknesses of this kind of design are particularly pronounced when it comes to groups with different receptive abilities. For example, low literacy groups may feel overwhelmed by the sheer volume of information available if the design is too complex and there is too much information. Because of their cultural limitations, they are not able to sift through information, and providing them with too many choices is similar to not providing them with choices at all. This style of design certainly exacerbates the information gap between groups.

Information overload manifests itself in three main ways. Firstly, the design of the home page is crowded. As mentioned above, the homepage concentrates a large amount of information, not all relevant to the target group. All participants expressed varying degrees of annoyance with the information overload, although younger people, who also generally use the site more frequently, were less annoyed with it than older people. At the same time, the vast majority of participants (13/15) said they would be happier if they could personalise their homepage by choosing which features they wanted to be at the top and hiding the sections they did not like. This content was explained detailed in functional choice selection in 6.4.1.

> *"The app's homepage was cluttered, with colourful images, advertisements and many icons that made it difficult for me to know where to click…"—P4*
>
> *"The first impression of the website was that it needed a redesign for the information layout… and seems had not been updated in a long time…" --- P10*

Secondly, all participants were under the assumption that selling goods to make money was the primary purpose of these media. While this is partly true, since these are commercial products, these platforms are primarily presented as health communication tools, and people are naturally more sensitive to health commercialisation (Banks, 1995). Many previous studies

have shown that when too many commercial elements are included in health communication, media can significantly reduce people's trust in the health information being communicated (Jenkins et al., 2020). Three people said that the feeling of using the website was that more than half of the information was about promotions, and merchants were trying their best to encourage people to consume something, which made them feel that the site's reliability was diminished. These observations are consistent with the analysis of the current design of MCH presented in Chapter 4. The crowded layout with advertisements and many unnecessary trending news is not attractive as the merchant's images.

Thirdly, many media outlets have placed gossip news and live chat features in a very visible position on the homepage. The vast majority of participants (12/15) said they were not interested in the gossip and found it annoying to watch the live-scrolling chat box. They said they are more concerned about their interests being satisfied than strangers' gossip. Also, with the trending news, participants (6 of 15) felt that they do notdon't care about such news and hoped there might be more funny functions like videos or children's books. Only two people said they were very interested in gossip and just enjoyed watching people chatter.

> *"if I want to chat with others or to watch news, I can do it on WeChat or Weibo rather than here, where has more interesting news and I can also discuss with my familiar friends…"* ---P4

Finally, there is a particular issue that is specific to the app. Due to income constraints, low-income people can only use a limited budget for a smartphone with a certain storage space. Most trending MCH media in the Chinese market only operate app versions and have no other accessible ways to use them. This is also another important reason why many of them prefer not to download too many apps to occupy the limited space.

6.2.1.3 Readability

Readability emphasises how the text is written, organised and visually displayed for maximum reader comprehension. The importance of readability has also been highlighted in many previous studies on low literacy groups (Kouame, 2010; Morony et al., 2015). My participants also repeatedly complained about the presence of large sections of text and densely arranged images in the media, which made it difficult to read.

To expand on this, readability in this section was related to two aspects, visual and textual content. Firstly, in the visual part, the problem is mainly related to the unmatched images with content, and most of those pictures that emerged among articles are decorative and

less related to the text. In addition, in many mobile apps, for example, there is advertising with a flash effect, and this poses a problem in that it is difficult for the viewer to focus on other important content if they realise that they are constantly being drawn to the flashing ads.

"I don't understand why this ad is flashing so much, it hurts my eyes"—P7

Another important point is that this kind of media includes a wealth of images, and there is no visualisation of health information, so it is not very helpful for the audience to understand.

"I am literate, and I can read, but I hate reading long passages, I feel it will hurt my brain…"--- P2

"Oh, I don't want to read when there are so many words, I don't like reading, pictures or videos would be better"---P9

6.2.1.4 Conservative consumption habits

The participants also demonstrated a particularly conservative attitude to spending during the shopping task. Due to their budget limitation, "saving money" and "free" were two words they repeatedly mentioned during the research.

The conservative spending attitudes of the participants in this study were first observed about the purchase of milk powder. Participants did not seem to be interested in products with very high-quality descriptions, saying that they did not need those products and that the merchants might exaggerate functions or something else. Although all of them completed the shopping task, they also clarified that they would not usually purchase items on the app, and 9 of 15 people said that they had never shopped on the app before. The main reason was that they felt the price was not a bargain compared to another shopping app-Pinduoduo (Chinese in 拼多多), which is a specialised shopping app for low-income people who may live in lower-tier cities. In this app, one can find similar products at the lowest prices around the Internet. In addition, participants also said that they were not brand-seeking and preferred cheaper prices rather than good quality (Hwang, Ko & Megehee, 2014).

Continually during the online consultation session, participants also showed great skepticism towards this paid consultation service. All participants could use their mobile phones to communicate smoothly with the doctors on the Internet. As I said before, the Combat Illiteracy Campaigns (1950-1956) eliminated illiteracy to a great extent. One of their complaints, however, was that the free time for online consultations was short, usually only

five minutes. Participants said that they felt that the time was up after they had described their status and that they would have to pay if they wanted to continue asking for a solution or further advice. Meanwhile, although the app provided information about the doctor's qualifications and background, participants were still suspicious about the doctor's background and qualifications. Distrusting online media and being afraid of leaking personal information are two main reasons.

As for the community joining task, all the people can join it smoothly without any problems, except for two apps that did not have the local community function. While the daily communication content of such groups also focuses on selling products or chatting, and useful or helpful information is rarely shared.

6.2.2 Mocks scenarios

6.2.2.1 Reason for conducting this section

A game was carried out with a simulation of the usage scenario in order to understand the audience's usage scenarios better and to customise the design framework increasing the usage rate, thus enhancing the effectiveness of health communication and ultimately raising their health awareness.

6.2.2.2 The process

The game was conducted without a computer and through the use of Lego minifigures, scene cards, and a scene map. The main consideration for conducting this game is to provide participants with a small activity that covers a broad timeline, fully inspiring their reflection on the daily use of the MCH app. Similar to the simulation of a one-day journey in prototyping, this is also a common activity. Participants could freely combine to describe and simulate their daily use of the app in words and Legos, as well as the time, occasion, and reception of information. The scenario cards consist of five themes: home, work (if they have a job), park (other leisure spaces), fair/shopping mall and public transport. Each participant was asked to present their use of MCH media in different scenarios, one by one, in the order of the cards. By tracking the positions and usage of people within a space or scene over time, which could record the pathways and traffic patterns of occupants of space helps to define zones of different spatial behaviours.

The second section was a one-day tracking map, which is a complement of the above card storytelling. I then drew up a flowchart-like agenda and marked out some additional

scenarios related to accessing MCH health information (seeing Figure 29). The second method requires participants to visualise an experience through drawings and diagrams, which could debunk assumptions and reveal how people conceive of and order their experiences or activities.

This part of the game was much more interesting than the previous one. The participants were also very interested in the Lego minifigures, so it went smoothly and successfully. They took the Lego minifigures, placed them on the different scenario cards and the scenario maps, and talked about their using sense. They described their life paths and how they used their mobile phones to access MCH information.

Figure 29 Scenario Card and Lego Minifigures.

6.2.2.3 Reflection

Several interesting points emerge from the scene mock. Firstly, the participants said their families also need MCH media use. Their husbands are busy working during the day, but when they get home in the evening, they have no idea what to play with their children. Besides, 7(of 15) participants also said that their children had more than once asked why all these things were for adults and not children. Then, the child will leave disappointed. Secondly, the

participants felt that the entertainment function of the media was almost nothing. They prefer entertaining and learning about knowledge rather than reading long texts in a fixed context. As they say, focusing on those texts seems like “in school”. Thirdly, they usually arrived at the kindergarten entrance within half an hour before the children were released from school. During that period, they either chatted with other parents or swiped short videos on their mobile phones.

As we can see, their scenario-based needs are very clearly personal. Firstly, it is desirable to have a family account that can cater to different members of the family at the same time and then automatically switch between content aspects to meet their needs after logging in. For example, an evening entertainment function could be developed for husbands, with content focused on interacting with parents and children. Secondly, the participants' time is very fragmented, so if the health information can be visualised entertainingly, in the form of funny pictures or short videos, this can meet the emotional needs of more people, which might be a good time for them to take advantage of for some meaningful things.

6.2.3 Section summary

This section focuses on the use of the popular MCH media by users and explores the problems they encounter when using the media in question while at the same time maintaining a constant dialogue with the participants during the observing process in an attempt to get to the heart of their media use. The four tasks were applied in a pilot study and two formal workshops, and through thematic analysis, I identified four relevant themes, which are described in detail in 6.3.1.1 to 6.3.1.4. In addition, I designed a scene mock session after the user experience observation, in which I used card selection and journal mapping to gain a comprehensive understanding of how the target group uses MCH media in their daily lives. This was to provide suggestions for specific scenarios in the design of the MCH media in the subsequent design framework and to customise the design to suit the characteristics of the scenarios, e.g. to deliver short health messages while waiting for children to leave school.

The aim of this section is to identify the problem, as it serves the design framework that follows, and therefore the aim is to identify the problem rather than to solve it, so not much time is spent on exploring the reasons behind the motivations for particular behaviours. These have also been discussed in previous chapters. If future research focuses on understanding the usage habits of the target group, a complete fieldwork plan should be designed to explore a range of motivations, behaviours and reasons behind them.

6.3 The Desirable Communication Media

The conducting of co-design workshops has enabled this research more in-depth. Questionnaires and interviews conducted in the previous section were from the designer's perspective, and it is essential to add a section from the perspective of audiences as a pairing with the designer's perspective. Also, by using creative tools in creative activities, participants' creative thinking can be maximally activated, and at the same time, they can spark new inspirations under the influence of others. All the ideas generated during the workshop process can receive timely feedback, entering a positive cycle of discussion, creativity, optimization, and discussion. Based on the considerations listed above, a co-design workshop is essential.

After using observation was done, I started the desirable media co-design section, which includes four activities aimed at understanding the targeted people's preferences on MCH media. It aimed to gain insight into the ideal communication media for the target group and their perfect reception of the message. I have used a combination of design methods in this section, all mentioned in 6.1. The critical point worth highlighting is that the design is based on online communication media. Due to China's ultra-high smartphone and Internet penetration—the rate up to 72% in 2022 (Statista, 2024), it is much more convenient for them to receive health information via mobile phones. However, after reviewing the current literature (academic literature, web links, etc.), I found very limited research on exploring the design guidelines of online media. Although many links to relevant articles reference the five essential principles of app design, they lack the detail and comprehensiveness to systematically consider a wide range of electronic media design (including social media, web media, apps, etc.) and put users into various backgrounds. The Framework for effective Communications WHO provides meaningful guidance on health design communications and advice regarding content accessibility, actionability, credibility, and trust. But this is a guide for many communication channels, not just online media. A similar guideline is the inclusive design toolkit from Cambridge University, which broadly discusses inclusive design and gives many interesting examples. However, as with the WHO, the digital media design guidance is only a tiny part of the guide. It is more about comprehensive, multi-channel advice on online, offline, strategy and more. The toolkits make written material clear and effective, a health literacy resource that provides a detailed and comprehensive set of advice to help. It focuses on the presentation of written content and visual design to explore how it can be made accessible. But as the author said, this toolkit mainly focuses on printed material, and all of the guidelines for writing and design are oriented toward this. Thus, to better conduct the workshop, I evaluated multiple

sources as references and combined them with the data that emerged before to describe the ideal design of digital communication media for low-income people.

This section was divided into three aspects: function, visual, and content, and four games were developed as detailed methods to explore users' preferences. The narrative structure below is based on the games as a unit.

The game set-up and co-design aids (stickers, tape, paper prototyping form, coloured markers, hand-drawn markers) were generally the same in both workshops. The low-income, literate participants often needed more relevant experience and confidence in using them. I explained in detail before starting that they could use the materials they already had for any creation and that there were no particular restrictions here. The strategies applied here include identifying the issues through storytelling. That is, participants could speak out their feelings and stories at any time during the process, and I will record it to have a unified analysis. This setting could help me better engage in the process and communicate and understand experiential knowledge.

The games proposed here are based on several standards. Firstly, providing accurate and reliable information is essential. Expectant mothers may rely on communication media to get information about pregnancy, childbirth, and parenting, so the media must provide accurate and reliable information. Secondly, the designer/organisers should connect expectant mothers with healthcare providers and support networks. MCH communication media can be a valuable tool for mothers to communicate with their healthcare providers, other expectant mothers, and other sources of support and guidance. Thirdly, users need to facilitate communication and connection. Maternal communication media should facilitate communication and connection between expectant mothers, their healthcare providers, and other support networks. Finally, Offering a range of resources and support. Maternal communication media should provide various resources and support to expectant mothers, such as educational materials, tips for managing pregnancy symptoms, and access to relevant services and support networks. Figure 30 shows the relationship between the three steps.

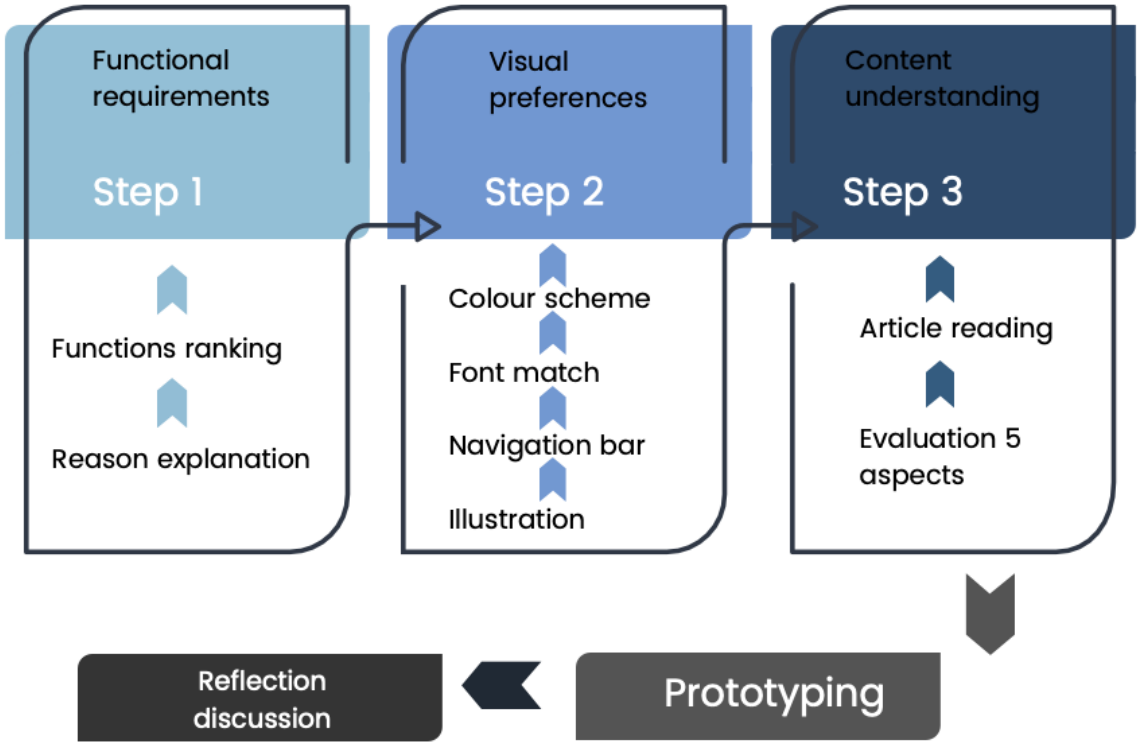


Figure 30 The relationship between three steps.

6.3.1 Functional requirements

Function is an essential consideration in the design of maternal communication media because it can affect the effectiveness of the media in delivering important information and support to pregnant women and new mothers. Maternal communication media can be used on various platforms, such as social media, websites, and mobile apps. The specific and essential functions will depend on the particular needs and preferences of the targeted users.

In this section, I have orchestrated an interactive voting game (as depicted in Figure 31). Participants were provided with three stickers, each bearing a number from 1 to 3, and were tasked with selecting their preferred function from the function board I had prepared. The function board encompassed six sections, namely early infant education, health care, daily diet, online games, online shopping, and experts' consultation, fostering an engaging and participatory research environment.

The results of the functional voting show that people are strongly concerned about the intellectual development of children. In the follow-up discussion, they also expressed the opinion that some of the existing training courses on intellectual development were very expensive, and they could not afford them at all. However, a lot of information is available on the internet, and they would like to learn if there is a platform that provides them with relevant

information. Several of them even said in the previous shopping task session that they had never spent money on those apps before, and they would be very willing to spend money on non-expensive materials if they had to buy them as a supplement to such activities. Then the second most popular feature was health care for adults. Participants said they knew that there are now many institutions in the city that specialised in postnatal care, but their income limits them from going to such places to recovery, so they would be willing to use a feature that would tell them what to do for a considerable period after they have given birth and in the cheapest way possible. The third popular feature is diet. The recipes currently available on the internet are all too complicated and usually require more than ten materials to prepare, which is unacceptable both in economics and time.

> *"It's impossible for a family like us to buy foods that way, and there is something like fresh prawns we cannot find it, even frozen prawns are also very rare in our local supermarket".* ---P13

They, therefore, expressed a strong desire for a feature that would give them recommendations for matching ingredients based on what they have available, as well as targeted recommendations based on their financial situation (they cannot afford expensive ingredients) and the situation in local supermarkets (small rural supermarkets have a limited range of vegetables and meat).

One user raised an interesting point, highlighting a common dilemma. They find that the features they enjoy the most are often at odds with the features they need the most. This insight could guide the development of a balanced feature set.

