

Parents' evaluation of the IDEFICS intervention: an analysis focussing on socio-economic factors, child's weight status, and intervention exposure

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ABSTRACT

Introduction: From April 2008 to August 2010 the IDEFICS intervention aimed to encourage healthier diets, higher physical activity levels, and lower stress levels among European children and their families. While the intervention was intended to improve children's health, we also wished to assess whether there were unwelcome aspects or negative side-effects. Therefore all parents of children who participated in the IDEFICS intervention were asked for their views on different aspects of the intervention.

Methods: 10,016 parents of children who participated in the IDEFICS survey and who were involved in the intervention were invited to complete a questionnaire on positive and negative impacts of the intervention. Responses to each of the statements were coded on a four point Likert-type scale. Demographic data were collected as part of the baseline (T₀) and first follow-up (T₁) surveys; intervention exposure data was also collected in the T₁ follow-up survey. Anthropometric data was collected in the same surveys and child's weight status was assessed according to Cole and Lobstein. After initial review of the univariate statistics multilevel logistic regression was conducted to analyse the influence of socio-economic factors, child's weight status and intervention exposure on parental responses.

Results: In total 4,997 responses were received. Approval rates were high, and few parents reported negative effects. Parents who reported higher levels of exposure to the intervention were more likely to approve of it, and were also no more likely to notice negative aspects. Less-educated and lower income parents were more likely to report that the intervention would make a lasting positive difference, but also more likely to report that the intervention had had negative effects. Parents of overweight and obese children were more likely to report

negative effects – above all, that “the intervention had made their child feel as if he/she was ‘fat’ or ‘overweight.’”

Conclusion: While the results represent a broad endorsement of the IDEFICS intervention, they also suggest the importance of vigilance concerning the psychological effects of obesity interventions on overweight and obese children.

Introduction

Obesity is associated with a number of health conditions (1,2), including traditionally later onset diseases, some of which are appearing for the first time in children (3). There is therefore a public health imperative to find interventions that will decrease the prevalence of childhood obesity.

The IDEFICS (Identification and prevention of Dietary- and lifestyle-induced health EFfects In Children and infantS) study aimed to conduct standardised assessments of diet- and lifestyle-related diseases and disorders, and to identify the effects of diet- and lifestyle-related factors on obesity and selected disease pathways. At the same time, it sought to develop, implement, and evaluate a community-oriented intervention to prevent obesity (4).

Rising obesity rates, and the ill-health associated with them, are often a side-effect of social changes that have welcome aspects, such as food plenty, palatable and convenient foods, universal (but largely sedentary) education, and effort-free modes of transport. Obesity interventions must therefore create further social changes, or foster new attitudes and responses to this changed social situation. Either way, there is a risk that attempts to reduce obesity rates will have side-effects (5,6).

This means that evaluating an intervention is not straightforward. An intervention might succeed in preventing obesity or improving health; but if it is widely disliked by those affected, then our overall evaluation must be negative. Alternatively, an intervention might be welcomed by many, but negatively perceived by particular groups within a community. Some authors have worried that obesity interventions might increase stigma or damage self-esteem for those already affected by overweight and obesity (7-9). In this case, benefits to some

might come at the cost of those who already suffer most. Authors have also worried that interventions – especially interventions that focus on behaviour change rather than changes to environments – might be less effective for people of lower socio-economic status (10,11). In that case, interventions would reinforce rather than address patterns of health inequality. (For further discussion, see Voigt et al. (12).)

To assess such risks, we must find out how an intervention is perceived by the people it affects. In this paper, we analyse parents' responses to a questionnaire survey developed to evaluate the IDEFICS intervention. In particular, we investigate whether the intervention was perceived differently by parents whose children were overweight or obese, by parents with lower incomes or lower educational status, and by parents who reported greater exposure to the intervention.

Methods

The IDEFICS study was a large European project that developed, trialed and evaluated a standardised community-oriented obesity intervention. It targeted 2 to 9.9- year- old children across eight European countries (Sweden, Germany, Hungary, Italy, Cyprus, Spain, Belgium, and Estonia).

The intervention and its overall evaluation methodology are described in detail in the introduction to this volume (13). As reported elsewhere (14-16), the intervention was based on six key messages across three domains focusing on diet, physical activity, and coping with stress (15). Key messages within these domains were: enhancing daily consumption of water; enhancing daily consumption of fruit and vegetables; reducing TV viewing; enhancing daily physical activity; spending more time together (as a family); and ensuring adequate sleep

duration. Measures were taken at the level of the community setting, through schools, and via parents to spread these messages and promote ways to change child and family behaviours. These activities, and the potential for positive and negative outcomes from interventions relating to these activities, were the focus of a parental evaluation questionnaire. This questionnaire complements a separate process evaluation which gives data about parents' exposure to the intervention: results of the process evaluation are reported in detail by De Bourdeaudhuij et al. in this issue (17) and incorporated in our analysis below.

Sample

Detailed descriptions of the initial IDEFICS cohort, including sampling approaches, have been published previously (14,18). Here we give only a brief summary.

Locations within each country were identified with the goal of selecting intervention and control regions that were comparable in terms of population demographics as documented by publicly available statistical data. However, the regions were not necessarily representative of the country as a whole. Parents of children eligible for inclusion were identified and recruited through local kindergartens, pre-schools, and primary schools. Approvals from local ethical committees were obtained by each survey centre prior to the surveys.

The IDEFICS baseline (T_0) survey was conducted from September 2007 to May 2008 and enrolled 16,228 children aged between 2 and 9.9 years (response proportion 53.4%). The IDEFICS study sample is comprised of this cohort plus an additional 2,517 children aged 2-9.9 years who were newly recruited during a second survey (T_1 : September 2009 to June 2010) that took place at the end of the intervention. For both intervention and control regions the total cohort size was 18,745.

Our present sample is limited to parents of children in the intervention region: n=10,016. All parents whose children had participated in the study at baseline (T₀) and/or follow-up (T₁) were invited to respond to the present evaluation survey (T₂: October 2010) concerning perceived positive and negative impacts of the intervention. Even if their child did not take part in the T₀ survey, all parents could be expected to have some familiarity with the IDEFICS intervention, since their children had attended a participating school. For parents who responded at T₁ we were also able to gauge their individual exposure by using data from this questionnaire, which specifically asked about parents' awareness of and involvement in the intervention.

Survey administration

While the IDEFICS intervention measures were standardised to facilitate cross-country comparison, the programmes were delivered through school settings (including preschools and kindergartens) and at a community level, specifically allowing for alterations according to local circumstances (15). Given this flexibility, survey administration varied between centres depending on local circumstances.

Questionnaires were distributed at the beginning of October 2010 and parents were asked to return them before the end of October, although in some instances questionnaires were returned at a later date. At each site, multiple reminders were made in order to maximise completion proportions.