> *"I definitely like entertainment, videos and stuff like that…but that's not the same as the most needed function, the most needed is definitely for kids, do you have any way of striking a balance?"*--- P1

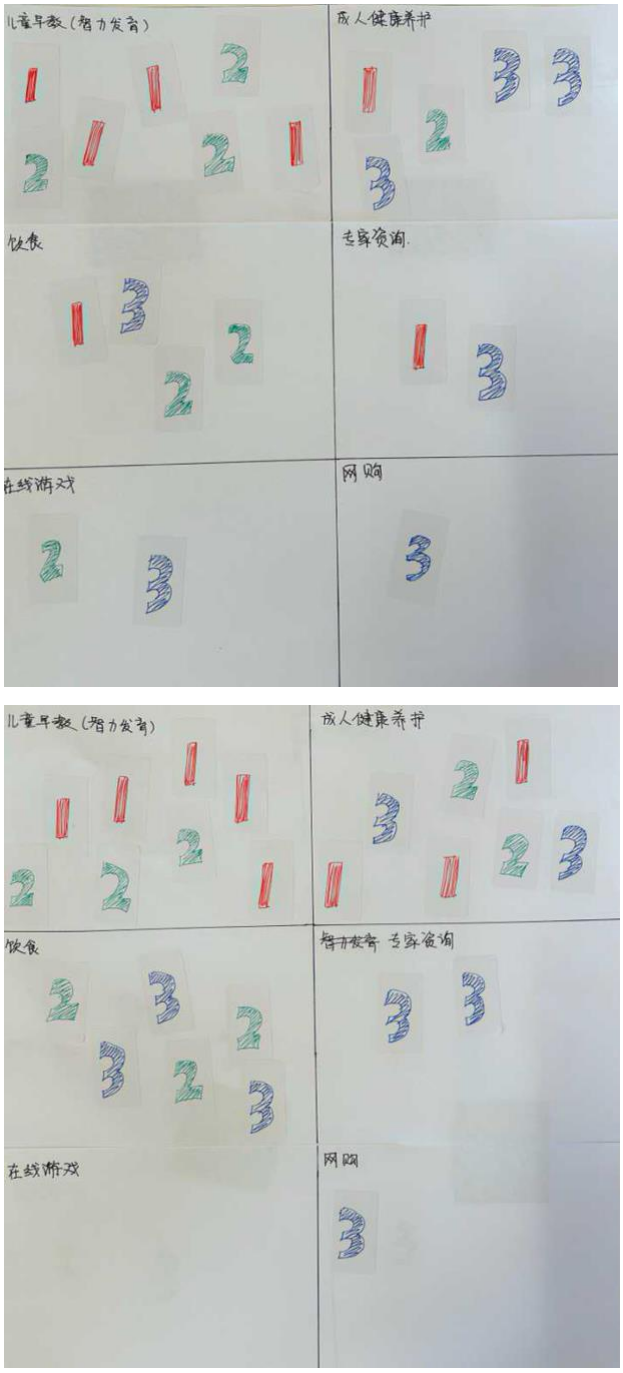


Figure 31 Functional Choice Table of Two Workshops, Above: the First Workshop, Below: the Second Workshop.

(in order from left to right: early infant education; adults health care; diet; experts' inquiry; entertainment; shopping).

6.3.2 Visual preference

In this section, the main focus was on visual design in terms of colour, fonts, page proportions, navigation etc. I prepared a series of cards, as shown in Figure 32, for the

participants to use. The discussion was also focused on design style, visual matching and visualisation of information.

As a result, participants showed the following visual tendencies during this session. First of all, regarding navigation, almost all participants have expressed some of the functions that are not often used. If there is an ideal app, they can customise the navigation bar and freely choose the functions they like to put on the home page. Secondly, regarding layout, some participants prefer a concise style that does not need too much decoration or advertising. Some people also say they like reading the recommended gossip, but others do not. Therefore, there are differences in people's preferences about layout. So designers can present the homepage content for customised design, or carry out a certain degree of preference research on the information recommendation at user's registered stage before pushing other information. As for colour, participants said they liked lively colours like pink, orange and yellow, which is in line with the current MCH media's colour system and don't have to make a significant change. Lastly, for the fonts, some participants clearly expressed that they did not like tiny fonts size, which is very hard for them to recognise, and they also did not like articles with long lengths, making it easy to lose reading interest. Visualisation key concepts is a great way for enhancing attractiveness.

Overall, even though visual preferences are subjective and can vary greatly from person to person, gathering feedback from a diverse group of users and considering a range of perspectives when making design decisions is essential.

Figure 32 Colour and fonts cards.

6.3.3 Contents

Participants were presented with three MCH articles (seeing Table 14) that were downloaded from WeChat (social media), Weibo (microblogging website), and MAMA (MCH apps). Participants read all three articles and then give a score based on five standards. Information source is the first standard, participants should give a score based on their first impression of the article, which is more about the information source impression. Then, people need to score the article's credibility after reading it. Readability is also an important consideration for low-literacy people. Then, they evaluated the article's actionably and gave the score. Finally, participants indicated the integral personal satisfactory grade. Table 15 shows the score results.

Table 14 Three articles' details.

Article No.	Title	Categories	
1-WeChat	Maternal and child health literacy 55	Popular science	https://mp.weixin.qq.com/s/qVey0NYTBsih2hMkzq8wiA
2-Weibo	The importance of Vitamin K injections in new-borns	Popular science	https://weibo.com/ttarticle/p/show?id=2309404886176736870552
3-MAMA	Reasons for weight control during pregnancy	Popular science	http://q.mama.cn/

Table 15 The average score of three articles with five evaluation aspects.

Different category	Article 1	Article 2	Article 3
information source	90	85	95

Credibility	75	80	85
Readability	70	75	70
Actionability	60	70	65
Personal satisfactory	65	75	75

**Full mark of 100*

As can be seen from the table above, the most trusted source of content for current participants is the dedicated MCH app. Participants said it was because the articles were clearly labeled with sources, information about the author who wrote the article, etc., which made it feel more reliable. The least credible is the WeChat article. Participants said the layout, illustration, and writing style made them feel unprofessional. In terms of readability of textual content, Weibo articles scored higher. Participants found the article to be short and the illustrations quite reasonable, making them more readable. In terms of actionability, WeChat articles were the worst performers. One participant said, "There are too many suggestions to read and remember". Finally, in terms of personal satisfaction, WeChat is the worst. After all, WeChat is a professional social networking software, so there are inevitably more suitable platforms for health communication.

In addition, the participants highlighted that none of the content of the articles addressed cultural inclusiveness. They felt that China is large and cultural differences exist in many ways.

"It seems the content is a uniform standard across the country…it's not correct…"---P12

"We have our own folk customs, which are not mentioned in their article, or they are the opposite of our customs ..... The article in WeChat says that we can take a bath 3 days after giving birth, how is that possible, we have to wait at least 1 month before we dare to take a bath... ... My neighbour took a bath after less than a month and now she is very sick ..... "---P1

6.3.4 Prototyping

This part is a design sprint, that is also rapid prototyping. During this process, I have presented users with different design prototypes and gathered feedback on which elements they find most appealing.

The first three activities emphasise offering materials to participants and giving them choices to help them become familiar with the co-design process. While prototyping does not intervene and is 100% created by participants. The previous section on user experience

observation explored issues related to users' use of the website. Here, I intend to develop design practices in prototyping that are purely app specific. Although social media and websites have been used in previous studies to communicate MCH information, for three reasons, I still chose to focus on app design: 1 Social media has a fixed design framework; thus, there is obviously a limitation on the design. 2 the primary function of social media is social, with the additional function of disseminating health information, so naturally it needs to be more professional as specialised apps. 3 as for website use, in previous research, it was shown that the search function was the most common web function used by the targeted people. While considering most of them did not own a personal computer (about 60% of rural people did not own a computer—Chinese Internet using Report, 2023) due to household income constraints. Therefore, prototyping was based on app page design.

The characteristic of this section is that the organiser (myself) only notes without intervening. participants can combine what has been discussed before, draw themselves or use the materials I have provided. The prepared materials include colour pens, and stickers with various patterns (Figure 33).

There are no strict rules on how many prototyping works they have to generate. If they want, they can draw all the themes or pick several. Moreover, the papers are offered with no limited numbers. Since there is no apparent difference between the two workshops, I would like to show the results together. Figure 34 shows part of the prototyping works.

Figure 33 Prototyping materials.

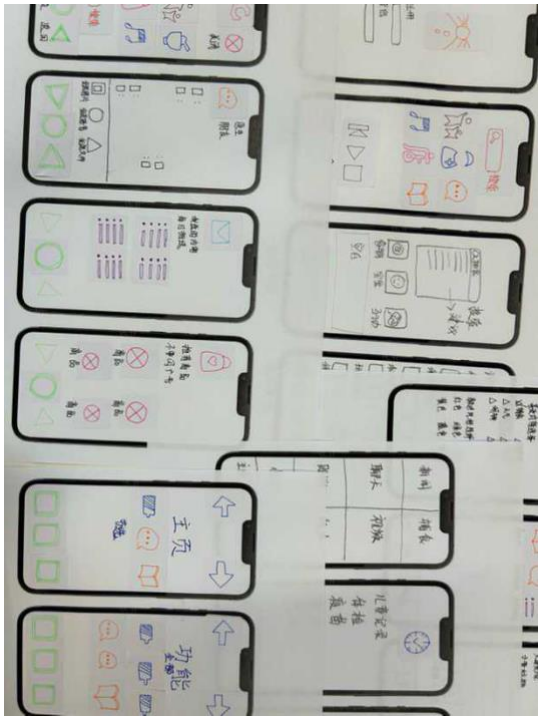


Figure 34 Prototyping.

6.4 Reflectional Discussion

6.4.1 Supplement from the perspective of organisers

This section proposes some suggestions for preparation from the tool's perspective in co-design. These suggestions are based on the reflections carried out in this study, especially about the creation of Chinese people with low income and low literacy levels. The aim is to provide comprehensive advice on the three aspects of pre-preparation, material preparation, and attention to the creative process, to ensure that the whole process maximises the significant results.

6.4.1.1 Sufficient preparing

Although the participants had some experience using on specialised apps, their level of familiarity with the relevant media was not known. For the participants to contribute more smoothly to the subsequent creation sessions, it was important to engage them and open up their ideas. Therefore, I prepared an observation session shown in 6.3, with four specific tasks to help them get familiar with/revisit the use of the media, so that they could have a clearer understanding of the content, visual and functional aspects. This set-up would help them to understand the purpose and media of this study better.

6.4.1.2 Easy-to-follow materials

All people are creative (Hussain & Sanders, 2012), but they need to have an opportunity to immerse themselves in thinking about the problem, learn about the creative process, and be given the tools with which to express ideas (Sanders, 2006). While they are only sometimes invited to participate in creative activities so they may need some preparation and support. But they may not have had the opportunity to share their dreams with others and will need facilitation. People will fill in what is unseen and unsaid based on their experience and imagination. We can see what is important and meaningful to them by asking them to make artifacts from ambiguous components. People project their needs onto ambiguous stimuli because they are driven to make meaning. The artifacts that participants create using the generative design tools can therefore be used to initiate conversations about their needs and dreams (Sanders & Stappers, 2008).

Considering the low literacy level of the participants, it is important to provide easy access to materials for participants to use. Materials that are versatile in shape and function but at the same time uncomplicated to create, can be matched by the participants themselves. This not only helps to reduce the time it takes for users to become familiar with the materials, but also allows for the inclusion of a wide range of participants, ensuring that people of all creative abilities can find materials that suit them. Meanwhile, adopting images with certain visual stimulation (Figure 35) can also enable participants to better immerse themselves in them and give play to their creativity.

Figure 35 Scenario Cards.

6.4.1.3 A creative process without Interference

Although participants lack basic design ability, for the outcome to really reflect people's thoughts, do not intervene creation process is also important, especially not to allow participants to perceive the in particular, participants should not be able to detect the preferences of the organisers, as they may otherwise create something that does not correspond to their real ideas in order to suit the organisers' preferences. In organising the event, special attention needs to be paid to avoiding leading words and giving conclusions of a suggestive nature. The best way is for the designer to observe the event as a spectator at the beginning of the co-design process.

6.4.2 The perspective of participants

After completing the activities, I organised a reflectional discussion for them to talk about their thoughts about the workshops and something that may not be included, and some interesting themes emerged.

Firstly, the participants found this co-design activity very interesting, they had not participated in such activities before but were able to do so well, and they felt that their opinions were valued and therefore, they felt happier when participating.

"It's my first time doing something like this, and it's really fun. In fact, it gave me a chance to think about my need for such products and my parenting style, and I feel very grateful to you..."—P7 from the first workshop

"I thought it was very interesting. There was chatting, snacks and games…" ---P13 from the second workshop

Secondly, they reiterated the discussion on topics related to MCH communication and felt that there is a lot of space for improvement in the current health communication strategy. They need to take the initiative to learn about it due to cultural constraints. There is also a need for more policies to promote the communication of such knowledge. The community is loosely organised and there is no unified organisation to provide them with the relevant expertise. This is similar to the findings of my previous study in that although the current government and hospital professional institutes provide basic health maintenance insurance, including free screening for major illnesses and pregnancy tests, there is still a lack of primary health care.

"I used to think our country's policies and regulations are perfect, basic health examination, subsidies... But attending this event also gave me the opportunity to realise the importance of basic health knowledge..."—P2 from the first workshop

"I have a relative in the hospital, and I ask him every time when I feel confused about something, but you know not many people like me have such a relationship with doctors and for them to access health information may be more difficult…"—P9 from the second workshop

Thirdly, although useful health information is readily available online and many apps offer related services, cultural differences make users doubt the authenticity of the content of these apps. The biggest problem is that the information on these apps or websites tries to give health information to the general public from a very uniform standard perspective.

"I know scientific parenting is reasonable, I guess most of us know this, but there is some advice that is not suitable for me…I saw that the number of days in confinement is different from what the old people in our village said, so how do you let us believe it…"—P12

In addition, one of the most criticised aspects is that the market is flooded with commercially oriented, money-making information. While it is true that a commercial-oriented industry is necessary for the development of society, it creates a neglectful outcome for the seemingly unprofitable low-income groups. At this point, the government and other relevant authorities need to play their role as the monitor machine to fill the lack part of health literacy for this group, and appropriate policies still need to be developed.

"I'm really poor, don't have money… I know those items (nutrition supplements) are good, but I don't have any extra money to buy them…"—P10

Finally, after the previous discussion and user observation, people feel more familiar with each other and also have a more accessible way to speak. But there are still some points we need to pay attention to, which could have an impact on a workshop. First, the familiarity between them means there may be more talks, which may lead to meaningless chats in the whole process. Therefore, the organiser should pay attention to correcting the theme in time when such things happen. Secondly, it is difficult for low-income and low-literacy people to carry out co-design at the beginning of the workshop due to the limitation of their educational level. Therefore, it is important to design a series of activities and allow participants to fully understand the main idea of the workshop and what they are expected to contribute. This research also encourages less-creative people to cooperate, engage more, and contribute ideas

(McNaney, Tsekleves & Synnott, 2020). Figure 36 shows the iteration process of co-design workshops.

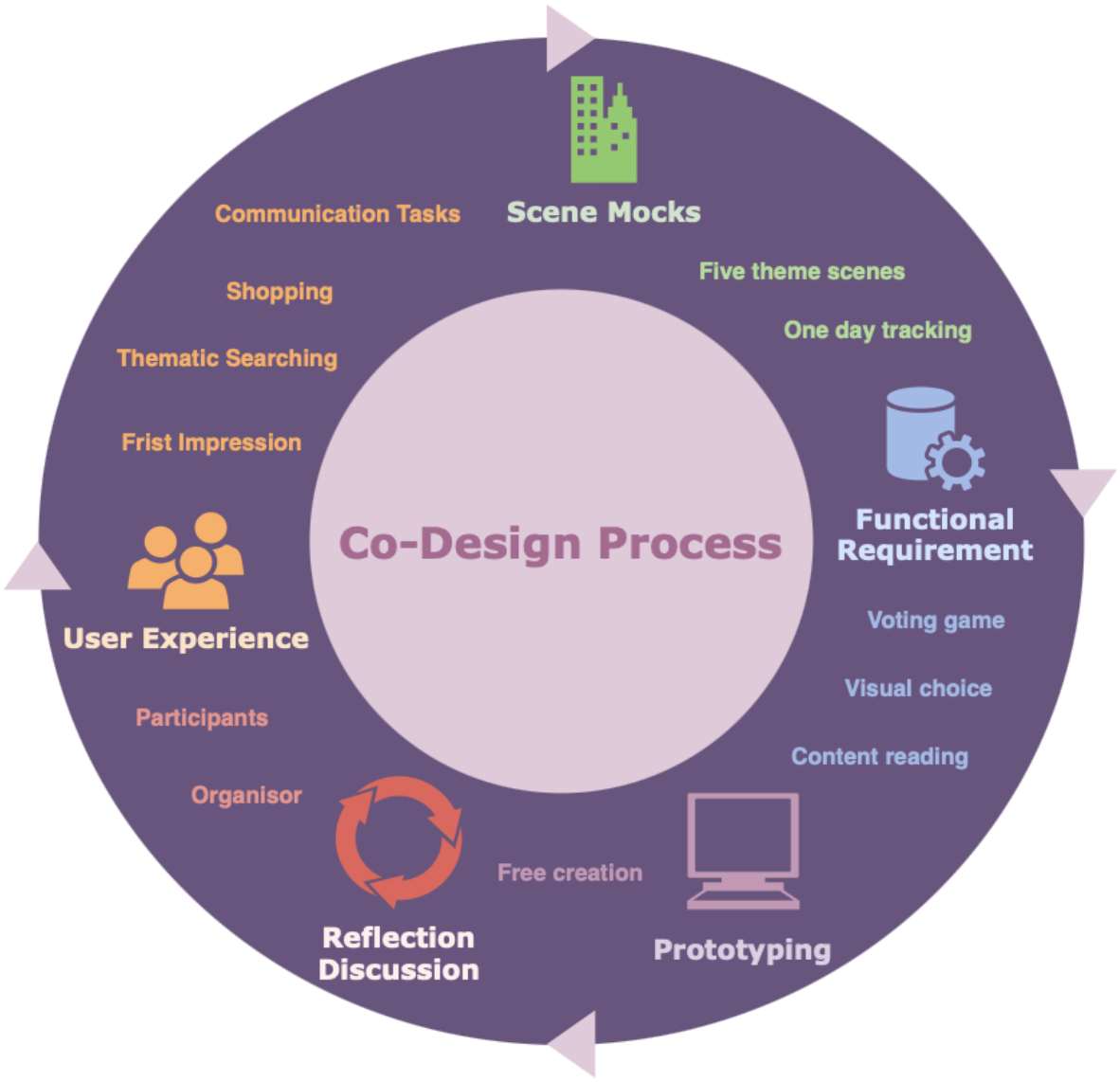


Figure 36 The iteration process of co-design workshops.

6.5 Engaging with Participants

6.5.1 Overview

In this section, the focus is on how to motivate low-income and low-literacy people into co-design activities. It is a response of RQ3 in 6.1.1:

RQ3: How to better cooperate with low-income groups who take the co-design workshop the first time?

This analysis draws from a paper published in 2021 by Jagtap which discusses co-design with marginalised people from designers' perception. 17 people with co-design working

experiences were interviewed by the author, and the conclusion is a framework that includes four aspects--BOP context, process and methods, organisation and collaboration (Figure 37). This framework is based on the context of India, so some features mentioned above do not fit in China, i.e., the well-covered transportation system matching with personal vehicles makes location choice no longer an issue. At the same time, this is an important question in Jagtap's work. Besides, there are slight differences between my research—only for female participants, and Jagtap's—with no limitation on genders. So I optimised the original framework and added Chinese features to generate a new one, shown in Figure 38.

Starting by introducing group features, this section mainly focuses on how to engage people based on the analysis of personality features-- knowledge deficiencies, culture and psychosocial hardship. Then, the organisation refers to three perspectives analysed to explain how to contribute to people's participation from the organiser's perspective. In the third part, the collaboration process is extracted into three barriers for discussion. A series of solutions-enablers, were given at the end of each section.