Measures

In view of our sample size, a closed questionnaire survey was used. The questions addressed perceptions of the IDEFICS intervention including those aspects that may have made a positive difference to the child or family, and potential negative impacts. Questions and statements were developed from the study objectives (for example, measures aiming to improve sleep, reduce sedentary behaviour, and improve diet), and by considering the broader literature on obesity interventions – with particular consideration given to the possibility that interventions could have stigmatising effects on overweight or obese children, as well as other potential negative aspects such as interference in parents’ and families’ lives (19-22). Responses to each of the statements were coded on a four point Likert-type scale as *agree*, *moderately agree*, *moderately disagree*, or *disagree*.

The survey also asked parents whether they would like to see various aspects of the intervention taken further – the same aspects about which parents were asked if they thought they would make a lasting positive difference (cf. Figure 1). Parental responses were uniformly enthusiastic: agree percentages were in every case higher than with responses to ‘lasting positive difference.’ These responses also showed hardly any significant correlations with our explanatory variables, and are therefore omitted from our reporting below.

Demographic data were collected as part of the T₀ and T₁ surveys. Parental attributes included: educational level, recorded using the International Standard Classification of Education (ISCED) (23) and coded as 0/1/2 (*early childhood education, primary education, or lower secondary education*), 3 (*upper secondary education*), 4 (*post-secondary, non-tertiary education*) or 5/6 (*short-cycle tertiary education, bachelor’s or equivalent*); and parent income level (country-specific categories based on the average net equivalence

income) (14,24). Child-level variables included child's weight status defined as underweight/normal weight, overweight or obese (at T₀ if available, or at T₁ for newly recruited children at T₁) according to Cole and Lobstein (25). Finally, we also considered the intensity of exposure for families/parents to the IDEFICS intervention based on data gathered at T₁. As detailed in the present issue (17), an exposure composite score was computed for each responding parent. Drawing on separate responses for school and community level exposures, we calculated the following sum: frequency with which the responding parent had heard of the intervention (1=*every week*, 0.25=*every month*, 0.13=*5-9 times a year*, 0.04=*1-4 times a year*, 0=*never*), whether the respondent had noticed efforts made with regard to each of the six key messages (1=*yes*, 0=*no*), and whether the respondent had been involved in each of the six key messages (1=*yes*, 0=*no*). This resulted in two ranges (0-13) for school and community levels. For the present analysis, we added both scores to create an overall index of intervention exposure (0-26), and subdivided the results into tertiles, indicating a low, medium, or high level of exposure for each responding parent.

A missing value for an outcome variable (that is, a response to the questions we asked regarding parents' evaluation of the intervention) led to an exclusion for the analysis of that specific question (i.e. case-wise deletion). Since the size of the group with a missing outcome was relatively small (approx. 2%), the bias that might be introduced by omitting these subjects is negligible. On the other hand, missing values for the explanatory variables (that is, the variables included within our multivariate model, including socio-economic factors and intervention exposure) were coded as an additional category. This allowed us to assess whether missingness within the explanatory variables was associated with responses to the survey questions.

Data accuracy was ensured using double data-entry with a resulting comparison database for conflicting data. Invalid entries were listed by the coordinating centre and returned to the relevant survey centre where they were manually checked and compared with the original questionnaire.

Data analysis

In the first instance we assessed scaled responses to the statements using univariate frequency counts in a purely descriptive manner. We then carried out a multilevel logistic regression. All models were conducted using the Proc Glimmix procedure in SAS (SAS 9.3, Cary, NC). For statements that suggest positive approval of the intervention, the outcome variable was the dichotomised response of full agreement (*agree*) versus other responses (*moderately agree*, *moderately disagree*, or *disagree*) to individual statements. This was done in order to identify variables that were significantly associated with definite support for the statement, and also to ease interpretation. We adopted a different approach for statements concerning negative aspects of the intervention, since so few parents (less than 5%) responded *agree* (as opposed to *moderately agree*) (see Figure 2). In order to achieve more stable results in our regression models, both agreement categories were combined for the negative items. If anything, then, our model tends to understate positive responses to the intervention and to overstate negative views.

To take account (at least to some degree) for multiple testing, i.e. to minimise false-positive findings, we used a type 1 error rate of $\alpha=0.01$. That is, for all statements odds ratios (ORs) and corresponding 99%-confidence intervals (99%-CIs) were derived for each of the included explanatory variables, with clustering by country modelled as a random intercept.

Given the large number of variables collected, a process of pre-selection was required in order to derive a mathematically functional model. We included the following explanatory variables simultaneously in the model:

- Parent's educational level and parental income level, in line with broader concerns that interventions might be less helpful for people of lower socio-economic groups (10-12).
- Child's weight status defined as underweight/normal weight, overweight or obese (at T₀ if available; at T₁ for children newly recruited then) (25), in line with concerns that obesity interventions might have stigmatising or other unwelcome effects on children of higher weight status and/or their parents (7-9).
- Survey participation (T₀ and/or T₁), in order to see whether families who declined to participate in the T₁ survey, or who joined at T₁, had different perceptions of the intervention.
- Parental level of exposure to the IDEFICS intervention, as described above, in order to see whether greater exposure was associated with more or less favourable responses.

Upon review of the univariate analyses and initial regression coefficients, *parental sex*, *sex of the child* and *parental perception of child's weight status* did not show any notable additional effect (data not shown). These were therefore excluded from our final model and subsequent analyses.

We also considered the hypothesis that changes in the child's actual or perceived weight status would affect parents' responses to the intervention. However, and perhaps surprisingly, analyses based both on objective BMI z-score alterations and on parental perception of weight status change showed that this was not a sizable or consistent factor (data not shown): for

example, even where children gained in weight status or parents perceived their child to have done so, this did not seem to generate any higher levels of disapproval for the intervention. Therefore, we again excluded these factors from the analysis reported here.

Results

Of the 10,016 parents from all IDEFICS intervention regions, 4,997 (49.9%) completed the post-intervention survey at T₂ (see Table 1). In this sample, the proportion of boys and girls was approximately equal. The majority of the questionnaires (approximately 85%) were answered by mothers. About three quarters of the families (72.6%) had previously participated in both the T₀ and the T₁ surveys. There was a slight gradient in response patterns, with proportionately fewer responses by less educated and lower income parents. Higher weight status of the child was only marginally associated with lack of response at T₂.

[Table 1 here]

Aspects likely to make a lasting positive difference

When asked about specific aspects of the IDEFICS study that were likely to make a lasting positive difference to their child's or their family's behaviour, parents were generally positive about most aspects (see Figure 1). Overall, support was high; almost three quarters of participants indicated that they agreed or moderately agreed that the IDEFICS intervention had a positive effect on each of the aspects. Most support was garnered for interventions relating to diet (89% agreed to some degree that education of children on healthy lifestyles would have a lasting positive effect, while 88% agreed to some degree that increased consumption of fruit and vegetables in the school/kindergarten would have a lasting positive

effect). There was also a very high level of support for interventions relating to physical activity; 74% agreed to some degree that an improved playground and/or better opportunities for physical activity would have a lasting positive effect, and 76% believed that better physical education classes and activities in the school/kindergarten would have a lasting positive effect.

[Figure 1 here]

Logistic regression analyses indicated that several variables were significantly associated with likelihood of agreement with the statements. While the significance of association varied by question, there was a clear and notable trend. Respondents of lower educational level, or of lower income, were more likely to agree that the IDEFICS intervention had had a positive effect than those respondents of higher educational attainment or higher income (Table 2).

[Table 2 here]

Less educated parents (maximum educational level of 0, 1, or 2, as classified by ISCED) were significantly more likely to agree that the following aspects of the IDEFICS study would have a lasting positive effect: improved play-grounds and better opportunity for physical activity (OR = 1.87, 99%-CI = 1.27-2.74); better physical education classes and activities in the school/kindergarten (OR = 1.62, 99%-CI = 1.11-2.38); and providing and promoting drinking water in the school/kindergarten (OR = 1.67, 99%-CI = 1.14-2.48). Similar trends and effects were seen for parents with ISCED level 3 and for low income families (see Table 2).

Regression analyses indicated no statistically significant differences in agreement based on whether participants were recruited during the T₀ or T₁ phase, nor by child weight status.

However, there was a general trend, with increased child weight status, for higher levels of

agreement to each of the statements. There was also a statistically significant association between agreement with each statement and increasing level of intervention exposure.

Aspects experienced as negative

As shown in Figure 2, the vast majority of parents felt that there were no negative aspects to the intervention, with roughly 90% of responding parents disagreeing with the statements to some degree.

[Figure 2 here]

Most concern was raised by the tests and/or collection of biological samples from children, with 14% (n=690) indicating that this had negative aspects. Notably, this view was more often reported by parents who refused to participate in the T₁ survey (23.1%), resulting in an OR of 1.95 (99%-CI: 1.26-3.02) as compared to parents participating in both surveys (Table 3).

[Table 3 here]

Approximately 7-8% of the parents indicated that the interventions regarding nutrition, physical activity, or watching TV were in some way unwelcome or stressful, while 10% perceived the intervention as conveying a critical judgment about their parenting. In all cases, the strongest objections regarding the IDEFICS intervention were expressed by parents with obese children, and to a lesser extent those with overweight children. Sizable minorities of the former complained that the intervention had made their child feel as if he/she was 'fat or overweight' (33%), or 'unhealthy' (15%). These proportions were much higher than those reported by parents with normal weight/thin children (4-5%) resulting in significantly and

strongly elevated ORs of approximately 10 (feeling fat or overweight, 99%-CI: 6.34-15.72) and 4 (feeling unhealthy, 99%-CI: 2.31-7.11), as shown in Table 3.

For most statements, parents of lower income or education level tended to report negative effects more often. Only a few parents (4.6%), for example, felt that the expectation to alter their child's sleeping habits was stressful, but this concern was mostly reported by parents with low education (11.3%) or low income (8.4%). Unsurprisingly, financial concerns were mentioned about twice as often by parents with low (OR: 2.18; 99%-CI: 1.15-4.11) or low to medium income (OR: 2.01; 99%-CI: 1.10-3.69) as compared to parents with a high income level. Again, and also unsurprisingly, parents who declined to participate in the T₁ survey were also more likely to perceive negative aspects to the intervention. There was no association between level of exposure and perceived negative aspects of the study: that is, parents who were more aware of various aspects of the intervention were no more likely to report negative perceptions.

Overall evaluation of the intervention

As shown in Figure 3, the vast majority of parents indicated overall approval for the IDEFICS intervention. By comparison, perceptions of the effectiveness of the intervention were somewhat lower and even neutral on some counts.

[Figure 3 here]

Again, diet-related information was the most strongly welcomed aspect, with 73% of parents indicating that the intervention had helped them know more about healthy eating. However, the intervention was felt to be less enabling in other areas, with over half of parents disagreeing that the intervention helped their child to watch less TV, and almost half feeling

that the intervention had not helped their child to sleep well. Surprisingly, given the widespread support for physical activity aspects of the intervention, almost 40% of parents disagreed that the intervention had helped their child be more active.

[Table 4 here]

More detailed analysis shows that the intervention was much more likely to be perceived as enabling by lower income parents and, even more so, by less educated parents (Table 4).

Interestingly, parents who had decided to become involved in the IDEFICS study at T₁ (as opposed to T₀) more often felt that particular aspects of the intervention had been helpful – perhaps suggesting that the intervention specifically motivated some to take part in the T₁ survey. Given the strong pattern of unfavourable responses (i.e. agreement with statements critical of the intervention) among parents of obese or overweight children, it is interesting to note that these parents also showed a slight tendency to agree more often with statements connoting approval of the intervention.

As with the positive aspects of the intervention, parents' overall evaluations were positively associated with level of exposure: parents with a greater level of exposure were significantly more likely to agree that the intervention was enabling for them. By contrast, and in line with our earlier results, responses to the statement 'the study also had negative effects' were not associated with level of exposure.

Discussion

This paper reports our analysis of parents' views of the IDEFICS intervention. All these parents had previously participated by filling in questionnaires about themselves and their

child, by allowing the child to participate in various survey measures, and had been exposed to the intervention in varying degrees. To the best of our knowledge, the IDEFICS study is unique among large-scale, multi-level interventions in seeking such a wide range of evaluative feedback from those affected. In general, we found that parents welcomed all aspects of the intervention and thought it would make a lasting positive difference in terms of each of the intervention's key messages. Beyond this broad endorsement of the IDEFICS intervention, however, our analysis shows some interesting trends and exceptions. In what follows, we discuss: the role of intervention exposure; trends relating to socio-economic status; differences in approval levels for different aspects of the intervention; the trends to greater disapproval among parents of overweight and obese children; differences in approval levels among parents who declined to participate in the T₁ follow-up; and, not least, some limitations inherent in our methods.

Intervention exposure and parental attitudes

The most striking and consistent of our findings is that parents who reported greater awareness of the intervention invariably showed higher approval ratings. At the same time, they were no more likely to report negative perceptions. Our data do not permit us to judge the direction of causality here, but most likely it goes in both directions: Parents who, for whatever reason, started with an unfavourable attitude to the intervention would obviously be less inclined to take up or get involved in IDEFICS intervention activities, and therefore likely to report lower exposure. At the same time, and especially given the overall strength of approval, it is also reasonable to suppose that many parents were inclined to approve of the intervention, the more they heard about it and got involved.

Greater perceived benefits for parents of lower socioeconomic status

An especially welcome finding of our analysis is that parents of lower income or education were more likely to evaluate the intervention favourably. As we mentioned in our introduction, some fear that community-level interventions – especially those that focus on behaviour change – are likely to be less effective for families of lower socio-economic status (10-12). Our findings do not speak directly to this worry. Indeed, in one sense the worry does not arise for the IDEFICS study, since the intervention did not prove effective in reducing children's BMI z-scores in the T₀-T₁ timeframe (although, as noted below, it did appear to promote weight normalization in children who were already overweight) (26,27).