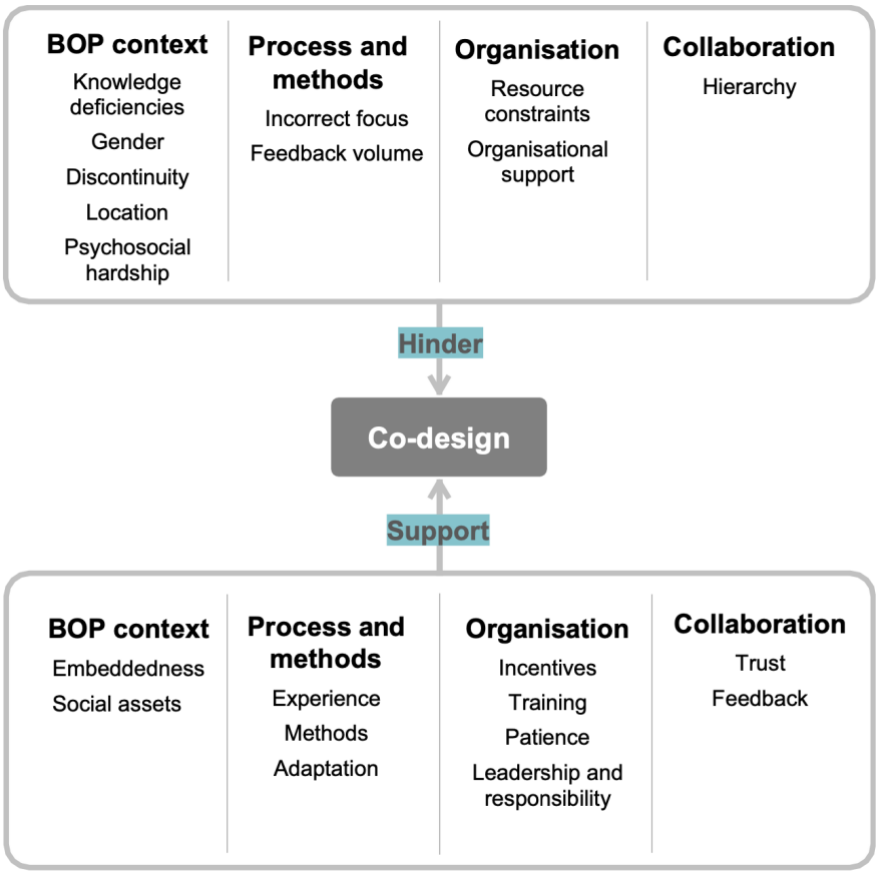


Figure 37 Factors influencing various activities in the process of co-designing with Bottom of Pyramid people.

(BOP, means people who lives in the bottom of society) (Jagtap, 2022).

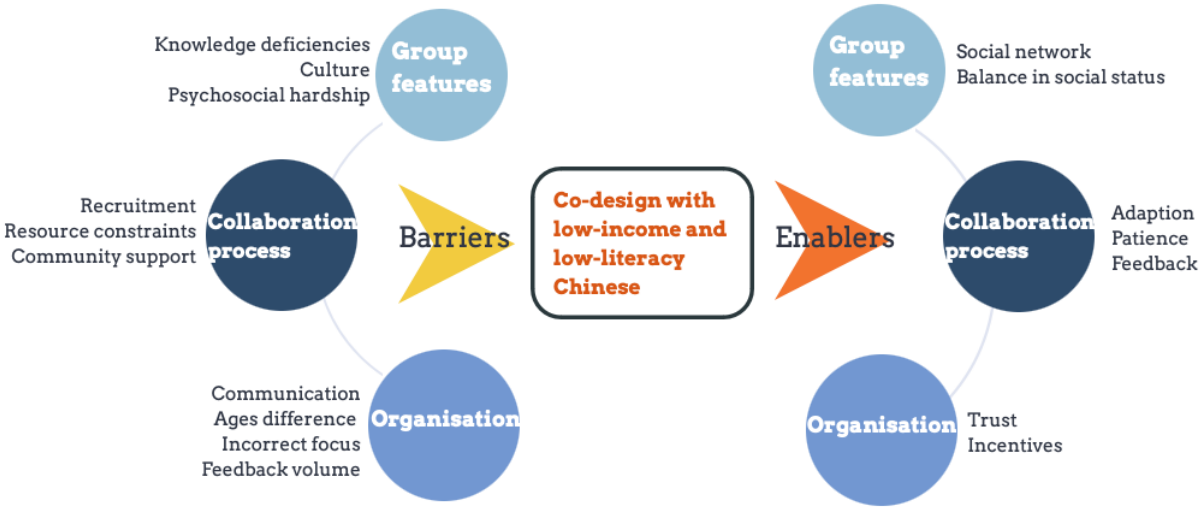


Figure 38 The relation map of barriers and enablers of co-design with low-income and low-literacy Chinese.

6.5.2 Group features

Before considering how to engage with participants in an activity, the factors that may impact their interaction should be discussed. Previous research has also demonstrated that people's concern about co-design varies due to differences in status, income, and experience (Jiang & Lou, 2018). Therefore, in this section, I explain in detail the influences that affect the participation of low-income groups in co-design. In particular, it is essential to consider some group characteristics, such as the fact that many people can be particularly stubborn about certain issues due to their educational attainment (Jagtap, 2021).

6.5.2.1 Knowledge deficiencies

Co-design workshops usually have specific themes. The unfamiliarity with design activities of low-income and low-literacy people was described as limiting their participation in design projects (*p*.279). Their limited knowledge of design processes and of generation and evaluation of requirements and alternative solution concepts makes a huge impact and can be an obstacle in co-designing with them, which could bring negative consequences, like manifesting in the form of project delays or limited involvement of marginalised people in co-design activities (*p*.281).

Unlike other developing countries in Asia exampled above, where many co-design participants have problems with literacy and basic understanding, the participants had a basic level of literacy in this study. Thanks to China's literacy campaign in the country's early years, the vast majority of Chinese people have good basic communication and literacy skills. In particular, since 1986, China has enacted a compulsory education law, which mandates that all Chinese children and teenagers between the ages of 6 and 15 must receive primary and junior high school education (Fang et al., 2012). All the workshop participants were also born after 1986 and therefore had a certain cultural literacy ability. The questionnaire that was completed at the beginning of the workshop also showed that all the participants had lower secondary education, with 5/15 having a high school education experience or higher.

However, most participants struggled to understand the purpose of the project, the process, or how they could contribute to the ultimate goal. This ambiguity leads to a lack of clarity about what they need to do, and what their own benefits will be.

6.5.2.2 Culture

Ensuring participation and the conditions for mutual trust when sharing ideas and thoughts are crucial in the organisation of co-design workshops. Understanding the local culture was essential for knowing how to approach participants and treat them respectfully for their culture and beliefs. Similarly, the social hierarchy was necessary for organising the workshops with the adults. Social hierarchy exists in many areas of Asia and in various forms. Many areas in Asia are well known to be hierarchal, and social relationships are structured vertically in terms of power, status, and patronage (Ledgerwood, 1990; Hinton, 1998). It is a part of good etiquette and moral order to show obedience towards one’s social superior (Hinton, 1998).

The hierarchy of Chinese society is usually reflected in the respect for the powerful, the knowledgeable, or the elderly, because of their social status beyond ordinary people (Farh et al., 1997; Coleman & Chou, 2013). There is one such person in Workshop 1. She was the only person in the workshop who had a degree in a technical secondary school and ran a kindergarten. Therefore, she is regarded as a competent, knowledgeable, and literate competent woman. When she shares ideas, everyone listens and praises her. Even though there were older (than her) people in the group, she was impressed by the head gardener, and others continued bragging to me more than once about how excellent she was.

6.5.2.3 Psychosocial hardship

The pilot study shows that some people might feel uneasy during co-design sessions and reluctant to contribute to the planned activities. They were perceived as nervous and low in confidence during their interaction with the designers. Even though the designer's role throughout the entire process is more like a facilitator, guiding the entire process to unfold correctly within the specified framework and timeframe, participants tend to feel nervous unconsciously when faced with such a role. Socio-cultural and knowledge differences between participants and designers were speculated as contributing factors behind their low confidence (Jagtap, 2022). The ill health, constant stress and social isolation that they experience as having an influence on their behaviour during co-design activities, with an inhibiting impact on their contribution to design projects. Hussain et al. (2012) advised that keep it as friendly and informal as possible and emphasize the benefits of participation, i.e., explaining to participants the benefits of participating in the workshop and how their input can help shape the design of the app or product..

Generative design tools are very efficient and effective when co-designing with targeted users in the West (Sanders, 2000). However, using productive design tools with women in rural parts of China has been a challenging process. Due to the significant difference in people's experience in Chinese social life, making the participants active by participating in open-ended activities was difficult (Lu, 2001). Participants often express this lack of confidence: "How I feel does not matter." Many previous studies have confirmed this argument, especially for low-income and low-educated groups, who usually appear more conservative about expressing their opinions so as not to appear out of place. Also, participants may show agreeableness by agreeing with what others are saying. Perttula, Krause, and Sipilä (2006) show that the pooled performance of individuals outweighs the performance of a group, wherein group settings, only one person speaks at a time as participants are reluctant to contribute ideas to avoid hostile evaluation from others. This explains why the whole group brainstorming activities in this study produced limited ideas and confirms why participants avoided giving negative comments about each other's ideas (Taffe, 2018).

6.5.2.4 Enabler

Social Network

The root cause of the participants' lack of understanding of the activities they are participating in and their considerable scepticism about their contribution lies in their weak

understanding and limited insight (Alvesson, 2001). There are many ways to address this issue. For example, it is possible to get in touch with them before the formal workshop begins. A visit prior to the workshop not only gains the trust of the participants, but also provides an opportunity to explain in detail the purpose of the activity, its benefits for them and what the organisers hope to gain. However, this approach is only suitable for workshops with a small sample size, and once the number of participants reaches 20 or even more, this is a very time-consuming exercise.

A simpler approach could be to write down the core concepts of the purpose of the study, what the participants need to do and what they need to provide in a small note to the person recruiting the participants, which is then passed on to the participants via their hands. This saves time and ensures the recruiter's efficiency. After all, in many cases, including this research, the recruiter is the same person as the target research group.

Balance in Social Status

The co-design workshop attempts to produce design research in a collaborative atmosphere. If there is a significant hierarchy within the workshop, it can affect what other participants areparticipants discussing. In order to avoid unnecessary negative effects, it is important to take this into account when organising the workshop. If a large number of people are included in a workshop, a brief analysis of their backgrounds should be carried out in advance, so that people with class differences are not grouped, thus hindering the democratic exchange of ideas in the group. In rural China, the co-designed grouping can be done with special consideration of whether the participants are very different in terms of age, personal wealth and official position. In particular, if there are people in the group with crushingly superior social status, then it is likely to end up as a stage for the few speakers. A thorough examination of social backgrounds and status can also help reduce the participants' lack of self-confidence by awakening targeted groupings. It is easier to feel relaxed when surrounded by people of the same type or similar social status.

6.5.3 Organisation

6.5.3.1 Recruitment

There are several strategies for participant recruitment. One of such strategy, community-based, is a way of attracting participants by leveraging on the respectability and contacts of local organisations which could ensure the organisation of a team in a very short time. Considering participants' unfamiliarity with co-design and distrust of the organisers,

reaching out to the local community in advance can be effective to help organisers identify potential participants. Puri et al. (2004) describe how they had to take different approaches to foster participation in South Africa, India, and Mozambique. During this process, the Mozambican Ministry of Health (MoH), Eduardo Mondlane University, the University of Oslo, and the University of Western Cape were engaged with the co-design workshops as a kind of endorsement to recruit participants. On the other hand, organisers could develop their personal network to recruit participants. Hussain, Sanders and Steinert's research (2012) on co-design prostheses in Cambodia, needed to work with the development of solutions targeted at whole communities such as villages or districts. The critical point in such research is to find out the targeted participants and convince users and other stakeholders to participate in building trust with them over time. Authors visited the users and showed interest in their lives and concerns to establish people's confidence.

The basic administrative organisation in China is the village, where the village head is the leader. If work is to be carried out as a community in such areas, consensus needs to be reached with the leadership in advance. Chinese society is a relational-based society. Fei Xiaotong, one the most prominent rural sociologists of China, once used the term "the differential of association" (chaxugeju 差序格局) to describe Chinese society, which is very different from the Western (Fei, Hamilton & Zheng, 1992, p.60). Simply, Western society is more like the way we collect rice straws to use for cooking our food, a kind of 'distinct bundles of straws' (p.75). Their nation as a group is a distinct and unique grouping boundary. Those who are people in the state have no escape from the group, like a bundle of firewood. They cannot but make the state an institution for the benefit of each individual, so they have revolutions, constitutions, laws, congresses, etc.. Chinese society is somewhat "organisational mode of association" (*tuantigeju* 团体格局), everyone's circles are interrelated (p.63). It is like water ripples pushing away from themselves as their origin. In other words, social relations are gradually pushed out from one person to another, and an increase in private connections is the deep core of Chinese society. The social sphere is a network made up of roots of private ties, and therefore all social morality in our traditional society also takes on meaning only in private ties. It is clear from this that "*relationships"* are a constant theme in any work or activity in Chinese society. This is also true in the context of co-design work. Participants to this research came to me through referrals from acquaintances. Anything introduced by an acquaintance naturally makes both (or more) parties involved feel reliable. This is because the reputation of

acquaintances can vouch for each other, somewhat reducing mistrust and lowering communication costs.

6.5.3.2 Resource constraints

The needs of the site and equipment vary depending on what is being co-designed. From a general perspective, both of these requirements face some challenges in rural areas. For example, most of China's lower-income rural areas do not have libraries, museums and other public spaces. As mentioned earlier, the smallest administrative unit in China is the village. Above the village, there are towns, counties and cities, while large venues such as museums are generally available up to the municipal level. The units below have very few large public spaces, and some only have an open space in the centre of the village where the village head can hold regular meetings with all citizens. So when organising a co-design workshop in China, it is important to take into account the lack of large indoor public spaces. For this reason, my workshops are also limited to about 8 people per time. Moreover, commercial development in rural China is very weak and is mainly focused on meeting people's daily needs, with little other entertainment or spiritual development. Therefore, if organisers need commercial or academic equipment, preparing it in advance and transporting it to the destination might be the most convenient way.

6.5.3.3 Enabler

Trust

Taking a longer-term view was considered essential to working with low-income people and building trusting relationships with them. However, trust is not inherent. As mentioned earlier, it is naturally the easiest way to reach workshop participants if you can find a go-between. This is the approach used in this study. The go-between plays a crucial role in bridging the gap and establishing trust. But more often than not, finding people who know each other well enough to help with these things is not always possible. If the research needs to be conducted in an environment with no familiar faces, there are two ways to gain the participants' trust. Firstly, try to contact the local leaders directly. For example, if the organiser plans to conduct a co-design activity in a village, they could first visit the village headman's house and explain what he needs to do and what benefits he will get. Secondly, building trust with the villagers by visiting them directly. However, it is important to note that it is best not to visit the villager’s home initially, as it is a very private place, a direct visit may be offensive. In rural

China, where villages are usually clustered, villagers often gather in the square (mentioned in the Resource section) to chat during the non-agricultural season (except April and September), have a direct chatting with them at there could be a great choice.

It cannot be denied that all people are creative, but they need to have the opportunity to immerse themselves in thinking about the problem, learn about the creative process, and be given the tools with which to express ideas (Sanders, 2006). A good solution, therefore, is to inform participants after establishing a trusting relationship with them, especially about how meaningful their participation is and their significant impact on solving the problems they encounter. People are more likely to participate in a project when they understand how they will benefit.

Incentives

Designers cannot assume that people living in extreme poverty and working hard for survival will prioritise their time to participate in design projects (Hussain et al., 2012). Since participants were not paid an honorarium, it was necessary to reward them in other ways for their contribution. This was done by thanking them in unperson, both the children and the adults, and showing appreciation for their willingness to help.

After everything was done, I offered everyone a 15 Pound value voucher to encourage participation in the workshop. Giving financial support is very effective in attracting more participants to co-design. However, care should be taken to avoid showing large sums of money directly to participants to prevent participants from saying things against their will to please the organisers (Jagtap, 2022). This has been common in previous studies. However, when it comes to participants having to pay their transport costs to participate, it is also essential to give as much financial support as possible, at least not so that participants lose money to participate in the activity due to irregular participation, including among others, their nature of work and family commitments.

6.5.4 Collaboration process

6.5.4.1 Communication

Previous research on this issue has focused on the barrier between languages, for example, Hussain and Sanders (2012) in their Cambodian study indicated a range of problems due to organisers' unfamiliarity with the local Khmer language. While in China the barrier of communication mainly focuses on accents. There are seven major dialects in China, divided

according to geographical location. Under this, each dialect includes a lot of different developments. There are even accent differences between villages.

In this study, the participants also had very heavy accents. Most were housewives and therefore lacked a working environment to practice their Mandarin. Also, they had stayed in the local area since they were born and therefore did not need Mandarin. The lack of a need to communicate with the outside world in Mandarin led to their lack of attention to practice. In particular, more than once during the research I had problems understanding what was being said and repeatedly confirming the meanings. As the event organiser, I was also very concerned that such repeated questioning would put a psychological burden on the person, making them shyer about sharing their thoughts.

6.5.4.2 Ages difference

Although I had conducted the pilot study before the formal start of the research and had revised minor issues, such as how to get all the participants more familiar with each other at the beginning so that they were less inhibited. While I still overlooked one problem: the age gap. Three participants in the pilot study were all under 30 years old, and the process went so well that I did not notice that age may be a potential issue. As a result, in the subsequent formal workshop, I did not strictly limit the age of the participants. However, the reality was that the oldest participant was 34 years old, which is a very advanced age in rural areas, and that this participant had already raised three children and had little need for information on maternal and child health.

> *"I've raised three children, the oldest is 14 years old. I know everything I think, and do not have a willing to learn new knowledge about caring a child. "*—the participant

On the contrary, there is often a considerable need for health information for younger people, especially those who have just raised their first child. This is why I added an extra condition that participants must be under 30 and have only had one child at the second workshop.

The co-design workshop was held for a total of three sessions (including the pilot study), and it was only in the second session that an important problem was identified. This could be a reference that when holding offline events (i.e., co-design workshops), it is important to allow as much time as possible for more testing in case new issues arise and changes are not made in time.

6.5.4.3 Incorrect focus

Two kinds of people emerged in both workshops: the 'social butterfly' and the 'social phobia'. A "social butterfly" is a colloquial term used to describe someone who is very sociable, outgoing, and enjoys interacting with a wide range of people in various social settings. Social butterflies are typically extroverted individuals who thrive on socializing, making new friends, and participating in social activities. They are often comfortable in different social situations and can adapt well to diverse groups of people. Here, it refers to some people in the workshop who always maintain high enthusiasm and activity. Social phobia, also known as social anxiety disorder (SAD), is a mental health condition characterized by an intense fear of social situations and a persistent worry about being judged, criticized, or humiliated by others. While the second kind of people mentioned here is not strictly in the pathological sense, but generally refers to some people who do not talk. For the first type of people who talk very much during their participation and tend to steer the conversation in irrelevant directions if they always have the initiative. Although I explained the purpose of the study and the process at the beginning, it was difficult for most of us to keep focusing on a goal from beginning to end. I had to guide the participants several times during the process to focus on our discussion rather than on other irrelevant topics. As for the 'social phobics', they were more introverted, less talked about their thoughts, and participated in the whole process but had a weak presence. They need to be prodded constantly before they can share their ideas. These two types of people can steer the discussion in different directions during a workshop, so the organiser needs to pay extra attention to guiding the process during the pit stop.