Nonetheless, less educated and lower income parents were more likely to report that the intervention would make a lasting positive difference to various aspects of their family's or child's behaviour. (In this connection, it may be worth noting that parents with lower incomes and education levels were more likely to report higher exposure to the intervention than parents with higher income (data not shown), perhaps reflecting the special efforts made by intervention teams to reach parents of lower socio-economic status.) Of course, these findings need to be corroborated by empirical data regarding actual behaviour and eventual health outcomes – data that will be obtained as the cohort of children are followed into adolescence as part of the I.Family study. Still, the present analysis provides grounds for hoping that the IDEFICS intervention will promote the longer-term health of children who, given their socio-economic background, could otherwise expect a greater burden of ill-health.

Differences in approval levels for different aspects of the intervention

It was notable that parents were more welcoming of diet-related information than aspects centred on physical activity and stress coping strategies. This mirrors findings from the process evaluation that, of the IDEFICS key messages, parents were most exposed to and involved in efforts to increase fruit and vegetable consumption (17). The finding that other

aspects, such as reducing TV viewing or increasing sleep, were not as well received may be caused by several factors.

With regard to physical activity and limiting screen time, the fact that intervention components were largely based on educational messages and advice to support family-based behaviour change (16) may play a role. That is, responding to some of the key messages may (be perceived as) requiring more support from structural or environmental factors. For example, a substantial minority of parents in the present study disagreed that the intervention had helped their child be more active. Parents may not feel able to increase the amount of outdoor play children engage in or to reduce time watching television unless the perceived safety of the neighbourhood is improved (28-30) or there are more and better spaces available for children to play in (29-31). In a systematic review of studies to reduce television viewing in children, for example, Schmidt et al. found that of four school-based education studies involving young children (under 6 years), only one significantly reduced television watching (somewhat better results were found with children aged 6 to 12 years) (32). When structural changes have been implemented, however, they have been shown to significantly reduce television viewing (32). Given its timescale and resources, however, the IDEFICS intervention could only make modest environmental changes, such as alterations to school food provision or play facilities.

With regard to sleep time and spending time together, we cannot (again) offer definitive explanations. It is, however, perhaps worth remarking that these messages are the least ‘obvious’ of the IDEFICS key messages: while physical activity and diet are widely perceived as important factors in obesity and ill-health, the importance of adequate sleep time and the role of stress or relaxation have been much less widely promoted. It should not be surprising, then, that parents were less likely to think the intervention was helpful in these regards.

Responses by parents of overweight and obese children

Various authors have raised the concern that obesity prevention measures might have stigmatising effects on overweight people, or prove less helpful for them (7-9). In this regard, our findings do not provide grounds for optimism. Agreement responses regarding negative aspects were significantly associated with child weight status. Parents of obese children were more likely than other parents to dislike various intervention components. (For example: to feel that the intervention implied some criticism of their parenting, or interfered in family life, or to experience stress as a result of expectations to change diet or physical activity patterns.)

Even more starkly, parents of overweight and obese children were far more likely to agree that “The intervention has made my child feel as if he/she was ‘fat’ or ‘overweight’” and that “The intervention has made my child feel that he/she is unhealthy”. In both cases the odds ratios of agreement for parents of obese children were substantially raised, with parents of obese children almost 10 times more likely to agree that the intervention made their child feel fat and 4 times as likely that it made their child feel unhealthy. Since parents of overweight and obese children tend to underestimate their child’s weight status (17), some may feel that these figures reflect a welcome increase in awareness of the child’s weight status, along with its potential health implications. Against a background of widespread stigma and discrimination, however, these findings also suggest cause for concern about the effects on children’s self-esteem and body confidence (18). As two of the present authors have argued elsewhere (12), parents of heavier children face a very difficult combination of duties, given the widespread bullying, shame and exclusion that such children so often suffer. While they are expected to help their child reduce his or her weight status, they also have a clear obligation to protect or defend their child’s confidence in his or her own body.

This said, we should be cautious in interpreting these figures as reflecting on the intervention itself. While one third of parents of obese children expressed concern (*agree* or *moderately agree*) about their child's feeling fat or overweight as a result of the intervention, the majority did not. Moreover, our data show that greater intervention exposure was *not* associated with more negative responses. This may suggest that it was not so much the intervention itself that gave rise to such concerns, but rather the fact of being involved in a study that weighed children (among other physical investigations) and had obesity prevention as an explicit concern (even though health rather than obesity was presented as the main focus of the intervention). We might also bear in mind the welcome findings reported by Lissner et al. in the present volume about the intervention's success in secondary prevention (26). That is, while the intervention did not (as noted above) succeed in its primary prevention goals, there was a tendency for children who were overweight or obese at T₀ to reduce their BMI z-score level during the intervention. Furthermore, it was notable that parents of overweight and obese children tended to score higher in terms of intervention exposure (data not shown). These points notwithstanding, it is still true that our findings suggest a continued need for vigilance with respect to how body weight is assessed, reported and responded to in surveys and interventions, and to the possible negative effects that interventions to prevent obesity may have for children of higher weight status (20,33,34). Not least, it is always worth remembering that for many overweight and obese children, the immediate problem their weight poses is not specific health effects, but the daily shame and exclusion that arises from widespread prejudice and stigmatisation.

Differences in approval levels among parents who declined to participate follow-up

Like other longitudinal cohorts, the IDEFICS study has suffered from loss of participants over time. As Hense et al. discusses, there were distinctive patterns in these losses between

baseline (T_0) and follow-up (T_1) surveys: if the child was overweight or obese, or if parents were less educated, or single, then the family was more likely to drop out of the study (35). Although we see similar patterns in terms of (non-)responses to the T_2 evaluation survey, one welcome aspect was the sizeable number of responses from parents who had declined to participate in the follow-up survey.

While this sub-sample (20% of those who dropped out) is unlikely to be representative, our data does point to one factor that helps to explain non-participation. These parents were no less likely to welcome different aspects of the intervention – if anything, the reverse was true. But they were roughly twice as likely (OR = 1.95, 99%-CI = 1.26-3.02) to agree that the tests and collection of biological samples were stressful for their child. Testing and sample collection were not part of the intervention itself, and they were also undertaken with all children in the control arm of the study. Nonetheless, we included this item in the questionnaire partly because children's experience of these aspects represents an important question in research ethics, and also because of the suspicion – borne out by these results – that dislike of the tests was an important element in discouraging participation in further surveys, and hence in overall cohort attrition.

Parents who declined to participate at follow up were also more likely to agree that: the intervention interfered in family life; that their child was made to feel fat or overweight; and that an expectation to change their child's diet was stressful. As our findings also show, parents of lower income or educational levels were more likely perceive negative aspects to the intervention. However, we should not take these patterns of perceptions as explanations for decisions not to participate at follow-up. In the first place, as Hense et al. discusses, attrition rates were no higher in the intervention region than in the control regions (35). Second, and as already discussed, the tendency to more negative perceptions among parents

of lower income or education was more than offset by a tendency among parents in these same groups to evaluate the intervention more favourably.