6.5.4.4 Feedback volume

The participants were generally willing to share their insights and give timely feedback during the process. This was naturally a positive status, as I was able to get their feedback at any time. But it also put a certain burden on me to keep track. I had to quickly capture the key points, and after the workshop, I repeatedly listened to the recording to identify if there were any points I had missed. The contents were many and varied, and it took a lot of time to sort out the logical lines.

6.5.4.5 Enabler

Patience

Many designers insist that patience is central to involving low-income and low-literacy people in design projects (Jagtap, 2022). Working with them was considered to take more time than anticipated because of their lack of relevant experience. Here, we have to be patient when working with them and find a way to move at their pace.

Adaption

It is no exception that co-design activities often encounter many unexpected problems when they are carried out. Adapting co-design methods and procedures to a given project's requirements and conditions was also necessary to involve low-income and low-literacy people in design activities. The differences between goals and anticipated solutions of various projects meant that designers needed to adapt methods and strategies to gain access to targeted people, maintain their continued participation, and facilitate their contribution to design activities such as requirements identification and idea generation. As in this research, after I found differences between my expectations and participants' tendencies in workshop 1, I revised the recruitment conditions for the third time to ensure that participants could contribute more ideas.

Feedback

Offering feedback to low-income and low-literacy people on how their participation and contribution to previous design work helped shape the project was considered to influence their interest in future participation (p.301). When targeted people were aware of the successful impact of projects in which they participated, their willingness to participate in new projects or to contribute consistently towards ongoing projects was seen as being strengthened. In addition, the results of successful projects encouraged new participants to engage in ongoing projects.

Before the start of the workshop, I can explain how I expect their contribution, and during the process, I can rest each hour and talk briefly about reflection, what the next step is, and how I expect their performance. Suggestions must be made at the right time, such as when the discussion goes astray and when order is maintained. Besides, for a co-design organiser, fostering and encouraging open and honest communication, and ensuring that all participants feel comfortable expressing their thoughts and ideas are also important. Then, before the end of activities, organisers could collect feedback from participants and involve them in the decision-making process to ensure that their needs and preferences are considered.

6.5.5 A brief summary

This section explores how to better engage low-income and low-literacy groups in co-design in China, from the recruitment of participants to the organisation of activities and the

process of progression is described comprehensively. After analysing the relevant barriers individually, the corresponding solution-enabler is also given at the end of each subsection.

It is common sense that different people have unique group characteristics. For the target group of this study, the low level of literacy means that they need more knowledge of the co-design activities they are involved in. This lack of knowledge made them unable to clearly understand the objects of the activities they were participating in and aspects of their contribution. If this uncertainty is not answered in a timely manner, participants are likely to engage in the process with a lack of confidence. As their mantra, "I do not know if what I say is useful" is a great proof. Furthermore, just as hierarchies have been shown in other developing country studies to influence the conduct of co-design to some extent, in this study, the participants also reflected some characteristics. At the same time, the manifestation of this nature was not obvious and therefore did not have much impact on the research process. Secondly, I have also discussed how to engage the target group from an organisational perspective. To reach a specific group of people in China, organisers must contact them in specific ways. Otherwise, it will take much work to recruit participants. It is relatively easy to gather some people to attend the workshop. This is essential and could help organisers to cut losses. Then, the four aspects of the collaborative process were discussed separately, including how to communicate smoothly, age differences, how to deal with deviations from the focus of the discussion and how to handle feedback efficiently. In particular, it is important to allow enough time for iteration of the whole process, and to correct any problems that arise until organisers feel that enough data was collected to make a strong argument.

6.6 Chapter Summary

As a continuation of the questionnaire and interview, this chapter attempts to explore two core issues: how to engage low-income and low-literacy people in co-design workshops and identifying their desired forms of MCH media. However, the limited research in this field in the context of mainland China brings uncertainties and difficulties in terms of organising and implementing workshops, conducting data analysis, and drawing conclusions. Therefore, it was necessary to make constant iterations to improve the research process and the results presentation. Finally, a number of issues worthy of in-depth analysis in the study were uncovered.

Although sufficient reading and a pilot study had been carried out before conducting the formal workshops, unexpected problems were still encountered in the first workshop. Serious issues that emerged stemmed from the fact that the current health literacy needs

of the participants had not been correctly assessed and the health literacy needs of those with more than one child had been misjudged. Thus, I adjusted the approach to include additional requirements regarding the age of the participants, the birth of their children, and the use of MCH media. As a result of these changes, the second workshop went much more smoothly than the first.

Next, observation of users and their desired communication media designs were explored. As mentioned in the previous section, in the first workshop, there were fewer participants using MCH media. This rendered it somewhat difficult to carry out the observation of users, an issue that was overcome in the second workshop. The participants in the first workshop were slightly older than those in the second. As rural people generally marry earlier than urban people, many of them already had experience of child-care before participating in this workshop. As a result, despite their lack of knowledge regarding the use of MCH media, most of them exhibited positive attitudes toward learning about it. Indeed, there was a general consensus among them that MCH media was useful. In the co-design session, all of the participants gave positive feedback and completed the tasks well.

This section fills the gap in the current research on the co-design of MCH communication among low-income, low-literacy Chinese. But China is a vast country, and, as the participants noted, the information to which they are exposed is rather standardised. Advising such a wide range of cultures from a standardised perspective does not take into account the audience's position at all, and leads to low usage of MCH apps. As my study also only sampled low-income groups in provinces with a medium level of GDP, specific case studies are still needed to explore information retrieval habits, information access preferences, and other aspects in different regions.

The goal of this workshop was not only to produce specific design works but also to focus on the ideal form of MCH media. As mentioned by the participants during the design process, the current apps do not generally differentiate between users, and particularly neglect the usage needs of children as potential users of such software. For the main users, specifically women, the existing apps also suffer from information overload and insufficiently concise information.

In terms of policy, during the reflection discussion that took place after the workshop, participants expressed their approval of the current policy. However, they also noted that policies tend to focus on essential aspects of health, such as diseases and routine health examinations, while not enough attention has been paid to the seemingly non-essential

aspects of health literacy. Finally, they also expressed a desire for appropriate health information. In their passive role as receivers of MCH information, the participants often lack sufficient awareness of what they truly need. Although they can understand longer texts, especially those of a popular science type, they generally dislike reading such texts, and prefer video or audio content because it is less time-consuming and easier to digest.

The final outcome in this chapter related to how to mobilise low-income and low-literacy people to participate actively in co-design workshops, as discussed in Section 6.5. Barriers to working with them were discussed from three perspectives: group features, organisation, and collaboration. Special attention was paid to ways in which trust can be established and they can be made to feel comfortable and thus more willing to share information for this research. Partnership was a key concept that emerged during the co-working process, and key to which was showing participants sufficient respect and guiding them to forget the potential hierarchy between participants and organisers.

Overall, it was the last part of the study (the co-design workshop) that contributed the most important content to this research, in which we worked with stakeholders to produce maternal and child health media that meet their expectations. The study identified key considerations for how to cooperate with low-income people and provided guidelines for conducting similar fieldwork in rural China, thus filling the research gap on the design of MCH information aimed at low-income and low-literacy people in the context of China. This study also serves as a reference and guide for other types of co-design research. In Chapter 7, the final chapter, I will synthesise the overall research project and my literature reading to produce a framework that can guide future MCH communication for low-income low-literacy groups in China, including recommendations for media design and standards, as well as recommendations for strategic communication.

CHAPTER 7 A Framework for MCH Media Design and Communication

7.1 Overview

7.1.1 Background

This chapter builds upon the findings presented in the previous sections, which highlighted the lack of a comprehensive system for MCH communication design and the gap in health communication research focused on low-income and low-literacy groups from a designer's perspective. Combining the issues identified during fieldwork, such as users' deep distrust of new media and their preference for using social media for accessing health information, a targeted and tailored health communication framework is proposed. The framework focuses on two main aspects: 1) Targeting low-income and low-literacy groups; and 2) approaching the issue from a designer's perspective, to support the design of MCH media and communication strategies that are accessible and relevant to low-income and low-literacy users in mainland China.

The purpose of this framework is to propose guidelines for effective health communication targeted at low-income and low-literacy individuals in rural China. Firstly, it addresses a critical gap in health communication for low-income and low-literacy groups, who often face barriers in accessing and comprehending essential health information. By focusing on this demographic, the framework responds to a pressing need for inclusive and effective communication strategies. As a novel tool for MCH communication design targeting the specific demographic at the core of this study, the framework sets a precedent for future research and interventions that cater to less developed communities, emphasising the importance of tailoring communication strategies to the needs of diverse audiences. In addition, unlike previous single-perspective frameworks, it integrates design principles and strategic communication, thereby presenting a more holistic approach. This integration is based on the recognition that effective communication involves not only conveying information clearly but also considering the cultural, social, and psychological factors that influence behaviour. Furthermore, it demonstrates a sensitivity to the specific cultures and characteristics of mainland China, making it more likely to resonate with the intended recipients. Most importantly, the potential to apply the framework's principles in different regions beyond mainland China underscores its global relevance. The principles and insights of the

framework can potentially foster better health communication practices across different demographic groups, yielding improvements in health awareness and behaviours.

7.1.2 Purpose, objectives, and definition of audience

The framework is based on the premise that digital media serve as a crucial vehicle for MCH communication, and it addresses the need for a comprehensive tool for designers engaging in health communication. This design framework incorporates perspectives from a broad audience, i.e., users, medical professionals, and policymakers (see Figure 39 for details).

The framework has three main objectives. Firstly, it is designed to clarify and identify designers' role in health communication and help designers establish a clear professional identity that aligns with their unique contributions to health communication efforts. Secondly, the comprehensive framework applies design thinking principles in an attempt to standardise the creation of health communication design to ensure consistency, user-centricity, and effectiveness in conveying health information across diverse communication channels. Finally, by providing actionable recommendations for designing health communication media, the framework is intended to enhance credibility and trust, as well as explore design strategies that resonate with target audiences, fostering a sense of reliability and authenticity in health-related messages.

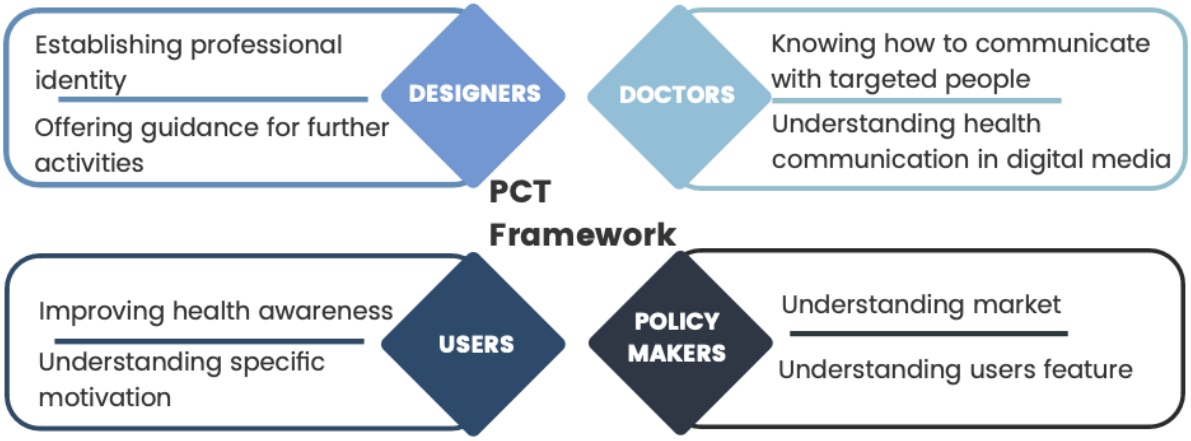


Figure 39 Benefits for stakeholders.

While the framework is designed primarily for designers, others can also gain certain insights from it in terms of understanding the health behaviours and motivations of low-income cultural groups. More precisely, users can better understand their own group's habits when acquiring health knowledge, and better comprehend certain health behaviours of which they may not have been aware. Doctors can use this framework to understand

the needs of low-income cultural audiences regarding MCH information and desirable communication media and strategies. While policymakers were not included in the fieldwork, they can still use this framework as a reference for policy formulation because it provides profound insights into the design of current communication media, market conditions, grassroots health policies, etc. Ultimately, the core group of intended users are designers, who have traditionally played a secondary role in previous project activities (this will be detailed further in Section 7.2.1, which deals with the role of designers). Designers can play a more significant role as coordinators in health communication campaigns. Indeed, this framework elevates the designers from being mere components of health communication activities to crucial leadership positions in health communication activities.

7.1.3 How findings inform each section of the framework

This section represents the essence of the entire doctoral research findings, with the core content summarized into a health communication framework encompassing three main aspects. Start from section 7.1, which provides an overview of the framework, including the background, purpose, and definition of audiences. Section 7.2 presents a detailed introduction of the framework proposed in this thesis. It provides a multidisciplinary communication and design theory approach that applies to multiple scenarios and audiences. Design was central to the development of this study and provided the normative framework for the data collection and outcome presentation. Three key arguments were shown in 7.2.1, 7.2.2 and 7.2.3.

Partnership is the first argument, at section 7.2.1. This argument is based on data from chapter 5 and chapter 6, focusing on designers' attitudes. In Chapter 5, many participants expressed their interest in obtaining health information through interviews, as well as their confusion with the current media. This is the main reason for forming this argument, which is to enhance the role of designers throughout the health communication design activities to address the issue of a lack of designs that meet the needs of the target audience. This argument includes four main perspectives were explored in depth: establishing a connection, building trust, cultural sensitivity, and breaking the stereotypes of both organisers and participants. 7.2.1.1 the main contents of Establishing a Connection are mainly come from the primary stage of co-design workshop, my reflection on how to collaborate with the target audience。 Detailed conclusions of this part can be found in

section 6.5. In short, due to the limitations inherent to the low-income, low-education group, it is difficult for them to develop trust, not only in the health communication media they encounter but also in the designers conducting the research with them. Therefore, in this section, I discuss the experiences gained from each stage of the research, from the initial contact with potential research groups to reaching more participants through contacts, and incorporate relevant studies. 7.2.1.2 Building Trust is the second subtopic, and the content discussed stems from my experience of establishing trust with other participants through intermediaries during the co-design workshop. Additionally, I discuss, based on literature review, how to build trust with the target audience in the absence of intermediaries. Establishing trust is a fundamental prerequisite for conducting research. Third, 7.2.1.3 Cultural Sensitivity. Cultural sensitivity here means that designers need to remain humble and respect the contributions of participants throughout the process. This argument is based on my reflections from the interviews in Chapter 5 and the co-design activities in Chapter 6. During the research, participants repeatedly brought up viewpoints I had never considered before. For instance, in the interviews, participants mentioned their skepticism towards even traditionally authoritative institutions/experts such as hospitals and doctors. In the co-design activities, they questioned whether the purpose of the communication media was commercial rather than to disseminate health information to them. From these findings, I realized the importance of designers being humble and culturally sensitive in such activities, as this is crucial for encouraging participants to express their most genuine thoughts. 7.2.1.4 Breaking the Stereotypes is the final subargument. The main basis for this argument comes from reflections on interviews with users and doctors in Chapter 5. During the collaboration with different stakeholders, designers need to overcome their own biases and communicate with the target audience with an open and inclusive attitude, in order to maximize participant engagement and enthusiasm. It is worth mentioning here that the purpose of partnership in this context is to guide designers while carrying out MCH communication design activities. Of course, not all MCH designs require research with target groups. Therefore, the first point here (partnership) is key only for situations where empirical research is needed.

7.2.2 presents the second argument in the framework, Cultural Inclusivity. The basis for this argument primarily comes from the participants' evaluations of the content in the health communication media they encountered in Chapter 5 and Chapter 6. The subpoints include: localized information, tips rather than news, and a sense of caring. For 7.2.2.1 Localized Information, the main source comes from the co-design workshop, where

several participants mentioned that one significant reason they dislike using existing MCH communication media is that the health information presented does not align with their traditional beliefs. For example, the duration of the postpartum confinement period varies by region, but the health communication media promotes a fixed scientific model rather than health advice that incorporates local customs. 7.2.2.2 discusses the presentation of information, specifically 'tips rather than news.' This argument is based on interviewees' comments about some of the confusing aspects of current media communication, such as the fact that news is often more prominently displayed than useful tips and articles. The fragmented and random presentation of information affects users' ability to systematically engage with relevant knowledge. Finally, 7.2.2.3 discusses 'a sense of caring.' This section is prompted by the fact that throughout the fieldwork (questionnaire, interview, and co-design workshop), participants frequently expressed that they believe the health information media they encounter are trying to deceive them into spending money, as these media often include advertisements and product promotions. In response to these concerns, I believe it is crucial to incorporate a sense of caring into the design of health information. This approach helps bridge the gap between the designers and the target audience, thereby fostering trust and more effectively conveying health knowledge.

Trustworthiness is the core argument of this framework and is presented in 7.2.3. This section synthesizes the entire research process, from the content analysis in Chapter 4 to the fieldwork in Chapters 5 and 6. Based on the visual analysis in Chapter 4, I found abundant unverified MCH information on social media and specialised apps. These messages received widespread dissemination, leading many to question them, while others believed them to be true. In the later interview and co-design workshop process, I encountered participants frequently using such phrases as: 'no idea about the authority…' 'not sure if it's correct…' when they describe their using experiences on existed MCH media. Especially during the co-design workshop, many participants indicated that they are often confused by online information due to uncertainty about its authenticity, and frequently find that it conflicts with their traditional beliefs. Hence, I identified trustworthiness as the final key point, as it is a factor that fundamentally impacts the effectiveness of health communication activities. The trustworthiness mentioned here specifically refers to the credibility of health communication media, rather than other forms of trust. Following this, four sub-themes regarding the characteristics of credible health communication media are discussed in detail: reliable information, non-commercially oriented, consistent visual design, and offering an interactive channel.

Firstly, the notion of reliable information is based on participants' widespread feedback during the research process that the internet currently fails to provide reliable health information. They believe that excessive advertising undermines the purity of health communication, turning it into a profit-driven endeavor. Therefore, for a trustworthy health communication medium, disseminating reliable information is particularly crucial. Secondly, an important reason participants cited for their lack of trust in current MCH media is that these media seem to be profit-driven. To address this issue, I propose a non-commercially oriented design. Thirdly, the concept of consistent visual design is based on the finding from Chapter 4 analysis that existing media designs are chaotic, and excessive visual elements can easily confuse viewers. Finally, offering an interactive channel is considered highly useful. In the interviews and co-design sessions, I found that many participants had excellent ideas, such as increasing cultural diversity in communication materials, which were very constructive. However, the media analysis in Chapter 4 revealed that most health communication media lack effective channels for feedback, which undoubtedly poses significant challenges for the dissemination of health information.