Limitations and conclusion

Before concluding, we should register some limitations of our methodology. Our sample size dictated the use of a closed questionnaire, so that parents did not have chance to indicate negative (or positive) effects that were not already anticipated by our statements. Since the questions were answered by parents, children were not able to offer their opinions. Similarly, many families in the intervention regions chose not to participate in either baseline or follow-up, but were still affected by various aspects of the intervention, and our survey did not give them opportunities to offer feedback. Furthermore, while our analyses did account for exposure to the IDEFICS intervention, our composite measure did not differentiate between different aspects of exposure or explore qualitative differences.

These limitations notwithstanding, our data still provide a very comprehensive indication of parental perceptions. They show impressively high approval ratings for the intervention, and very limited negative perceptions. Moreover, we find a clear positive association with exposure, with increasing support for the intervention being associated with higher levels of exposure, but no increases in negative responses. We therefore believe that there are good grounds for confidence that the IDEFICS intervention was very welcome to the families and communities involved. At the same time, parents of overweight and obese children were more likely to reply that the intervention had had negative effects on their child. It remains, therefore, an important priority to ensure that interventions operate in a way that is as supportive as possible of these children.

References

1. Lobstein T, Baur L, Jackson-Leach R. The childhood obesity epidemic. In: Waters E, Swinburn BA, Seidell JC, Uauy R (eds). *Preventing childhood obesity: evidence, policy and practice*. Blackwell: London, 2010, pp 3-14.
2. Lobstein T, Baur L, Uauy R, for the IASO International Obesity TaskForce. Obesity in children and young people: a crisis in public health. *Obes Rev* 2004; **5**: 4-85.
3. Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus – present and future perspectives. *Nat Rev Endocrinol* 2012; **8**: 228-236.
4. Ahrens W, Bammann K, de Henauw S *et al.*, on behalf of the European Consortium of the IDEFICS Project. Understanding and preventing childhood obesity and related disorders – IDEFICS: a European multilevel epidemiological approach. *Nutr Metab Cardiovasc Dis* 2006; **16**: 302-308.
5. Lumeng JC, Appugliese D, Cabral HJ, Bradley RH, Zuckerman B. Neighborhood safety and overweight status in children. *Arch Pediatr Adolesc Med* 2006; **160**: 25-31.
6. Austin SB. Fat, loathing and public health: the complicity of science in a culture of disordered eating. *Cult Med Psychiatry* 1999; **23**: 245-268.
7. Bacon L, Aphramor L. Weight science: evaluating the evidence for a paradigm shift. *Nutr J* 2011; **10**: 9.
8. Maclean LM, Meyer M, Walsh A *et al.* Stigma and BMI screening in schools, or 'Mom, I hate it when they weigh me'. In: O'Dea JA, Eriksen M (eds). *Childhood obesity prevention: international research, controversies and interventions*. Oxford University Press: Oxford, 2010, pp 17-30.

9. O'Dea J. Developing positive approaches to nutrition education and the prevention of child and adolescent obesity: First, do no harm. In: O'Dea J, Eriksen M (eds). *Childhood obesity prevention: international research, controversies and interventions*. Oxford University Press: Oxford, 2010, pp 31-41.
10. Beauchamp A, Backholer K, Magliano D, Peeters A. The effect of obesity prevention interventions according to socioeconomic position: a systematic review. *Obes Rev* 2014; **15**: 541-554.
11. Swinburn B. Closing the disparity gaps in obesity. *Int J Epidemiol* 2009; **38**: 509-511.
12. Voigt K, Nicholls SG, Williams G. *Childhood obesity: ethical and policy issues*. Oxford University Press: New York, 2014.
13. Pigeot I, Baranowski T, De Henauw S, the IDEFICS Intervention Study Group, on behalf of the IDEFICS consortium. The IDEFICS intervention trial to prevent childhood obesity: design and study methods. *Obes Rev Suppl* 2015; **??/?**: ??-??.
14. Ahrens W, Bammann K, Siani A *et al.*, on behalf of the IDEFICS consortium. The IDEFICS cohort: design, characteristics and participation in the baseline survey. *Int J Obes Suppl* 2011; **35/1**: S3-S15.
15. De Henauw S, Verbestel V, Mårild S *et al.*, on behalf of the IDEFICS consortium. The IDEFICS community-oriented intervention programme: a new model for childhood obesity prevention in Europe? *Int J Obes Suppl* 2011; **35/1**: S16-S23.
16. Verbestel V, De Henauw S, Maes L *et al.* Using the intervention mapping protocol to develop a community-based intervention for the prevention of childhood obesity in a multi-centre European project: the IDEFICS intervention. *Int J Behav Nutr Phys Act* 2011; **8**: 82.
17. De Bourdeaudhuij I, Verbestel V, De Henauw S *et al.*, on behalf of the IDEFICS consortium. Implementation of the IDEFICS intervention across European countries: perceptions of parents and relationship with BMI. *Obes Rev Suppl* 2015; **??/?**: ??-??.

18. Bammann K, Peplies J, Sjöström M *et al.*, on behalf of the IDEFICS consortium. Assessment of diet, physical activity and biological, social and environmental factors in a multi-centre European project on diet- and lifestyle-related disorders in children (IDEFICS). *J Public Health* 2006; **14**: 279-289.
19. Daniëlsdóttir S, O'Brien KS, Ciao A. Anti-fat prejudice reduction: a review of published studies. *Obes Facts* 2010; **3**: 47-58.
20. Campos P. *The obesity myth*. Gotham Books: New York, 2004.
21. Oliver JE. *Fat politics*. Oxford University Press: Oxford, 2006.
22. Furedi F. *Paranoid parenting*. Chicago Review Press: Chicago, 2002.
23. UNESCO. ISCED: International Standard Classification of Education. [WWW document]. URL <http://www.uis.unesco.org/Education/Pages/international-standard-classification-of-education.aspx> (accessed June 2015).
24. Bammann K, Gwozdz W, Lanfer A *et al.*, on behalf of the IDEFICS consortium. Socioeconomic factors and childhood overweight in Europe: results from the multi-centre IDEFICS study. *Pediatr Obes* 2013; **8**: 1-12.
25. Cole TJ, Lobstein T. Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. *Pediatr Obes* 2012; **7**: 284-294.
26. Lissner L, De Bourdeaudhuij I, Konstabel K *et al.*, on behalf of the IDEFICS consortium. Differential outcome of the IDEFICS intervention in overweight versus non-overweight children. Did we achieve “primary” or “secondary” prevention? *Obes Rev Suppl* 2015; **??/?**: **??-??**.
27. De Henauw S, De Bourdeaudhuij I, Huybrechts I *et al.*, on behalf of the IDEFICS consortium. Effects of a community-oriented obesity prevention programme on body fatness in preschool and primary school children. Main results from the IDEFICS study. *Obes Rev Suppl* 2015; **??/?**: **??-??**.