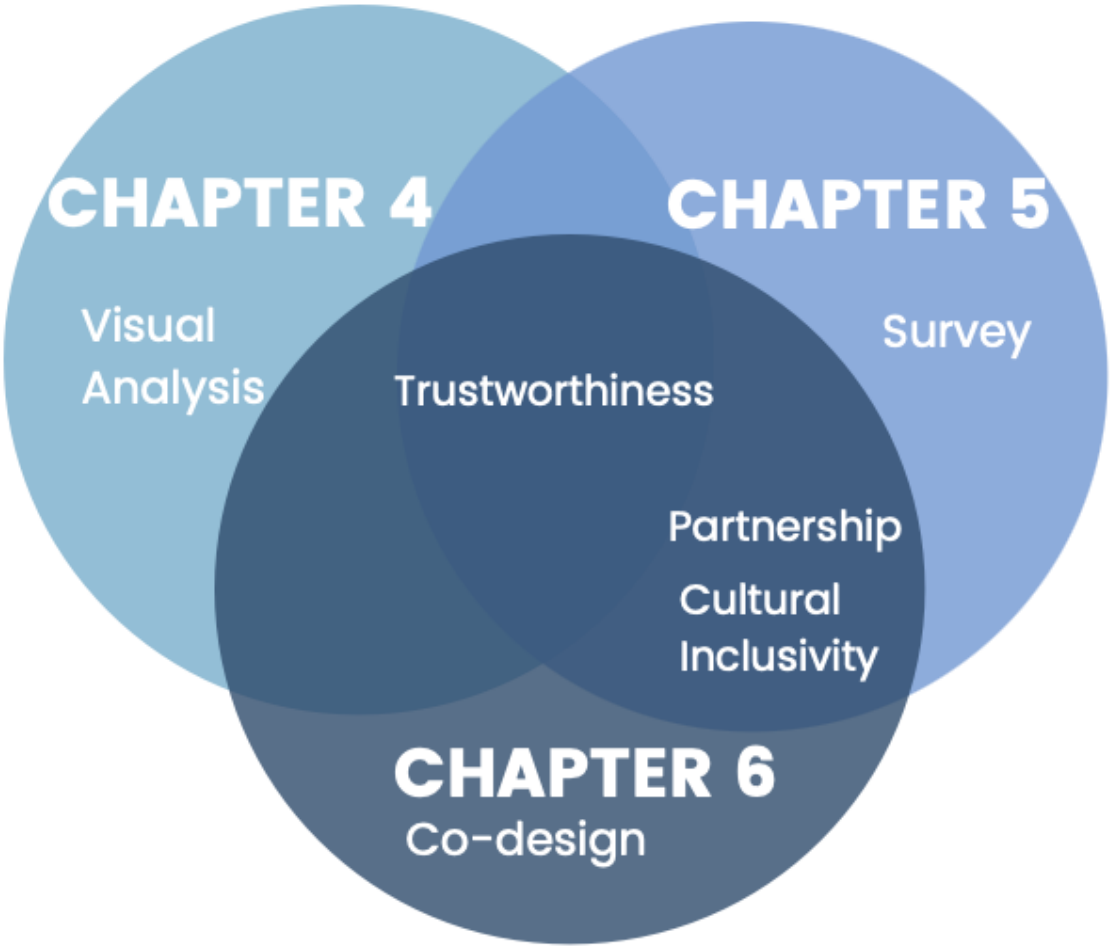


Figure 40 Map showing the relationship between the discussion chapters and the three arguments.

The proposal of the three branches is based on two considerations. Firstly, the findings of the systematic content analysis of academic research and design practices based on the literature review and Chapter 4 shows that academic research in this area is mainly concentrated on disciplines other than design (e.g., psychology, journalism, and communication), and design practice focuses on urban citizens with a certain level of purchasing power. Thus, there is an urgent need for a health communication framework that focuses on low-income and low-literacy people from designers' perspective. Secondly, the many concepts uncovered during fieldwork (see Chapters 5 and 6) underwent thematic analysis to generate the three directions. Figure 40 shows the relationship between the three discussion chapters (4, 5, and 6) and the three main arguments. In general, the themes of partnership, cultural inclusivity, and trust represent the three key components of health media design for low-income and low-literacy groups, as they determine the organiser's mindset, users' cultural background, and design reliability. This study addresses the gap

in research on MCH communication design practice, especially in the Chinese context, by providing value orientation for health communication targeting low-income and low-literacy groups.

7.2 PCT Health Communication Framework

Figure 41 shows the inner relationships between the three branches and 11 sub-topics of this framework.

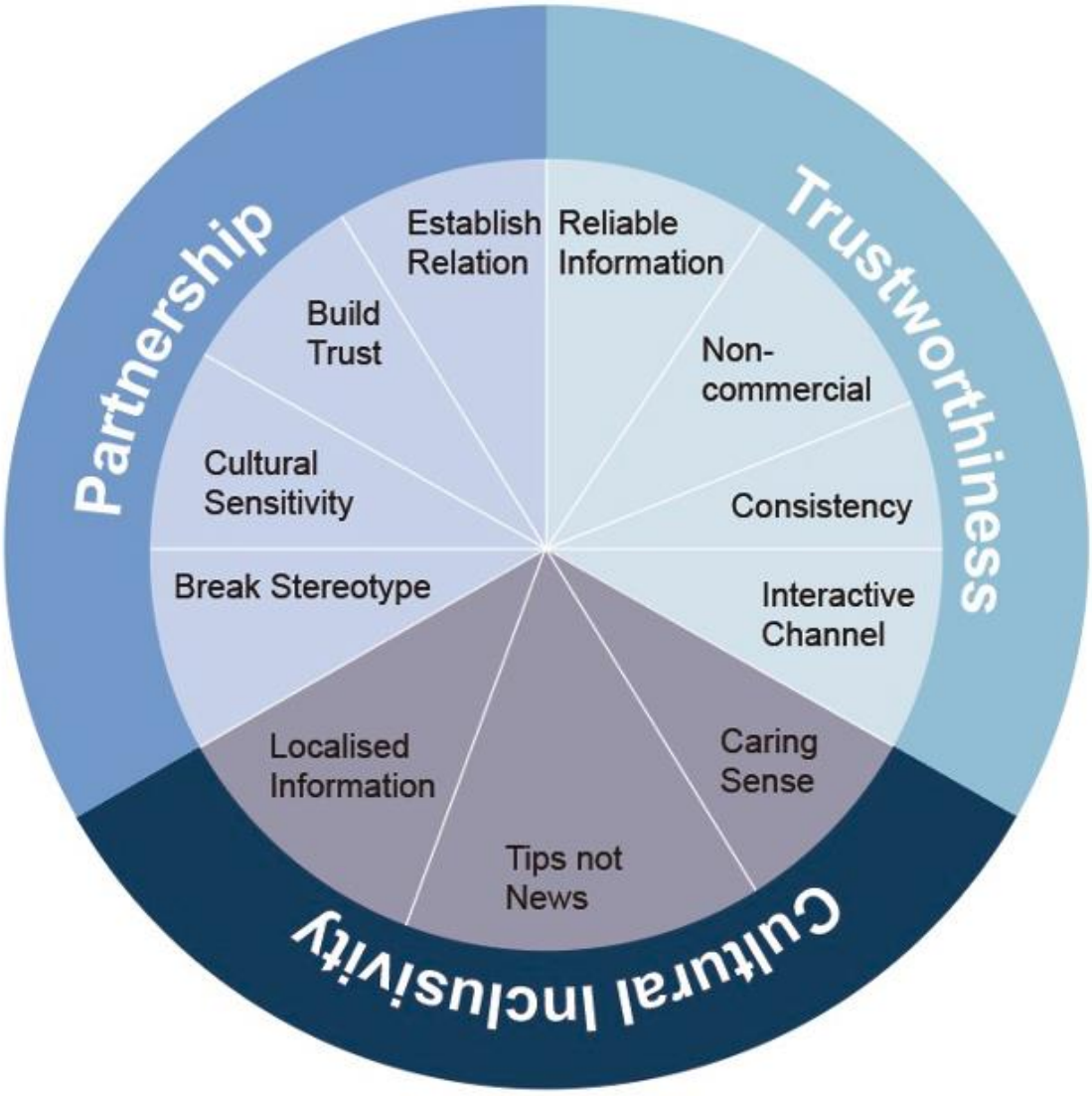


Figure 41 Relationship of three key points.

7.2.1 Partnership—from the designers' perspective

Table 16 Findings about partnership in relation to the proposed framework.

Partnership

Problems	Strategies
• Lack of communication • Mistrust of strangers • Social hierarchy • Participants too shy to share ideas • Participants lacked self-confidence • …	• Establishing a partnership relationship with participants • Building trust and maintaining a positive relationship • Showing cultural sensitivity • Breaking stereotypes

**Problems identified in previous chapters*

The role of designers has expanded significantly during the 21st century. This expansion stems from the growing awareness of sustainable design and designer responsibility. Additionally, the COVID-19 pandemic prompted research into remote communication and collaboration, further shaping the designer's role. In such a context, there is a growing emphasis on designing for mental health and well-being and increasing research into the role of designers. For instance, Tjahja and Yee (2022) discuss how social designers contribute to social innovation design programmes. This new trend has generated interesting discussions about the designer's social role. Most related discussions are based on transdisciplinary design, which involves designers "transgressing" or "transcending" their disciplinary norms and adapting ways of working from other

disciplines (Lawrence & Despres, 2004; Muratovski, 2021, p. 50). This requires designers to achieve a sufficient level of knowledge to enable them to work across disciplines in new and innovative ways. This approach is most suitable for working on complex problems for which every discipline possesses the necessary methods on its own to frame or resolve them. Working in this way requires extensive knowledge of research methods and methodologies and many years of experience. Despite the complex nature of this type of research, there can be many opportunities for generating new knowledge when researchers with diverse backgrounds begin working in a cross-disciplinary fashion (Aagaard-Hansen, 2007). Emerging designers who actively pursue an experiential learning experience will be better equipped to work in complex environments, and, in time, they can even lead cross-disciplinary teams toward the pursuit of new knowledge (Muratovski, 2011).

However, this kind of research has yet to involve the role of designer cognition when designing cooperatively with low literacy people. Despite the abundance of research on cooperation with low-literacy people, most only focus on specific aspects, such as how to co-work with the marginalised in India (Jagtap, 2022) or case studies of—co-designing with communities to support rural water management in Uganda (Ssozi-Mugarura, Blake & Rivett, 2017). Therefore, there remains a lack of research exploring the role of designers in interactions with low-income, low-literacy groups.

This section discussed what identities designers should adopt and what they can do when cooperating with low-income and low-literacy Chinese during MCH communication design. The goal was to contribute to improving design work and reducing the adverse impacts on collaborators.

7.2.1.1 Establishing a partnership relation with participants

The democratisation of the creative process, a trending topic in design and social innovation, has eroded the traditional roles of the professional designer as the main catalyst and the creative mastermind (Tjahja & Yee, 2022). This shift has necessitated the identification of new roles for designers to frame their contribution better. However, previous findings suggest that adopting a role-based approach limits potential discourse to what it means to adopt a situation/social-centric perspective in design (p.145). This study therefore seeks to abandon the traditional designer-centred perspective and explore an equal partnership relationship

between the designer and the situation, as well as include interviewees. This partnership relationship is also a product of the exploration of democratised design.

Establishing a partnership relationship with participants, which requires time, is a key requirement for collaboration with local participants and can easily be overlooked by designers. This is especially true in rural China among designers used to working in urban environments. Thus, more time may be needed to understand and deal with real and complex social situations or groups, which can be difficult to achieve through short event-based workshops or field research experiences. Moreover, certain groups or environments can often be very exclusionary and protective. As a result, short-term fieldwork for health media design might be impractical or need more local support. Therefore, a longer time commitment is both necessary and beneficial, and a balance needs to be found between traditional social research and current working models of design.

In Western societies, much research is carried out through open recruitment to ensure participant sampling is fair and impartial and data is collected without prejudice. However, this practice does not always work in China. A key reason is that, despite China's high rate of internet use, academia in the country has not yet developed the habit of recruiting research participants online. Therefore, online recruitment for design activities represents a complete novelty for the targeted group. In addition, the considerable level of online fraud in China has made the general public very wary of information they find online. Finally, the decentralised nature of the internet makes it very difficult for organisers to accurately deliver relevant recruitment messages to a specific group of people, and no community or network organisation brings the targeted group together. In a word, the problems listed above make open recruitment of low-income, low-literacy participants via the Internet a very challenging task in China.

China is a relationship-based society, especially in remote and underdeveloped areas. A direct or indirect acquaintance in the targeted communities can greatly facilitate the smooth running of a study. These people can either act as participants or as intermediaries between designers/organisers and local participants prior to fieldwork. However, this recruitment method may require a certain amount of rethinking about the impartiality of the collected data. For example, acquaintances may seek to pander to the organisers and put forward views that do not correspond to their actual ideas. Researchers should therefore pay particular attention to how they communicate with participants to ensure that the latter are comfortable expressing their true feelings.

7.2.1.2 Building trust and maintaining a positive relationship

Building and maintaining trust and active relationships is the key to working with low-income and low-literacy people. Trust often takes time to build. As mentioned above, it is possible to establish a degree of personal contact with the interviewee through personal social relationships, which also play an important role in building trust. After the previous step of establishing contact, the sense of unfamiliarity has been largely removed. On this basis, a series of actions are required to win the participants' trust and maintain positive interactions. In this study, the relationship of trust I was able to establish with the participants was primarily thanks to intermediaries. Indeed, intermediaries represent one of the most effective methods, and helped save a great deal of time during the connection-making process. However, there might be situations in which members of the community do not like the organiser. To avoid such scenarios, it is essential to thoroughly discuss the likelihood of such a situation occurring before engaging in activities with the local community through intermediaries. Organisers should openly communicate the research plan to the intermediary and demonstrate the tools and materials that might be used throughout the entire process. Then, as residents, intermediaries are better able to anticipate potential risks.

In the absence of an intermediary, it is also possible to establish connections by talking directly with the participants. However, there are two points to note about the process that would be involved. Firstly, organisers should ensure clear and transparent communication in order to engender trust. Organisers should provide comprehensive information about the objectives, content, and schedule of the workshops, as well as any prerequisites or requirements. They should also be responsive to participants' inquiries and provide timely updates or clarifications. Furthermore, participants are more likely to trust workshop organisers with expertise and qualifications in the subject matter. Organisers should, therefore, possess a demonstrable understanding of and experience in the topic of the workshops so that they can deliver valuable and accurate content. The final requirement for fostering trust is a well-defined structure for the workshop, as this demonstrates professionalism and a commitment to providing a meaningful learning experience.

7.2.1.3 Cultural sensitivity

Collaborative design is an established field in Western countries, but needs to be better developed in terms of methods and practices in East Asia (Taoka, Kagohashi & Mougenot, 2017). Few studies have reflected on the entire collaborative design practice process from the perspective of East Asian designers. Just as there is a power distance between industries and ethnic groups, there is also, in many cases, a power distance between designers and the people being researched. Different levels of education and disparities in social status can naturally lead to a sense of hierarchy, which can significantly impact research findings. Thus, it is crucial to show humility during the whole process of designing health communication with low-income and low-literacy people.

In the design industry, designers must become proficient in a range of technical and artistic skills. But with multi-role proficiency comes the possibility of being immersed in an elite image of the self when designing (Gray & Malins, 2016). This immersion may affect a designer's ability to empathise, negatively impacting some activities when working with particular groups. For instance, when working with low-literacy groups, it is sometimes difficult for designers not to assume a superior attitude because of the difference in cultural levels.

As an organiser of a co-design project with low-income individuals in China, I was also able to experience the impact of the large cultural gap with the respondents due to our different educations, perspectives, and living environments. If not dealt with effectively, this gap can lead to participants being afraid to express their true thoughts due to low self-esteem or other non-positive psychological states. Cultural sensitivity is a key consideration in effective design practice activities. Organisers must think of the user, and not of themselves. Socrates described wisdom as knowing what we do not know. He taught humility as a way to acknowledge gaps in our knowledge, to the point of actively seeking to identify and address our blind spots. Some studies have even found that humility is a stronger performance indicator than IQ (Owens, Johnson, & Mitchell, 2013; Krumrei-Manusco et al., 2020).

Many scholars have discussed the importance of being empathetic, curious, and open-minded to ensure cultural sensitivity during design process (e.g., Gray & Malins 2016). In this research, I extended the meaning of cultural sensitivity to a focus on cooperation with low-income and low-literacy people for MCH communication design. This mindset does not constitute a specific method but refers to the whole process of design activity. There are three

considerations here that need to be taken into account when developing design activities with target groups. The first is mutual respect. It is important to develop research relationships based on mutual respect and to make sure everyone involved is prepared to listen to the voices of others and to accept that there are diverse perspectives. Designers have to realise that despite being specialists in their field, they still need to be superior to the participants, who in fact possess greater knowledge of certain aspects. This is precisely why co-design is so necessary. Secondly, designers should encourage and enable people from a range of backgrounds and identities (e.g., ethnicity, faith, class, education, gender, sexual orientation, (dis)ability, age, etc.) to lead, design, and take part in research. They should actively seek to include people whose voices are often ignored by ensuring that all information about meetings, venues, and formats is accessible to all. Thirdly, designers should enable all participants to contribute meaningfully to decision-making and other aspects of the research process to ensure democratic participation. Acknowledging and discussing differences in the status and power of research participants, designers should work towards sharing power more equally by communicating clearly using language everyone can understand and using participatory research methods that build on, share, and develop different skills and expertise.

7.2.1.4 Breaking the stereotypes

As technology becomes more complex and intrusive, the need for human-centric leaders capable of designing simplified and more intuitive experiences will continue to grow. This, however, also means that we need to start rethinking the designers' role. Training designers to be able to address "non-routine situations" implies more than just learning creative thinking. Design across disciplines requires new skills and cognitive attributes that will enable the individual to draw on knowledge developed in other disciplines. This means that designers, in addition to developing a high level of expertise in their discipline, will also need to exhibit an understanding of other disciplines. An active learning attitude is also important. Designers have to view research collaboration and the research process as an opportunity to learn from others. This requires a commitment to ensure there is time to identify and reflect on learning during the research and the different ways in which people learn, both together and individually. They should offer all participants the chance to learn from each other and share their learning with wider audiences, while also sharing responsibility for interpreting the research findings and their implications for practice. In the process of organising the survey in this study, I designed and planned the whole process based on my knowledge gleaned not only

from the field of design, but also from reading the literature related to communication and psychology (e.g., regarding the health literacy of low-culture groups) in order to better cooperate with my target group.

In addition, it is important to pay attention to the creative outputs of participants. As the direct stakeholder in relation to certain issues, they can be expected to have valuable insights to offer. In this research, interviews and co-design workshops were conducted in person. Many participants in the 1-to-1 interviews were too shy to talk at length about their ideas. Even when they made certain points, they tended not to suggest a deep level of reflection. However, the co-design workshops, involving 6-7 participants per session, worked well, as the number of people was sufficiently large to generate a productive discussion. During this research, I found that although the participants possessed a certain level of awareness of the issues they were investigating, they needed a discussion environment to be able to stimulate their thoughts successfully. It is, therefore, important to provide the right environment and guidance to enable participants to develop their initiative and engage in interactive discussion with their peers.