28. Slater A, Bowen J, Corsini N, Gardner C, Golley R, Noakes M. Understanding parent concerns about children's diet, activity and weight status: an important step towards effective obesity prevention interventions. *Public Health Nutr* 2010; **13**: 1221-1228.
29. Mytton OT, Townsend N, Rutter H, Foster C. Green space and physical activity: an observational study using Health Survey for England data. *Health Place* 2012; **18**: 1034-1041.
30. Wolch J, Jerrett M, Reynolds K *et al*. Childhood obesity and proximity to urban parks and recreational resources: a longitudinal cohort study. *Health Place* 2011; **17**: 207-214.
31. Sallis JF, Floyd MF, Rodríguez DA, Saelens BE. Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation* 2012; **125**: 729-737.
32. Schmidt ME, Haines J, O'Brien A *et al*. Systematic review of effective strategies for reducing screen time among young children. *Obesity* 2012; **20**: 1338-1354.
33. Falconer CL, Park MH, Croker H *et al*. The benefits and harms of providing parents with weight feedback as part of the national child measurement programme: a prospective cohort study. *BMC Public Health* 2014; **14**: 549.
34. Grimmett C, Croker H, Carnell S, Wardle J. Telling parents their child's weight status: psychological impact of a weight-screening program. *Pediatrics* 2008; **122**: e682-e688.
35. Hense S, Pohlabein H, Michels N *et al*. Determinants of attrition to follow-up in a multicentre cohort study in children – results from the IDEFICS study. *Epidemiol Res Int* 2013; **2013**: 936365.

TABLES AND FIGURES

Table 1: Country-specific sociodemographic characteristics of the study sample

Descriptive statistics of the database	ITA		EST		CYP		BEL		SWE		GER		HUN		ESP		All	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Sex of the child																		
Male	516	52.2	409	47.8	242	47.3	288	48.2	239	52.4	193	51.7	342	45.5	223	48.1	2452	49.1
Female	473	47.8	446	52.2	270	52.7	309	51.8	217	47.6	180	48.3	409	54.5	241	51.9	2545	50.9
Parental sex																		
Missing	30	3.0	31	3.6	35	6.8	9	1.5	4	0.9	3	0.8	6	0.8	14	3.0	132	2.6
Male	120	12.1	72	8.4	96	18.8	78	13.1	78	17.1	46	12.3	66	8.8	70	15.1	626	12.5
Female	839	84.8	752	88.0	381	74.4	510	85.4	374	82.0	324	86.9	679	90.4	380	81.9	4239	84.8
Parent's maximum educational level according to ISCED (International Standard classification of education)																		
Missing	20	2.0	36	4.2	42	8.2	23	3.9	3	0.7	13	3.5	12	1.6	3	0.6	152	3.0
Level 0/1/2	196	19.8	16	1.9	19	3.7	29	4.9	1	0.2	92	24.7	30	4.0	27	5.8	410	8.2
Level 3	611	61.8	343	40.1	46	9.0	164	27.5	61	13.4	93	24.9	316	42.1	110	23.7	1744	34.9
Level 4	0	0	333	38.9	150	29.3	120	20.1	45	9.9	88	23.6	68	9.1	44	9.5	848	17.0
Level 5/6	162	16.4	127	14.9	255	49.8	261	43.7	346	75.9	87	23.3	325	43.3	280	60.3	1843	36.9
Parent's income-Level (country-specific categories based on the average net equivalence income)																		
Missing	128	12.9	58	6.8	198	38.7	118	19.8	13	2.9	34	9.1	241	32.1	23	5.0	813	16.3
Low income	430	43.5	90	10.5	81	15.8	26	4.4	5	1.1	41	11.0	54	7.2	17	3.7	744	14.9
Low/medium income	281	28.4	129	15.1	32	6.3	83	13.9	17	3.7	84	22.5	108	14.4	41	8.8	775	15.5
Medium income	129	13.0	153	17.9	73	14.3	214	35.8	165	36.2	151	40.5	122	16.2	128	27.6	1135	22.7
Medium/high income	15	1.5	159	18.6	65	12.7	95	15.9	107	23.5	39	10.5	102	13.6	126	27.2	708	14.2
High income	6	0.6	266	31.1	63	12.3	61	10.2	149	32.7	24	6.4	124	16.5	129	27.8	822	16.4
Survey participation*																		
T0+, T1-	166	16.8	111	13.0	44	8.6	0	0	5	1.1	55	14.7	167	22.2	3	0.6	551	11.0
T0-, T1+	98	9.9	166	19.4	134	26.2	158	26.5	9	2.0	29	7.8	216	28.8	10	2.2	820	16.4
T0+, T1+	725	73.3	578	67.6	334	65.2	439	73.5	442	96.9	289	77.5	368	49.0	451	97.2	3626	72.6
Child's weight status (according to Cole & Lobstein, 2012)																		
Normal/Thin	589	59.6	744	87.0	392	76.6	539	90.3	396	86.8	331	88.7	639	85.1	385	83.0	4015	80.3
Overweight	221	22.3	82	9.6	81	15.8	52	8.7	45	9.9	33	8.8	71	9.5	61	13.1	646	12.9
Obese	179	18.1	29	3.4	39	7.6	6	1.0	15	3.3	9	2.4	41	5.5	18	3.9	336	6.7
Intervention exposure																		
Missing	203	20.5	128	15.0	445	86.9	59	9.9	129	28.3	193	51.7	751	100.0	17	3.7	1925	38.5
Low exposure	184	18.6	260	30.4	34	6.6	166	27.8	206	45.2	77	20.6	0	0	93	20.0	1020	20.4
Medium Exposure	243	24.6	285	33.3	20	3.9	194	32.5	76	16.7	60	16.1	0	0	156	33.6	1034	20.7
High Exposure	359	36.3	182	21.3	13	2.5	178	29.8	45	9.9	43	11.5	0	0	198	42.7	1018	20.4
All	989	100.0	855	100.0	512	100.0	597	100.0	456	100.0	373	100.0	751	100.0	464	100.0	4997	100.0

* T₀+: parents participated in the baseline survey (T₀); T₁+: parents participated in the follow up (T₁)

Table 2: Percentage of parents agreeing with a series of statements given in response to the following question: *Do you think the following aspects of the IDEFICS intervention will make a lasting positive difference to your child's behaviour and/or your family's behaviour?*