7.2.1.5 Section summary

Discussion of a designer's role is not a new topic. Scholars have carried out research in this area from various perspectives, producing valuable findings that provide good guidance for designers in their ongoing quests to develop their roles. However, interdisciplinary project research on the role of designers and low-literacy groups is less common. This study has built on this background and engaged in fieldwork that involved questionnaires, interviews, etc.

The study found that designers need to pay particular attention to building trust with low-literacy groups when designing collaboratively with them. This is the basis for all research. Establishing a trusting relationship and maintaining a good interaction will allow for smoother data collection and research. As Tjahja and Yee (2022) note, 'Low-income groups do not care how important or powerful your research is, it is not about them'. To ensure participants can cooperate well with the research, it is vital they enjoy positive interactions with the organiser (in this case, the designer), as this will make them more willing to participate in the research, based on a friendly relationship. The prerequisite for a good relationship is that the designer maintains cultural humility. As an important

element of democratic design, it is essential to dialogue with the audience on an equal footing to form a partnership, rather than any other form of class-based relationship.

In addition, throughout the process, designers must move away from traditional stereotypes in their support role when carrying out their work. Although, as in the case of this study, a wide range of skills is required, combining knowledge of communication and sociology, the designer must also be able to draw on common knowledge from relevant disciplines when carrying out research. The development of such a wide set of skills is key to the designer's ability to work independently on a range of projects. Armed with such skills, the designer's unique strengths, such as empathy and the ability to produce products (solutions), can be maximised.

In summary, partnership is a perspective that places the participants on a more equal footing with the designers (organisers). Only within an equal partnership can participants contribute as fully as possible, thus providing better quality and more reliable data.

7.2.2 Cultural inclusivity—from the perspective of content

Table 17 Cultural inclusivity findings in relation to the proposed framework.

Cultural Inclusivity

Problems*	Strategies
• Lack of suitable information • Too much irrelevant news • Troubling narrative • Sense of alienation • …	• Localised information • Tips rather than news • A sense of caring

**Problems identified in previous chapters*

Cultural background influences values and opinions. Though culture is difficult to define, Leininger and McFarland (2006) describe it as 'the learned, shared, and transmitted values, beliefs, norms, and lifeways of a particular group of individuals that guides thinking, decisions, and actions in patterned ways (that are also often intergenerational).' People view health promotion and treatment through the lens of their cultures, which in turn impacts their overall health (Dunning, Heath & Suls, 2004). One's culture has an inextricable and meaningful relationship with one's health needs, care, and outcomes (Brottman et al., 2020).

Health disparities are largely the result of historic systemic inequalities. It is nearly impossible to address the impact of the political, socioeconomic, and geographic factors that have led to these inequalities. Regardless of a healthcare provider's good intentions, a lack of cultural understanding can lead to lower levels of compliance and poor health outcomes. Thus, to this day, health disparities have continued or even worsened (Mackenbach, 2012).

Numerous studies have been conducted in this subject area (e.g., Shatenstein & Ghadirian, 1998; Hansen, Ekholm & Kjøller, 2008; Osei-Kwasi et al., 2016; Erdem et al., 2019). Many scholars have explored the health behaviours of ethnic minorities in Western societies, and the barriers faced by unique ethnic or group cultures in Western health communication, as well as the potential solutions. However, China is a vast country with 56 ethnic groups and people from different geographical regions, each with their unique cultural practices. As a result, standardised health communication models cannot reach this entire group. Therefore, after a series of thematic analyses, I have selected three directions for recommendations for future health communication design in mainland China.

7.2.2.1 Localised information

Despite the widespread availability of information on parenting and health that can be accessed online, context-specific health information still has a vital role. This localised information is often more in line with the thinking and health habits of local residents. For example, in the co-design workshop, a participant mentioned that the length of yuezi (postpartum confinement) indicated in online sources needs to be correctedYuezi, often translated as "confinement" in English, is a traditional postpartum practice in many East Asian cultures, including China. It is a period of confinement and recovery that a new mother typically undertakes for around one month after giving birth. During this time, the mother and her newborn are expected to stay indoors, rest, and follow various cultural customs and dietary

guidelines. The northern part of China generally has a longer confinement period (due to colder weather), while the southern part has a shorter period because of the warmer temperatures. This is one of many examples of cultural differences that are not reflected in the current mainstream MCH media.

The participants in this study are mainly from Henan, Hebei, Shaanxi, and Shanxi, which are all in the central part of mainland China. The rest of China is huge and can be divided into six geographical regions: East, South, North, Southwest, Northwest, and Northeast (see Table 18 below for details). These areas differ greatly in terms of geography and climate, human habits and ethnic folklore. This feature makes it particularly challenging to standardise health communication based on any single principle.

Table 18 Area and ethnic distribution of China's seven regions.

	Northeast region	**East China**	**North China**	**Central China**	**South China**	**Southwest China**	**Northwest China**
Area	1.52 million km^2	0.7983 million km^2	0.87 million km^2	0.56 million km^2	0.613 million km^2	2.351 million km^2	3.108 million km^2
Ethnicity	Manchu, Korean	She	Mongolian	Tujia, Dong	Yao, Li,	Zhuang, Miao, Yi, Buyi, Bai, Hani, Dai	Uygur, Hui, Tibetan, Kazakh

Therefore, future health communication activities aimed at low-literacy and low-income groups in China should be designed with the cultural characteristics of each region in mind (Ma & Zhu, 2016). Moreover, when designing standardised apps or websites,

designers need to make specific adjustments depending on the different cultural situations of different regions. It is only through more targeted information that the target group's trust can be won in the dissemination process and healthy behaviour can be effectively promoted (Schein, Wilson & Keelan, 2011).

7.2.2.2 Tips rather than news

Presenting information in a fragmented and entertaining way is a common strategy in current media design (Ware, 2019). The reasons for this phenomenon can be broadly attributed to three aspects. Firstly, the rapid speed of information dissemination has led to the fragmentation and entertainment-focus of information. This is because people tend to look for immediate, short snippets of information, rather than in-depth content. Secondly, the limitations of social media platforms lead to users writing short posts. For example, Twitter limits the number of words to 280, which directly influences users' forms of expression. Thirdly, media outlets compete for the attention of users, preferring to use eye-catching and compelling headlines or snippets that can quickly capture the interest of users, rather than providing comprehensive and detailed content.

Two of these points were mentioned by the participants during fieldwork. In social media, for example, fragmented health information is generally presented randomly. It is therefore difficult for low-income and low-literacy groups to develop their health knowledge from such platforms. In addition, there are problems with the way information is presented on specialised apps. For instance, there needs to be more focus on relevant and entertaining news that affects the user's reading experience. Moreover, when relevant health information is presented, redundant information is often mixed with valid information, which hinders users' ability to take in the information.

Therefore, it is necessary to provide the audience with health information in a systematic and continuous order, rather than in a fragmented and entertaining form. In practical terms, social media can be used to tag health information more precisely. Health communication media platforms could introduce an official tag to better categorise shared health information. In addition, the health information could be shared in multiple formats. For example, visual content might be presented from a multimodal perspective, combined with other sensory stimuli to make effective communication easier to achieve.

7.2.2.3 A sense of caring

Another theme almost all participants mentioned was costs, or perceived costs. They generally perceived MCH media as part of efforts to make money. There is evidence to support this view. For example, many scientific articles are accompanied by a link to a product promotion, and many health websites feature flashing advertisements on their homepages, as if to urge readers to hurry up and spend their money. As a result, the participants always approached such media and the health information it contained with a strong sense of hostility or defensiveness, which undoubtedly affected their understanding of such content.

A caring model of information communication based on a culturally inclusive understanding of health information dissemination is more likely to be effective. When experiencing a sense of caring, users are more likely to lower their guard and continue to use the media. This would constitute a user-centred approach to design. Caring is not merely a question of speaking, but rather a design practice that can be achieved through clearer and more functional compartmentalisation. For example, promotional and product-related information (products) can be placed in the shopping sections of websites and have a lower presence in interfaces. In addition, this caring also needs to take into account low-literacy users and pay attention to the presentation style when designing information content. For instance, visualisation or a multimodal approach can be used to present information more understandably and improve the diversity of information presentation, thereby attracting users' attention.

Therefore, employing communication and visual strategies that convey a feel of care and empathy for the user can foster a sense of trust. In addition to being as objective and unbiased as possible when communicating content, it is important not to give the audience the impression that the communicator is trying to sell a product for commercial purposes. It is also possible to attract the audience to health media by combining design aspects, such as image, content, and colour layout.

7.2.2.4 Section summary

In the contemporary quest for unified, standardised, and scientific health information dissemination, it seems that cultural inclusiveness is overlooked by many designers. It is important to understand that scientific health information needs to be communicated in a way that takes into account the ability of users to receive the information. A step-by-step

approach is obviously more acceptable than a blunt, direct way of conveying information. This gradual approach needs to take more consideration of the information-receiving characteristics of the audience groups, as well as their preferences and dislikes. This summary of three attributes of culturally inclusive health communication design for low-income and low-literacy populations provides designers with a detailed perspective of how to design for the target group.

7.2.3 Trustworthiness — from the perspective of design

Table 19 Trustworthiness findings in relation to the proposed framework.

Trustworthiness

Problems*	Strategies
• People mistrust the information to which they are exposed • Lack of basic judgement • Financial sensitivities • Suspicions about profit-seeking motives • …	• Reliable information • Non-commercial orientation • Consistency in visual design • Interactive channel option

**Problems identified in previous chapters*

The audience's deeply rooted distrust of the health communication media that permeates the entire study serves as the primary motivation for this section. A number of previous studies have confirmed one of the findings of this research, namely, that low-literacy groups are significantly less receptive to information and less able to process it

than groups with a higher level of education (Nation & Snowling, 1998; Fernald, Marchman & Weisleder, 2013). How to build MCH media's trustworthiness was also a central aspect throughout the study, with almost all participants mentioning their distrust of the MCH communication media, the information disseminated on it, and even the doctors and specialists featured on it. Moreover, due to their low educational level, the participants also lack the ability to screen qualified health information, leaving them vulnerable to misleading rumours or false information on the internet. This skepticism and mistrust that permeates the entire health communication process underlines the great importance of starting design work from the perspective of credibility to engender a strong sense of media's trustworthiness among the audience.

Therefore, I carefully probed the participants about the root causes of this distrust, in an attempt to uncover factors to consider in efforts to restore trust. Four sub directions were identified as important factors affecting the trustworthiness in health communication media: reliable information, interactive channels, non-commercial orientation, and consistency in visual design.

7.2.3.1 Reliable information

There are many definitions of what constitutes "reliable information". From a general viewpoint, reliable information must come from dependable sources, which may include peer-reviewed articles and books, trade or professional articles/books and magazine articles, books and newspaper articles from well-established companies, etc. In terms of online MCH media, the evaluation of reliable information is more complex.

It is widely accepted that the internet, at present, does not provide reliable health information for audiences (Daraz et al., 2019). The suboptimal quality of online health information requires significant improvement. This issue was also identified in the current study, with participants repeatedly mentioning the mix of online information, which often caused confusion. It is evident that the form in which the information is presented does not cater sufficiently to this particular audience, which affects the participants' worthiness in the information they encounter. Considering the greater difficulty experienced by low-literacy people in effectively discriminating between information on their own, it is especially important to provide sources of information during information presentation. Experts' ratings could be an effective way for health information websites/apps to evaluate information quality. In such an endeavour, it would be best to hire more than one evaluator

to develop a consensus from a number of experts, which can then be used as a metric for evaluating similar sites. It is possible that training or providing other resources might increase agreement between experts, a point that could be considered in future research. Any measure producing a greater degree of agreement among raters of internet sites could bring great benefits to both medical and nonmedical internet users (Craigie et al., 2002).

7.2.3.2 Non-commercial orientation

The current design of MCH communication media shows a very clear commercial orientation, a point that was often criticised by the participants. From their perspective, if the ultimate goal of a health communication medium is to sell a certain commodity, this means that the content disseminated on the platform is full of exaggerated facts and aimed at generating sales. While it might be understandable why businesses engage in such practices (survival comes first in commerce), this does not make it right.

It is logical that if the user of an information medium senses the communicator has a financial purpose, it will be very difficult for the user to fully believe in the health knowledge conveyed by this means. Even if this medium is designed to present the content as professional and authoritative, if the consumer (especially among low-income groups, who are particularly sensitive in this regard) senses a product is being promoted when they are reading an article on health, they will quickly give up reading the article. It is clear, therefore, that overly commercialised design has seriously impacted how users consume the media, which the participants labelled 'money scams' and 'bad faith actors'.

In terms of efforts aimed at enhancing the credibility of design, it is clear that overt commercial intent is not appropriate. This is especially the case nowadays, when readers are bombarded with links to buy goods in the middle of health communication articles, which greatly reduces the user's reading experience. As one participant noted: 'Halfway through the article I find out that I'm being asked to buy something, and I get the feeling that I'm being cheated….' The optimal strategy would be to place different forms of information in different places. For example, websites should have a separate shopping section, or a themed recommendation column dedicated to each product type. This would make it easier both for those wishing to find out what is for sale and for those seeking a simpler environment to access health information.

7.2.3.3 Visual design consistency

Increasing the audience's trustworthiness in the media through well-designed visuals is particularly important in health communication. In this regard, good design should mainly focus on the accessibility of the media, i.e., the user's reception of the health information disseminated by the media. Only by providing users with more accessible information channels can their scepticism be addressed to the point of creating a positive outcome for health communication.

Accessible design encompasses two main aspects. The first involves the visualisation of the content of health communication. This visualisation can be in the form of videos or pictures to make health knowledge interesting and visible. Secondly, it is important to keep the design consistent. Consistent design helps low-income and low-literacy populations become familiar with the media, enabling them to find the desired information more easily across different pages, thus enhancing the overall user experience.

In conclusion, consistent design and high-quality information display are crucial for low-income and low-literacy populations. When seeking to meet user needs, designers should focus on presenting information concisely, transparently, and credible, ensuring consistency across pages to enhance user information retrieval efficiency and satisfaction, thereby facilitating the effective dissemination of health information.

7.2.3.4 An interactive channel option

In media design, obtaining user feedback and making timely adjustments is crucial. In the past, although the majority of media provided user feedback mechanisms, the design approach was relatively simplistic, usually relying on users to post messages to provide feedback. Researchers have criticised this interactive mode type for its inefficiency (Hsu & Ching, 2013). In particular, as today's communication media environment becomes ever more complex, the need for audience-media interaction becomes ever greater (compared to the single interaction model of traditional media). Based on analysis of the fieldwork data and the literature review content, this audience-health media interaction model can be summarised in terms of two aspects. The first concerns the interaction between users and the media product, which the participants frequently complained about ('These functions are not practical', 'It does not feel like it is suitable for me...'). Secondly, there is the interaction between users and media explorers/designers. User-product interaction is a well-understood concept. It means increasing the flexibility of the media design, so that

users can maximise the discretionary use of the product according to their wishes. For example, many participants mentioned that specialised apps often have impractical features. However, by increasing interaction between users and designers, the functions of such apps can be customised. For instance, users can choose and arrange the functions on the homepage according to their own preferences. This is one way to increase the interaction between users and the product and encourage users to continue using the product. Another method of enhancing interaction is adding voice interaction. Providing voice interaction would allow users to express their opinions and feedback through speech, which is particularly useful for the low-literacy population who may not be familiar with text input. This would enhance user engagement and feedback efficiency. In addition, integrating MCH apps with social media would enable users to share and discuss content on these platforms, increasing participation and interaction possibilities. This is also in line with one of the key findings of Chapter 5, namely, that the target group prefers to use social media, rather than specialised apps, for the exchange of health information.

The interaction between users and media explorers/designers is also essential. Users, as the main group of people using the media in question, naturally have a wealth of experience using it. This experience needs to be communicated to explorers/designers in a timely manner to improve the design's quality. The conclusions in Chapter 4 show that existing media designs provide little feedback to facilitate communication between users and media explorers/designers. Therefore, in order to improve communication efficiency and media design quality, here are three suggestions. Firstly, standardising user surveys and incentives can harvest effective user feedback regularly to understand their satisfaction levels and expectations and receive suggestions for improvement. For example, incentives such as prize draws in surveys can attract greater participation among users and make them feel their involvement is valued. Secondly, in addition to the traditional method of having users fill out feedback forms, diversified feedback methods can be introduced, such as easy-to-understand icon expressions, slider ratings, voting functions, etc., in order to lower the threshold for user feedback and increase participation in interactions. Users' suggestions should be recorded, and feedback should be provided to them once the action has been taken. This would also help users to feel that their opinions are valued and engender worthiness in the media.

In conclusion, in health communication activities targeting specific groups, it is essential to consider their characteristics and behavioural patterns to ensure more effective interaction with the target audience and thereby increase user engagement and satisfaction.

7.2.3.5 Section summary

Trustworthiness is central to the whole framework. Therefore, exploring how to increase levels of worthiness among users from an overall design perspective is a topic worth exploring; yet it has long been neglected. Being trustworthiness can better promote the dissemination of health knowledge, and can maintain the attention of users, resulting in a win-win situation for both media designers and users. However, it can be seen that current low-income and low-literacy groups still lack a basic trust in the related media, which is the fundamental reason why they choose to avoid it or to only resort to it on occasion.

In its examination of ways to build trustworthiness of MCH media, this section contributes relevant discussions in terms of four aspects. Distributing reliable information from reliable sources is the most basic requirement for winning audience trust. Next, care needs to be taken not to over-commercialise the information when presenting it. A consistent, clear design style is needed, preferably one that incorporates a visual dimension so that the audience can better understand the health information to which they are being exposed. This would help reduce uncertainties among users and allay any doubts they might have. Moreover, the existing model of interaction between media designers/explorers and users is relatively inefficient. Therefore, expanding the interactive channels to facilitate interaction between the two parties is an important step for promoting mutual trust and producing better media design.

In conclusion, trustworthiness is an important part for MCH media in terms of developing health communication and a prerequisite for ensuring that a message is delivered. Previous studies focused little on this aspect of the content, and scant attention was paid to specific groups. This study fills this gap to a certain extent.

7.3 Potential Impact Beyond the Researched Groups and Areas

This research focuses on the design of maternal and infant health information dissemination for low-income and low-literacy populations. It explores three main aspects: their health behaviours, health information needs, and ideal health media design. With empirical research at its core, the study combines content analysis of relevant literature and visual analysis of digital media to develop a framework for health knowledge dissemination tailored to these populations.

This framework includes three components: the designer's psychological cognition, cultural inclusiveness in content presentation, and the trustworthiness of media design. Although the framework primarily focuses on China's low-income and low-literacy populations, it can also be applied to a wide range of underdeveloped countries or regions.

This discusses the potential application of the framework in other regions of mainland China and other countries around the globe.

7.3.1 Application in other areas of mainland China

China's complex terrain and diverse ethnic groups are briefly discussed in Section 7.2.1.3. However, it is essential to emphasise that even when cultural differences exist between different ethnicities, the framework holds significant relevance when economic and educational levels are comparable. Minority ethnic groups in China have historically had lower per capita income compared to the Han majority. According to official data, in 2017, the average income of China's minority population was 3,310.50 yuan/month, while the Han population's average income was 4,184.48 yuan/month. The income gap between the two groups expanded from 115.77 yuan/month in 2003 to 874.35 yuan/month in 2017 (Iresearch, 2022). The lower income levels of targeted people are closely linked to their relatively lower educational attainment, directly impacting their health behaviours. For instance, they may need help understanding relevant design communication and comprehending health-related knowledge. Therefore, the framework can be of significant value by addressing the specific health behaviour characteristics of different ethnic groups and guiding the design of health communication activities tailored to these populations. Furthermore, in section two of the framework, one can incorporate information about the health behaviour characteristics of the target ethnic group, the environmental context in which they live, and the importance of respecting their local culture. By doing so, the framework becomes more targeted and culturally sensitive, allowing for more effective health information dissemination.

In conclusion, the framework offers important lessons even considering different ethnic groups in China. By understanding and accommodating their unique characteristics and challenges associated with specific ethnic populations, the framework can be enhanced to create more tailored and effective health communication strategies, ultimately contributing to improved health outcomes.

7.3.2 A reference for contexts beyond China

As a framework for health communication targeting low-income and low-literacy populations, this research can offer comprehensive guidance to a wide range of developing countries and regions in the Third World and vulnerable immigrant populations in the Western World. It covers three key aspects of health communication for vulnerable people: the mindset of designers conducting relevant activities, cultural inclusiveness in content presentation, and the final presentation of trustworthy designs.

In addition to the reference value brought by the proposed framework, the whole process of this study, especially the research methods (e.g., co-design), also has important reference value and can enable researchers to understand hard-to-reach segments of the population better. This study provides a detailed process for contacting vulnerable groups, gaining their trust, and finally carrying out relevant design activities, together with careful reflection on each step, in an attempt to provide valuable guidance.

In brief, the framework addresses the organisation of activities, media design, and content dissemination tailored explicitly to vulnerable populations. This holistic approach ensures that health communication efforts are sensitive, effective, and respectful of the cultural context and unique challenges faced by these populations. As a framework for health communication targeting low-income and low-literacy populations, this research holds broad implications for a wide array of developing countries, regions, and vulnerable immigrant populations worldwide. By addressing the key elements of designers' mindset, materials' cultural inclusiveness, and trustworthiness of media design, this comprehensive framework can guide health communication efforts to effectively reach and empower vulnerable populations in various contexts.

7.3.3 Limitations

To address the lack of MCH health communication designed for low-income and low-literacy groups in mainland China, this study developed a multidimensional health communication framework with designers as the core organisers. This framework fills a gap in design-related research by shifting the role of designers from subordinates in previous studies to central organisers and coordinators. However, this framework still has a certain number of limitations.

While a comprehensive health communication framework involves multiple stakeholders, the one proposed here only focuses on users and designers. This study has

limited involvement of doctors, who are important stakeholders. Similarly, policymakers who are crucial in determining health communication strategies have not been included in this study. As a result, this framework is centred around the perspectives of users and designers, with a primary focus on user-driven health communication based on user needs and attitudes. It lacks a thorough interpretation from a policy perspective. This limitation may lead to overlooking potential motivating factors that influence health communication strategies. For example, one significant reason why China has not developed a healthcare system targeting low-income groups is the slow penetration rate of the country's basic healthcare system.

7.4 Value of the Framework

7.4.1 The core position in this study

The framework is the essence of the entire study and serves as a concrete representation of the research findings, holding a position of great importance. Its introduction enhances the accessibility of health information, thereby making it possible to promote changes in health behavior. The framework is developed from the designer's perspective, addressing the gap in previous research that lacked a focus on low-income, low-education groups from a designer's viewpoint. This also provides practical guidance for future research.

More importantly, the introduction of this framework enhances the value of this study from the perspective of deeper social impact. The health communication framework for low-income, low-literacy groups helps reduce inequalities in access to health information, thereby narrowing the health gap between different groups. Moreover, it can also help alleviate health problems caused by a lack of health information, reducing the consumption of medical resources and economic burden to some extent.

In summary, the framework is not only significant in improving the effectiveness of health information dissemination for the target group but also has a positive impact on promoting overall societal health and reducing the public health burden. It provides valuable experience and insights for future research and application and represents the essence of the entire study.

7.4.2 The meaning for designers

This framework is centered around the designer as the core, transforming the designer's role from a subordinate position in many projects to that of an organizer. This role shift significantly impacts the promotion of health communication design activities. This role transformation not only improves the efficiency and effectiveness of the design process but also significantly enhances the quality and applicability of the final design solution, thereby better serving the implementation of co-design activities.

Secondly, the framework emphasizes the importance of cultural inclusivity and design credibility. Designers who can facilitate the development of these two aspects play a crucial role.

In conclusion, the designer's practice-oriented thinking has a decisive influence on the research's actionable strategy recommendations. The introduction of this framework acknowledges the role of designers in health communication and provides concrete strategy suggestions for conducting health communication activities. Overall, this framework offers a new reference paradigm for future health communication design and marks an important step towards the development of designers into more diverse roles and identities.

7.5 Summary

In order to promote more effective health communication design activities targeting low-income and low-literacy populations, based on the content of Chapters 4, 5, and 6, this study ultimately proposes a health communication framework with a designer-centric perspective. The development of this framework has been elaborated based on three main aspects: the role of designers, the cultural inclusiveness of content, and the trustworthiness of design. The first part of the framework sets out the attitudes that designers should adopt as organisers of health design activities and the steps to follow in order to establish cooperation with the target audience. The framework makes the original proposal that designers should conduct relevant collaborative work in a spirit of partnership. This concept enriches the role of designers and enhances the current discussion on the transformation of designer identity. Next, the framework introduces the concept of cultural inclusivity to guide content design. Cultural inclusivity is a broad concept that can have different meanings in different contexts. In China’s multi-ethnic and multi-regional context, “cultural inclusivity” mainly refers to the appropriateness of information. The

information must be appropriate to cater to the specific needs of the audience. For example, low-income individuals are sensitive to the term "money", so local cultural customs, especially those conflicting with scientific health information, need to be taken into account in the design process. Finally, the aspect of trustworthiness, the last and most crucial point, is discussed. The audience's low rate of literacy, their concerns about spending money, and their resistance to advertising are key factors that influence their trustworthiness in health communication media. The discussion in this section is the first to propose how trustworthiness can be built through design in research.

This framework offers unique insights from a broader cultural and design perspective. Health communication design for low-income and low-literacy populations is not solely about producing design works. Deeper design strategies and the research process are also important aspects to consider. This study does not primarily focus on individual design outputs, but provides insights from a strategic and design concept perspective. It aims to offer robust guidance for future health communication efforts and to serve as a reference for content development.

Health design research in China is currently in a rapid development phase, with ongoing healthcare reforms and the rapid rise of internet healthcare. This trend has further accelerated in the wake of COVID-19. Internet-based giants such as Tencent, Baidu, and Alibaba have all developed their own branded online consultation and pharmacy services. From a public perspective, after several years of the COVID-19 pandemic, there has been a significant increase in public awareness of aspects relating to healthy living, including developments and improvements in areas such as diet, exercise, and mental health. However, amid this progress, it is important to note the widely recognised fact that resources are increasingly concentrated in large cities and among high-income groups (Tomba, 2004; Li, Long & Chen, 2013). The neglect of low-income individuals remains a serious issue. It is on this group that the current research focuses, with the aim of drawing greater attention to these populations.

In summary, health communication research is about understanding how to achieve the ultimate goal of human sustainable development. While contemporary health communication design has made significant progress, we must still recognise the importance of addressing health inequalities. By implementing tailored health communication strategies for different social groups, promoting health equity, encouraging more people to change from unhealthy lifestyles, actively disseminating health information, and ultimately improving public health, we can address various health challenges and support the sustainable development of society.

CHAPTER 8 Recommendations and Conclusions

This chapter presents the main conclusions of the research. Based upon a systematic evaluation of the results, the chapter consists of: 1) an overview of the research aim, questions, and key findings (8.1); 2) a statement and justification of the original contributions to knowledge (8.2); 3) potential beneficiaries in academia and in practice (8.3); 4) potential limitations of the research and topics for further research (8.4); 5) value of the research results (8.5); and 6) concluding remarks regarding the research (8.6).

8.1 Discussion of the Overall Findings and Recommendations

8.1.1 Overview of the research aim, questions, and key findings

The central purpose of this research has been to investigate health communication design for low-income and low-literacy people. The research gained insights in addressing the following research questions:

Key research question:

How might design methods contribute to the development of appropriate maternal and child health communication strategies for low-income and low-literacy Chinese audiences?

Sub-questions:

1. What are the health behaviours of the targeted people in terms of searching for MCH information? What are their specific health features and the reasons for this?

2. How do social, cultural, and economic factors affect the values, needs, and objectives of low-literacy and low-income Chinese parents or prospective parents when accessing MCH communication materials?

3. How can future MCH communication for the targeted groups be promoted by the design of a health framework?

8.1.2 Narrowing the research focus to a specific field

Although the research question was initially formulated at the beginning of the study, it became evident that a detailed literature review was necessary to refine it more precisely. Therefore, three main areas were identified for comprehensive review: definition of the target group (low-income and low-literacy individuals) and the characteristics of this

group in accessing health information (MCH communication), the development of health communication in China, and MCH communication design.

Based on this review, the research scope was confirmed. Low-income and low-literacy pregnant women and mothers are the primary objects in this study. The data collection process also included their husbands and the elders in their households since these individuals can also impact maternal behaviours. The target group are information-vulnerable, lacking an awareness of health information and sufficient ability to adequately recognise reliable health information. Considering the context of MCH communication in China and the history of health communication media in the country, the research focused on online media. . The combination of internet with health communication has been developing for years, and there is much research in relevant fields. Therefore, based on this trend, this study also targeted internet use.

As for the research content, after the literature analysis of Chapter 2, the design practice analysis (in Chapter 4) served as a strong complementary for the theoretical analysis. Furthermore, given the lack of existing research into the health behaviour characteristics of the target group, this became an additional focus of this study. The entire research fieldwork was conducted on the basis of the existing literature. Behaviours and motivations were also the focus of investigation in this study.

In terms of data collection methodology, after assessing the main methods employed in existing literature, this study selected questionnaires, interviews, and co-design workshops. The entire planning, design, and implementation process was conducted based on the existing literature.

8.1.3 Identifying weaknesses in media design practices

The weaknesses in current MCH media design were identified in Chapter 4. Digital media is a vital platform for MCH information communication, particularly for supporting people with low levels of income and literacy, who might require more detailed explanations. The interactive media selected for analysis in this study play an important role in promoting health communication. However, these platforms have both positive and negative aspects. From a positive perspective, their high level of interactivity, through functions such as sharing, commenting, and liking, greatly increases user engagement, and effectively promotes the dissemination of health information. Moreover, the information spread through social media is fragmented, allowing the audience to quickly

access health information within a short period, thereby avoiding user fatigue or reduced dissemination effectiveness caused by lengthy reading or excessively complex information. Thirdly, such media often use big data to allow highly accurate targeting, making it easy to target users in the same city, push information of interest, or set up city-based groups. However, specialised apps tend to be profit-oriented. This means that their primary focus is on generating profits from targeted users, rather than on delivering health information to minority groups. The target audiences of current MCH apps tend to be people with a relatively high level of financial power (for purchasing), typically urban residents. These groups seek a certain quality of life and are willing to invest money to improve their living standards. These claims are supported by data showing that 60% of the targeted audience of the current MCH communication media have a monthly household income of more than 10,000 yuan (GBP1,200), the proportion of undergraduates in this group is over 60%, and those holding a college degree account for 25%. Approximately 74% of this group's households spend more than 5,000 yuan (about GBP600) per month on MCH app purchases, and their average monthly expenditure on this part (maternal and child relevant) is about 11,386 yuan (about GBP1,350) (MoonFox, 2023). Evidently, the users targeted in the current research do not belong to this demographic.

As for media design, health information is presented in completely different forms depending on the media platform on which it is distributed. In social media, the dissemination of health information relies more on interactive modes to enhance user trustworthiness and to convey information to the audience in a fragmented way. In specialised media, the information tends to be presented in a less interactive and simpler form to cater to people with specific questions or those wishing to improve their health knowledge. These two kinds of media also possess different shortcomings. The general media platforms are intended for all audiences, and the information presented on them is mostly unfiltered. Low-literacy and low-income people tend to have limited cognitive ability, and their ability to differentiate between information is poor. As a result, when using relevant media, they are easily confused by low-quality or false health information. On specialised media platforms, the health information tends to be of a high quality and filtered. Nevertheless, they are still products of the commercial market, meaning that the content provided on them is still profit-focused to a certain extent. Another issue is that downloaded apps take up storage space on mobile phones, and low-income people tend

not to own phones with a great deal of storage. Hence, this is another key factor that affects the use of such media.

8.1.4 Responding to RQ 1: the health behaviours of the target group and the rationales

RQ 1: What are the health behaviours of the targeted people in terms how they search for MCH information? What are their specific health features, and the reasons?

The health behaviours of the target group are multi-dimensional. Firstly, the audience exhibits a very serious crisis of confidence regarding the health information to which they are exposed. In their responses to the questionnaire in this study, the majority expressed their distrust in the internet, with a significant proportion showing suspicion of doctors, hospitals, and, other institutions. This finding is to some extent a reflection of the strained doctor-patient relationship in China. Secondly, in terms of how they access health information, personal motivation is the main influencing factor for this group. Next, media design is another key factor shaping users' attitudes and their continuity of use. The participants in this study indicated that the lack of effective design evident in many forms of media leads to an overly complex presentation of relevant information, rendering access to such information more difficult for them, and ultimately leading to less frequent use. It is also common for elders members of a family to frequently intervene in childcare, or even to live with young people to make it easier to bring up children; these factors are not taken into account in the design of existing communication media.

The main factors affecting users' decisions to seek access to health information were found to be: 1) a desire for a healthier lifestyle; 2) the channels available for them to access health information; and 3) their views on information presentation, and the reasons behind their use or non-use of MCH media. However, the participants still had questions in their minds about what the ideal media would look like, and it was clear that these could not be answered through interviews. This is what prompted the last part of the fieldwork, the co-design workshop.

8.1.5 Responding to RQ 2: values, needs, and objectives in relation to MCH information searching

RQ 2: How do social, cultural, and economic factors affect the values, needs, and objectives of low-literacy and low-income Chinese parents or prospective parents when accessing MCH communication materials?

This question was not addressed in just a single chapter, but was a constant theme throughout the entire research process. Starting from an economic perspective, existing MCH communication media are commercially driven, with the aim of selling products. Consequently, the target audience's attitudes towards such media are very clear: they believe that the main purpose of businesses distributing MCH information is to induce consumers to spend money, rather than to disseminate health information or consider consumers' well-being. In the consumers' minds, the pervasive advertising on these platforms is the clearest evidence of their inducements to consume. This reflects the fundamental difference in stance between businesses and the target audience, thus leading to the second point: from a cultural perspective, many existing designs are inappropriate and fail to build trust between target audiences and MCH media. Throughout the entire research process, one word that was consistently emerged was “trustworthiness”. The target audience exhibited a serious lack of trust in the media and the health information they encounter. Major reasons for this phenomenon are the standardised designs of health communication media, along with the uniform "scientific" (the quotation marks are used here because during content analysis, it was discovered that some health information claiming to be scientific does not come with clearly indicated sources, making its scientific nature questionable) dissemination of health knowledge, neglects the regional differences in China and local customs. This directly leads to the target audience’s needs remaining unmet. When they see the information disseminated by MCH media conflicting with their lifelong understandings or with the ideas relating to health held by their elderly family members or local communities, they immediately develop a sense of distrust and question the reliability of this media.

Multiple times in the study, the participants stressed that, despite not having financial resources, they aspire to lead quality lives and wish to enhance their knowledge and awareness so that they can raise their children in a more scientific way. However, there is a certain degree of neglect evident in Chinese society. Besides the aforementioned focus on consumption-oriented design in the existing mainstream media, this study also examined some weaknesses in China's grassroots healthcare system. While the design of the grassroots healthcare system overall considers many aspects, there are still certain shortcomings in terms of the details, particularly regarding healthcare for the target audience and the raising of awareness of health issues.

8.1.6 Responding to RQ 3: validation of the framework

RQ 3: How can a health framework be designed to promote good MCH communication for the targeted people?

The proposed framework consists of three main components: the role of designers in collaborative design work, cultural inclusion in health communication content, and the core concept of trustworthiness in health communication media design.

Firstly, the introduction of the concept of "partnership" from the designer's perspective is primarily based on the communication challenges that arise from the privileges possessed by many designers during the design process. Designers, as central organisers of relevant design activities, play a key role in facilitating communication throughout the process. Rather than adopting a mindset of guidance or organisation, designers should approach their role as collaborators, engaging with the audience in a cooperative manner and on an equal footing. This enriches the designer's role and contributes to ongoing discussions about the transformation of a designer's identity.

Secondly, during the research, it was found that cultural inclusivity is crucial. Many participants mentioned that the health information they encountered was not suitable for them as it reflects a lack of cultural inclusivity. Unlike in Western societies, where cultural diversity primarily pertains to different ethnicities, in mainland China, cultural diversity can be observed between different regions. For example, given China's vast territory, there are regional differences in diet and behavioural habits between the northern and southern regions.

Lastly, trustworthy design is of paramount importance. Throughout the research process, the participants frequently mentioned uncertainty about the trust of health information, making it a central point throughout the study. Low literacy levels, concerns about consumption, and resistance to advertising were found to be critical factors affecting the audience’s trustworthiness in health communication media. This section introduced for the first time ways in which trustworthiness can be established through design within the research.

This framework covers three aspects: the organisation of health communication design activities, the output content of design objects, and media design. It provides comprehensive insights and references for design activities based on empirical research.

8.1.7 Responding to the key RQ

RQ: How might design methods contribute to the development of appropriate maternal and child health communication strategies for low-income and low-literacy Chinese audiences?

The entire study revolves around this core issue. I have summarised the findings in terms of the following three aspects. Firstly, from the very outset, this study has prioritised a user-centric approach, and this principle has been consistently adhered to in every subsequent step. The health behaviours, motivations, and needs of the target users are the central focus of the entire paper. The analysis (theoretical research and practical design analysis) conducted, the three main research methods adopted, and the proposal of a framework all revolve around these three core focuses. Secondly, cultural sensitivity was a constant consideration throughout the entire research process. The design methods effectively facilitated the integration of cultural elements into the research. Without wishing to delve into politics, it should be noted that the significant differences between China and capitalist countries in the Western context play a significant influencing role. Politics, economics, and culture exert a mutual influence on one other. As a native Chinese, I am aware of how best to collaborate with the target group, and have incorporated this understanding into the entire research practice, respecting their local cultures, engaging with them in suitable ways, and flexibly applying design methods during collaboration with them.

Thirdly, interactive participation methods have served as a crucial component of this study, helping to engage a broader audience in research activities, thereby laying the groundwork for more targeted MCH communication designs and strategies. This aspect is discussed in depth in Chapter 6. While organising and conducting co-design workshops, I paid particular attention to how to collaborate with the target audience and how to encourage them to participate. These insights are presented in Section 6.5.