	Education of children on healthy lifestyles		Improved playground and better opportunities for physical activity		Better physical education classes and activities in the school/kindergarten		Providing and promoting drinking water in the school/kindergarten		Increased consumption of fruit and vegetables in the school/kindergarten		Information for parents on healthy lifestyles	
	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**
Parent's maximum educational level according to ISCED (International Standard classification of education)												
Missing	70.1	1.35 (0.74-2.47)	57.8	1.78 (1.00-3.16)	54.4	1.42 (0.80-2.52)	60.3	1.49 (0.83-2.66)	68.7	1.27 (0.69-2.32)	59.9	1.09 (0.61-1.96)
Level 0/1/2	73.3	1.47 (0.99-2.19)	60.2	1.87 (1.27-2.74)	59.4	1.62 (1.11-2.38)	67.7	1.67 (1.14-2.48)	71.9	1.34 (0.89-2.00)	66.0	1.27 (0.86-1.86)
Level 3	68.3	1.41 (1.12-1.78)	52.1	1.56 (1.23-1.97)	54.3	1.60 (1.27-2.02)	59.9	1.47 (1.16-1.85)	67.3	1.27 (1.00-1.61)	60.4	1.21 (0.96-1.53)
Level 4	51.2	1.01 (0.77-1.32)	36.8	1.26 (0.95-1.66)	37.2	1.30 (0.98-1.72)	46.1	1.31 (1.00-1.71)	49.8	0.91 (0.70-1.20)	44.7	0.95 (0.73-1.25)
Level 5/6	52.4	1.0 (reference)	35.8	1.0 (reference)	37.4	1.0 (reference)	46.4	1.0 (reference)	56.2	1.0 (reference)	49.0	1.0 (reference)
Parent's income-Level (country-specific categories based on the average net equivalence income)												
Missing	70.5	1.57 (1.11-2.21)	56.4	1.50 (1.05-2.12)	57.8	1.53 (1.08-2.16)	62.5	1.24 (0.88-1.75)	69.7	1.36 (0.96-1.92)	62.9	1.32 (0.94-1.86)
Low income	75.8	1.33 (0.92-1.92)	64.5	1.66 (1.15-2.39)	65.1	1.51 (1.05-2.18)	70.7	1.43 (1.00-2.06)	76.2	1.40 (0.97-2.03)	71.7	1.39 (0.96-1.99)
Low to medium income	68.3	1.36 (0.98-1.88)	51.8	1.44 (1.03-2.03)	53.0	1.35 (0.96-1.89)	58.8	1.14 (0.82-1.59)	68.1	1.40 (1.00-1.94)	60.5	1.25 (0.90-1.74)
Medium income	55.3	1.2 (0.90-1.58)	37.9	1.20 (0.89-1.62)	39.1	1.13 (0.84-1.53)	49.4	1.06 (0.80-1.42)	54.3	1.06 (0.80-1.40)	46.6	1.05 (0.80-1.40)
Medium to high income	47.6	0.96 (0.71-1.29)	31.6	1.06 (0.76-1.47)	33.9	1.11 (0.80-1.53)	42.9	1.01 (0.75-1.38)	53.2	1.13 (0.84-1.52)	45.8	1.11 (0.82-1.50)
High income level	44.7	1.0 (reference)	26.9	1.0 (reference)	28.1	1.0 (reference)	37.2	1.0 (reference)	46.0	1.0 (reference)	40.1	1.0 (reference)
Participation status												
T0+ / T1-	65.4	1.13 (0.78-1.62)	50.7	1.11 (0.78-1.60)	51.3	1.03 (0.72-1.47)	54.3	0.96 (0.68-1.37)	63.8	1.04 (0.72-1.49)	57.1	0.96 (0.67-1.37)
T0- / T1+	61.3	0.93 (0.70-1.22)	48.9	1.10 (0.84-1.46)	50.4	1.11 (0.84-1.47)	57.1	1.07 (0.81-1.41)	63.8	1.05 (0.79-1.40)	56.0	1.01 (0.77-1.34)
T0+/T1+	58.8	1.0 (reference)	42.3	1.0 (reference)	43.6	1.0 (reference)	52.1	1.0 (reference)	59.5	1.0 (reference)	53.0	1.0 (reference)
Child's weight status (according to Cole & Lobstein, 2012)												
Normal/thin	57.8	1.0 (reference)	42.2	1.0 (reference)	43.0	1.0 (reference)	51.3	1.0 (reference)	58.3	1.0 (reference)	51.5	1.0 (reference)
Overweight	66.3	1.04 (0.78-1.39)	50.2	0.96 (0.72-1.29)	53.8	1.09 (0.81-1.45)	59.3	1.03 (0.77-1.37)	68.1	1.11 (0.82-1.49)	62.1	1.10 (0.82-1.47)
Obese	74.1	1.13 (0.74-1.74)	57.5	0.96 (0.64-1.42)	59.8	1.00 (0.67-1.50)	63.8	0.95 (0.63-1.43)	73.9	1.11 (0.72-1.71)	66.9	0.98 (0.65-1.48)

Intervention exposure												
Missing	62.9	1.26 (0.90-1.76)	50.2	1.61 (1.14-2.28)	51.5	1.70 (1.21-2.40)	56.0	1.62 (1.16-2.26)	63.5	1.76 (1.26-2.46)	58.0	1.53 (1.09-2.13)
Low exposure	44.9	1.0 (reference)	29.5	1.0 (reference)	30.7	1.0 (reference)	38.4	1.0 (reference)	44.4	1.0 (reference)	37.6	1.0 (reference)
Medium exposure	57.4	1.51 (1.14-2.00)	38.6	1.45 (1.07-1.96)	41.3	1.59 (1.17-2.15)	50.0	1.59 (1.19-2.13)	59.4	1.74 (1.31-2.31)	49.7	1.56 (1.17-2.07)
High exposure	72.1	2.57 (1.91-3.47)	53.6	2.41 (1.77-2.28)	53.6	2.28 (1.67-3.10)	65.7	2.76 (2.04-3.74)	72.6	2.67 (1.97-3.61)	66.9	2.81 (2.09-3.78)
All	60.0		44.3		45.5		53.2		60.6		53.9	

* Percentages indicating *agree* with statements regarding the positive difference made by the IDEFICS intervention; ** Odds ratios and 99%-confidence intervals; *** T₀₊: parents participated in the baseline survey (T₀); T₁₊: parents participated in the follow up (T₁); values in **bold** indicate statistical significance

Table 3: Percentage of parents agreeing with a series of statements given in response to the following request: *Please let us know if different aspects of the IDEFICS intervention are having any negative aspects so far as you or your child are concerned*