8.1.8 Section summary

This section systematically reviewed the entire research process. It is presented in a logical form, starting with a literature review to identify the research gap, before presenting visual analysis of MCH media to further define the design practice status. In order to explore the health behaviours of the target group, questionnaires and interviews were conducted, focusing on several points. Then, a co-design workshop was conducted

to contribute to the co-creation. Based on the preceding steps, a framework was designed to guide future practice and research from three perspectives: the relationship between designers and users (partnership), content presentation (cultural inclusivity), and design concepts (trustworthiness).

8.2 Contributions to Knowledge

This study has explored information-acquisition habits related to maternal and child health among individuals from low cultural and low-income backgrounds. It has developed an ideal form of communication media through intense collaboration with the target audience, and via research and analysis in three key areas: health communication, media design, and health strategies. As such, the contributions of this study can be assessed from various dimensions.

• This study systematically reviews academic research related to MCH communication and identifies a lack of research focusing on low-income, low-cultural level populations in mainland China. This part of the research provides direction for future studies.

• It creatively integrates a review of design practices, systematically organising existing media on the market, including social media platforms and specialised apps, which are the main focus of this study's analysis. The analysis reveals that existing media design practices are mostly profit-oriented, aimed at guiding users towards consumption. It also highlights several issues relating to credibility in media design and the presentation of information. For instance, the excess of advertising leads to low audience trustworthiness.

Secondly, following preliminary academic research and design practice analysis, a series of practical surveys were conducted, resulting in significant theoretical contributions, as noted below:

• In terms of the health behaviours of low-income, low-cultural level populations, this study clarifies the relationship between the target group's income levels, education levels, and their health behaviours. It is found that individuals with lower levels of education pay less attention to their own health.

• Delving into the issue of the target group's lack of concern for their own health, two key influencing factors were identified:

1. Low cultural levels lead to a lack of judgment regarding health information.

2. The commercialisation of health communication results in a lack of trustworthiness in existing health communication media on the market.

After making this series of theoretical contributions regarding the health behaviours of the audience, the study digs deeper into the motivating factors behind the audience's trustworthiness. The following findings were made:

1. From a policy perspective, the weak development of grassroots health protection systems is an important influencing factor, with negative impacts being particularly evident in rural areas.
2. Rural areas typically have weaker community management and lack personnel and activities for basic health information dissemination.
3. From a design perspective, there are also many aspects in the content and visual design of health communication media that generate mistrust, such as excessive advertising content and exaggeration of expert information.

Thirdly, a significant part of this study consisted of the collaborative design workshop, which fills a gap in the current research relating to collaboration with low-income, low-literacy level groups in China.

1. The study provides recommendations for ways in which to conduct research with the target audience and motivate them to participate actively.
2. Lastly, this study contributes a comprehensive health communication framework that combines knowledge from communication and design. This framework, with the designer at its core, offers unique insights based on the mindset designers should adopt when organising relevant activities, combined with recommendations for health communication media content and visual design.

In summary, as the first systematic analysis, research, and proposal of communication strategies in the field of health communication design in China, this study holds an important position. It combines communication and design to explore the importance of effectively conveying health knowledge to the target audience and examines feasible solutions.

8.3 Potential Beneficiaries

There are four potential beneficiaries of the research: 1) low-income and low-literacy people; 2) primary medical staff/institutes; 3) policymakers; and 4) design researchers/designers:

Low-income and low-literacy people:

This research proposes methods that can be adopted in MCH communication to enable users to express their own viewpoints and showcase the specific challenges they

face when accessing health information. In previous studies, due to the relatively low commercial value of this group, it has been challenging to target this population with marketing practices aimed at mainstream consumers, resulting in limited tailored designs. This study is the first in mainland China to target low-income and low-literacy groups as the core audience for analysis. It was intended to enable the target audience to be exposed to clear accessible health communication, which can help individuals understand their health conditions, treatment options, and preventive measures, empowering them to make informed decisions about their health. The proposed final framework is designed to offer easier navigation of healthcare systems, increasing access to essential services. Tailored communication can help address health disparities and ensure that individuals from low-income and low-literacy backgrounds receive equitable care.

Primary medical staff/institutes:

Clear communication can reduce misunderstandings and the need for repetitive explanations. This, in turn, can lead to more efficient use of healthcare resources so as to address disparities in health outcomes, thereby supporting public health organisations' mission to promote health equity.

Policy Makers:

The research can inform policy decisions related to healthcare access, health literacy programmes, and regulations to ensure better health communication and cost savings in the healthcare system that contribute to the overall economic well-being of a community or country.

Designers/Researchers:

Research in this field contributes to the body of knowledge in health communication and can lead to the development of best practices and evidence-based interventions. This study is the first in mainland China to focus on designers as the core organisers of health communication for low-income and low-literacy people. Unlike previous studies, which always placed targeted users in a weaker position than designers, this research sought to empower individuals to make informed decisions about their health. It can give them the confidence to communicate with healthcare providers and navigate the healthcare system effectively.

In summary, research on health communication design for low-income and low-literacy individuals has the potential to benefit a wide range of stakeholders by improving health outcomes, reducing disparities, enhancing healthcare quality, and supporting

economic well-being. It constitutes a win-win situation for individuals, healthcare providers, institutions, policymakers, researchers, and the broader community.

8.4 Limitations of the Research and Potential Improvements

As a doctoral researcher, throughout the entire process, I have attempted to conduct research from a comprehensive and systematic perspective. However, due to the limitations of the research scope and the researcher's personal capabilities, this study has certain inevitable limitations. This limitation is mainly focusing on the scope of research.

The initial aim of this study's design was to encompass a broad audience, and efforts were made in this direction. However, inevitably, the participant sample in the study was limited to the northern regions of China, resulting in a lack of corresponding research in the broader southern and western regions of China. The two main manifestations of regional disparities are income and cultural differences. For example, it is commonly acknowledged that rural economies in northern China are generally poor, whereas rural areas in southern China have significantly better economic conditions. As for cultural differences, in addition to varying levels of education that may exist between regions, there are also differences in local customs. These differences are closely related to factors such as the local climate and religion. Therefore, when promoting health design, it is essential to conduct targeted research specific to the region rather than directly applying the framework proposed in this study.

Furthermore, another shortcoming of this study is the relatively small number of participants. Collecting questionnaire data online ultimately yielded 492 valid responses, a sizeable number. However, when it came to interviews and co-design activities, the researcher had to invest a significant amount of time and effort in organising activities and collecting data. As a result, the number of participants in these two phases was not substantial (21 and 15 participants, respectively). To address this issue, future research should expand the number of participants and involve a broader range of individuals.

8.5 Value of the Research Outcomes

The value of this research is multifaceted. Firstly, it fills the gap in current research by focusing on MCH communication design targeting low-income and low-literacy people in China. It provides important references for future health communication activities targeting this group. Secondly, the study provides recommendations for specialised media design, as well as strategic advice tailored to the needs of the target

group, offering pathways to enhance their health awareness and well-being. Moreover, this study highlighted the need for this economically disadvantaged group to be provided with additional support from the government or charitable organisations to ensure the equitable development of social health communication initiatives. Thirdly, from a community development perspective, this study's findings can foster more inclusive practices and policies, promoting equity in healthcare services. This, in turn, can lead to better public health outcomes and community well-being. Lastly, for society as a whole, this research provides information and advocacy for policy change, thus promoting equitable health and effective communication for the targeted populations.

In conclusion, this study provides a pathway to improve health outcomes for low-income and low-literacy people, and is an important manifestation of social equity development. To some extent, the positive impact of this research can foster a positive, proactive cycle in health communication design that contributes to both economic development and positive social outcomes.

8.6 Suggestions for future research

As a result of my study, and considering the limitations noted in the previous paragraphs, I recommend that further research should be conducted to understand MCH communication design under various ethic context, to improve the framework and add any emerged features to rich the inclusivity. These may include, for example: how to conduct health communication research adaptively in harsh natural environments, which may include regions like Xinjiang and Tibet (southwestern in mainland China), known for the high altitudes and lack of natural crop-growing conditions, resulting in significant differences in dietary habits compared to mainland area. It is particularly important to understand the health behaviour of different regions and the current health challenges they face during the research process.

From a design perspective, further research is meaningful to enrich the framework proposed in Chapter 7. For example, collecting data through testing and creating additional research methods, as well as exploring more efficient co-design methods, can enrich Section 7.1 with more detailed specifications. In the field of design research, practice, experimentation, and testing always hold a significant position. Through continuous practice, it is possible to propose more practical and effective guidelines and basic principles in the field of health communication design.

8.7 Concluding Remarks

This is the final chapter of the study, providing an overview of the entire research process and the main research findings. As a multidisciplinary research project, this thesis can be considered to have phased research outcomes, since the field of health communication design evolves as times change. In the future, more accessible and understandable health communication frameworks will likely be developed to promote the dissemination of health knowledge.

In Chinese society, low-income and low-literacy groups have long been neglected due to their low commercial value, as profit-driven businesses tend to design for groups with greater purchasing power. Of course, the government is aware of this phenomenon, and as a result, a number of maternal and child health programmes have been launched in disadvantaged areas. However, these activities have their own limitations. In such a context, the need for this study is evident.

Design is currently a fast-growing discipline, with many cross-border collaborations with other disciplines (sociology, psychology, etc.). The inherent attributes of designers, such as empathy, sympathy, and a broad knowledge base, provide them with special advantages in conducting such research. Additionally, well-designed materials are more appealing to low-literacy groups, making them more likely to be read and remembered, while also increasing user engagement, interactivity, and understanding. This research has also benefited from the realisation and validation of practical activities, as evidenced by the smooth running of the co-design workshop and the wealth of inspiring insights that emerged.

This pioneering research in the field of communication design for low-income people still has significant room for development. Future research can be approached from two directions. First, the categories of research subjects can be expanded, such as by focusing on health communication design for the elderly, ethnic minorities, people with disabilities, and specific disease patients, all of which are areas worthy of exploration. Second, as design methodologies continue to evolve, the media becomes ever more interactive, and researchers explore new ways to work with different groups of people, it is worth examining how to bridge the inter-generational information gap through more efficient design and increase the credibility and communication efficiency of different forms of media. Finally, as a socialist country, China's unique political system and economic model (planned economic development) will inevitably lead to different health communication development compared to other countries, especially capitalist ones. Therefore, future

research can explore differences in health communication design across political systems, and seek out more sustainable development models.

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Appendix A—Questionnaire

Questionnaire

Demographic questions

1-Gender

○ male ○ female

2-How will you care your child

○parents ○ grandpa/grandma ○ other

3-How many children are you care

○first child ○second child ○three children ○ four children and above

4-Your age

○ under 18 years old ○ 19-25 years old ○ 26-30 years old ○30-40 years old ○ over 41 years old

5-Monthly income

○ less than 1000 RMB ○ 1-2000 RMB ○ 2-4000 RMB ○ More than 4000

6-Education level

○ Junior high school and below ○ High school ○ Undergraduate ○ Graduate student or above

7-Do you live with your parents or alone

○ live with parents ○ live alone ○ live with friends

8-Do you have a religious belief

○ Buddhism ○ Christianity ○ Catholicism ○ Islam ○ other ○ no religious belief

9-Do you get MCH information from the Internet

○ yes ○ no

10-What channels do you usually receive MCH information?

○ books ○ magazine ○ TV program ○ Network ○ hospitals or other professional institutions ○ elders ○ other ○ seldom know about relevant information

11-When you encounter MCH problems, what will you do?

○ network ○ hospital ○ consult the elders ○ books ○other

12-Do you often consult elders about parenting?

○ yes ○ no

13-Why you choose to consult your elders?

○ the elders are experienced ○ it is more convenient to consult the elders ○ habit ○ as a reference

14-How often do you use the Internet to obtain MCH information

○ everyday ○ often ○ occasionally ○ almost not ○ never used it

15-Do you often browse MCH forums/websites? Have you ever posted questions on that platform?

○ just browse ○ browse and asked questions ○ never browsed

16-Have you followed any MCH bloggers?

○ yes ○ no

If yes, please give the name of account you followed and point out it on Weibo or WeChat

17-Do you use the MCH apps?

○ yes ○ no

If yes, please give the name of apps

18-Has the information on the Internet solved the problems you encountered?

○ almost all can be solved ○ most ○ occasionally, some problems can be solved

○ I can hardly find the answer

19-Why did you choose to search for MCH on the Internet

○ convenient ○ all-round ○ reliable ○ other reasons for recommendation

20-How much do you trust the MCH on the Internet

○ fully believe ○ believe in part ○ hardly believe it ○ never believe it

21-Do you follow the recommendations of MCH information on the Internet when you take care of your children in your daily life

○ almost everything is done ○ sometimes it's the sting, sometimes it's not, it depends on the actual situation ○ never

22-have you ever encountered a situation where the online advice is contrary to that of your parents or elders

○ yes ○ no

23-Who do you prefer to believe

○ network ○ elders ○ do not listen to anyone

24-Which of the following health information will you use the Internet to retrieve

○ prenatal maintenance ○ breastfeeding information ○ infant education (early education) ○ postpartum recovery and health maintenance ○ recommendation of MCH products ○ do not use network retrieval ○ other

25-Do you believe in the scientific nature of MCH information provided by medical institutions

○ fully believe ○ sometimes I believe ○ not sure ○ I don't believe it at all

26-Please choose the three most commonly used ways to obtain MCH information according to the following options

○ Internet (Weibo, Baidu) ○ books ○ hospitals or other institutions ○ TV ○ WeChat ○ app ○ magazine ○ never know the relevant information ○ other ways

27-Do you think it's easy to get the MCH information you want

○ yes ○ no

If yes, why is it difficult to obtain relevant information? Choose the reason you think

○ a lot of information is difficult to understand ○ it is difficult to surf the Internet or not often ○ I don't know where to find the information I want ○ other reasons

28-Can you fully understand the MCH information you have read

○ yes ○ no, please briefly explain what the obstacle is

Commonly used MCH apps words cloud selected by questionnaire participants:

Appendix B—Interview

for users: questions focus on using experiences

Questions: personal backgrounds? searching MCH habits? any problems when search for information? what is the best way for you to get MCH information? best way to understand MCH information? trust media? are you satisfied with current MCH media? do you have advice for improvement?

the desired effect: explore their daily necessities and find weaknesses and necessity in current media

for designers: design thinking

Questions: do you think the effect of new media for public users? does the emerging of new media extend the information gap between rich and poor? what do you think the reason cause that? what facts will you consider when you design-related products? how do you think current MCH media? are you satisfied with current MCH media? do you have advice for improvement?

the desired effect: understand the design thinking of related media

for doctors: explore weaknesses from a professional perspective, normally doctors touch a lot of users, their opinions may well rounded

Questions: how about the basic maternal and child health knowledge of pregnant or their families you touching with? did you find any problems when you treat patients? what's the main reason? solution? are you satisfied with current MCH media? do you have advice for improvement?

the desired effect: explore users' necessary from a different perspective

for officers: current progress on maternal and child communication works, and national policies. Stay at home children, the elders

Questions: current health policy, for the general public, for the poor; current maternal and child health work progress; what are the difficulties in carrying out health education, what do you think the solution? are you satisfied with current MCH media? do you have advice for improvement?

the desired effect: acquire national policies and have a general understanding of the current spread of maternal and child health communication

Appendix C—Codesign workshop

Questionnaire used in workshop--Personal health knowledge questionnaire

Pregnant common senses:

1 How often did you go to the hospital on average during pregnancy

Less than once a month, Once a month, twice a month, three times a month, >3 times a month

2 Can pregnant belly be touched by others? Why can or cannot.

3 Did you learn about maternal knowledge during pregnancy/postgartum?

4 Is there any influence for pregnant women to live with smokers and alcoholics? A scale of 1 to 10 means no sense to great influence

5 Have you pay attention to your mental health during pregnancy/postgartum?

6 Did you work during pregnancy

7 Which of the following is true:

Fruit should be eaten every day, as much as possible

Do not overeat vegetables

Laver, kelp cannot eat more

Eat more fruits and vegetables than meat each day

Pregnant women must eat lot of food since there are two people(women and baby) need nutrition

12 kinds of fruit, meat, eggs and milk should be eat everyday

Spinach, tomatoes and carrots do not provide folic acid

Fried food, marinated food can eat everyday

Neonatal care common senses:

1 Pick a baby's ears is right or wrong?

2 Do you clean your baby's mouth? Please write down how will you do or why you are not to do

3 Can the baby be kissed by adults?

4 Can baby use cleaning wipes?

5 Can the baby's face be pinched?

6 Can I use normal washing powder to wash newborn clothes?

7 Can new clothes wear directly to the newborn?

8 How often you wash your baby's face?

9 what is the frequency of breastfeeding per day?

Appendix D MCH apps lists

Name (from Huawei Market)	Name (from Apple store)
讯飞医生 DrXunfei	CloudMother 云孕妈
孕健康 PregHealth	小鲤鱼 Small carp
母婴健康手册 MC Handbook	甘草医生 Doctor Licorice
妈妈社区 MomBBS	女性医生 Female doctor
妈妈网 MAMA	棒棒糖 lollipop
宝宝日记 Baby Diary	亲亲母亲 Beloved mother
母子健康 MuziHeath	婴儿母亲 Baby mother circle
麦芽健康 Malt health	智慧医生 Wise doctor
细心 Delicate heart	快速问 Quick question
宝宝管家 Baby housekeeper	辣妈育儿 Hot parenting
托儿管家 Nursery housekeeper	好孕妈 Good pregnant mother
康护宝 Kanghubao	海购 Overseas purchase
全能妈妈 All-round mother	怀孕时刻 Pregnant Momnet
年糕妈妈 Rice cake mother	破壳购 PokiMall
每月食谱 Recipe month	布谷妈妈 Cuckoo Mother
好宝宝 HiBaby	京东孕婴 JDpregnant
萌旋 Mengxuan	憨妈妈 HanMAMA
云阿姨家 Aunt Yun's home	熊猫宝宝 Baby panda
宝宝医生 Baby doctor	宝宝树 Baby Tree
疫苗 Vaccine	孕婴社区 MC community
宝宝睡前故事 Baby bedtime story	阿姨来了 Auntie is coming
脉动妈妈 Pulsing mother	亲宝宝 QinBaby
绿芽 Green shoots	妈妈社区 MomBBS

妈妈来了 Mom's here	小豆苗 Small bean seedling
萌芽 germinate	天才辣妈 Genius hot mom
孕育 Be pregnant	太平洋健康 PICC Health
小可心 Xiao Ke Xin	妈妈护理 MomCare
胎动妈咪 Moving mother	晴朗宝贝 Sunny baby
曲美妈妈 Qumei's mother	月经助手 Period helper
辅食 Complementary food	国际妈咪 Internationl Mom
呵护 Care	爱宝贝 Ibaby
一扇母婴 Door for mother	华西孕婴 Huaxi Pregnant
运动健康 Sports health	怀孕管家 Pregnant manager
丁丁医生 Dr. Tintin	道特 Daote
胎心 FetalHeart	可爱鱼 Cut Fish
天使医生 Dr angel	崔玉涛 Cuiyutao
怀孕之家 Pregnant home	