	The intervention has made my child feel as if he/she was 'fat' or 'overweight'		The intervention has made my child feel that he/she is unhealthy		I felt as if the intervention was telling me that I am not as good a parent as I might be		The intervention interfered in our family life		Aspects of the intervention were expensive for our family	
	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)	% agree*	OR (99%-CI)**
Parent's maximum educational level according to ISCED (International Standard classification of education)										
Missing	9.5	1.15 (0.44-2.97)	8.9	1.97 (0.74-5.25)	15.1	1.38 (0.63-3.00)	4.9	0.97 (0.28-3.37)	9.5	0.99 (0.40-2.43)
Level 0/1/2	13.3	1.27 (0.70-2.29)	10.3	2.42 (1.27-4.62)	12.8	1.22 (0.70-2.11)	6.3	1.40 (0.63-3.11)	9.4	1.84 (0.97-3.49)
Level 3	9.1	1.06 (0.69-1.61)	4.4	0.98 (0.59-1.62)	9.3	0.94 (0.65-1.37)	3.9	1.01 (0.56-1.83)	8.1	1.32 (0.88-1.99)
Level 4	8.8	1.20 (0.74-1.94)	9.1	1.80 (1.10-2.95)	12.4	1.09 (0.73-1.63)	4.6	1.49 (0.78-2.83)	9.9	1.23 (0.79-1.93)
Level 5/6	7.0	1.0 (reference)	4.9	1.0 (reference)	8.9	1.0 (reference)	2.7	1.0 (reference)	7.0	1.0 (reference)
Parent's income-level (country-specific categories based on the average net equivalence income)										
Missing	8.7	1.05 (0.55-2.02)	6.4	0.75 (0.38-1.49)	10.8	1.11 (0.65-1.92)	5.4	1.69 (0.73-3.92)	11.6	1.47 (0.81-2.70)
Low income	12.2	1.32 (0.69-2.52)	6.4	1.03 (0.51-2.09)	12.8	1.82 (1.07-3.09)	6.0	1.73 (0.74-4.03)	9.2	2.18 (1.15-4.11)
Low to medium income	11.5	1.57 (0.84-2.90)	6.9	1.17 (0.61-2.25)	11.5	1.56 (0.94-2.60)	4.6	1.43 (0.62-3.27)	9.9	2.01 (1.10-3.69)
Medium income	7.8	1.21 (0.70-2.25)	5.1	1.05 (0.58-1.89)	9.2	1.20 (0.74-1.97)	2.6	0.95 (0.42-2.16)	6.4	1.13 (0.63-2.03)
Medium to high income	6.8	1.21 (0.65-2.28)	5.1	0.89 (0.46-1.73)	8.7	1.09 (0.65-1.82)	2.2	0.80 (0.31-2.05)	7.6	1.38 (0.75-2.54)
High income level	5.2	1.0 (reference)	5.1	1.0 (reference)	8.3	1.0 (reference)	2.6	1.0 (reference)	5.0	1.0 (reference)
Participation status***										
T0+ / T1-	14.2	1.69 (0.96-2.99)	7.4	1.39 (0.72-2.68)	14.7	1.20 (0.74-1.93)	7.8	2.15 (1.04-4.44)	10.0	1.18 (0.68-2.07)
T0- / T1+	9.4	1.17 (0.74-1.87)	7.3	1.17 (0.70-1.93)	10.5	0.98 (0.65-1.49)	4.8	1.32 (0.70-2.50)	11.1	1.03 (0.67-1.59)
T0+/T1+	7.6	1.0 (reference)	5.5	1.0 (reference)	9.4	1.0 (reference)	3.0	1.0 (reference)	7.2	1.0 (reference)
Child's weight status (according to Cole & Lobstein, 2012)										
Normal/thin	4.4	1.0 (reference)	4.8	1.0 (reference)	9.4	1.0 (reference)	3.1	1.0 (reference)	8.0	1.0 (reference)
Overweight	22.0	5.99 (4.08-8.79)	9.0	2.10 (1.29-3.43)	11.4	1.33 (0.87-2.03)	5.8	1.81 (1.00-3.28)	8.1	1.18 (0.72-1.93)
Obese	33.0	9.98 (6.34-15.72)	14.9	4.06 (2.31-7.11)	16.4	2.13 (1.28-3.53)	8.1	2.31 (1.15-4.65)	9.9	1.67 (0.89-3.14)
Intervention exposure										
Missing	10.8	1.46 (0.81-2.64)	7.2	1.03 (0.53-1.98)	13.6	1.44 (0.87-2.38)	5.1	1.74 (0.75-4.05)	11.8	1.30 (0.70-2.39)
Low exposure	5.6	1.0 (reference)	4.8	1.0 (reference)	7.8	1.0 (reference)	2.0	1.0 (reference)	5.5	1.0 (reference)
Medium exposure	7.1	1.20 (0.68-2.09)	5.1	0.97 (0.53-1.78)	7.9	1.00 (0.62-1.63)	2.9	1.33 (0.85-4.27)	5.2	0.87 (0.49-1.58)
High exposure	9.2	1.49 (0.87-2.57)	5.9	1.11 (0.61-2.02)	8.3	1.16 (0.71-1.89)	4.3	1.90 (0.85-4.27)	6.9	1.29 (0.73-2.28)
All	8.6		6.0		10.1		3.8		8.1	

	The tests and/or collection of biological samples were stressful for my child		The expectation that my child should make changes in his/her diet was stressful for us		The expectation that my child should be more active was stressful for us		The expectation that my child should alter his/her sleeping habits was stressful for us		The expectation that my child should watch less television was stressful for us	
	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**
Parent's maximum educational level according to ISCED (International Standard classification of education)										
Missing	16.3	0.92 (0.44-1.94)	6.8	0.71 (0.25-2.00)	9.5	0.95 (0.38-2.36)	4.1	0.63 (0.18-2.27)	8.8	1.32 (0.51-3.41)
Level 0/1/2	18.1	1.29 (0.73-1.92)	11.8	1.47 (0.80-2.67)	12.4	1.59 (0.87-2.88)	11.3	2.27 (1.17-4.42)	12.0	1.44 (0.79-2.60)
Level 3	11.1	0.77 (0.55-1.07)	7.0	0.90 (0.58-1.40)	6.4	0.82 (0.52-1.28)	4.1	0.88 (0.51-1.53)	6.1	0.82 (0.52-1.29)
Level 4	16.4	0.87 (0.61-1.24)	8.2	1.13 (0.70-1.84)	9.8	1.38 (0.87-2.19)	4.9	1.29 (0.71-2.35)	9.7	1.59 (1.00-2.53)
Level 5/6	15.2	1.0 (reference)	6.5	1.0 (reference)	6.4	1.0 (reference)	3.6	1.0 (reference)	5.8	1.0 (reference)
Parent's income-level (country-specific categories based on the average net equivalence income)										
Missing	12.6	0.77 (0.48-1.23)	8.4	1.21 (0.64-2.29)	9.5	1.12 (0.62-2.03)	6.5	2.49 (1.04-6.01)	7.4	1.09 (0.56-2.12)
Low income	13.9	0.86 (0.54-1.38)	10.9	1.58 (0.83-3.00)	11.1	1.23 (0.67-2.27)	8.4	2.85 (1.17-6.99)	11.3	1.93 (1.01-3.70)
Low to medium income	14.0	0.96 (0.62-1.49)	9.9	1.80 (0.97-3.32)	8.9	1.24 (0.69-2.22)	4.9	2.08 (0.85-5.16)	8.3	1.63 (0.86-3.08)
Medium income	14.2	0.89 (0.61-1.31)	5.7	1.16 (0.63-2.11)	5.1	0.83 (0.47-1.49)	3.6	1.84 (0.78-4.36)	6.0	1.30 (0.71-2.38)
Medium to high income	14.4	0.92 (0.61-1.38)	5.4	1.06 (0.55-2.03)	5.5	0.86 (0.47-1.60)	3.2	1.67 (0.66-4.24)	6.1	1.35 (0.71-2.56)
High income level	16.3	1.0 (reference)	5.0	1.0 (reference)	6.5	1.0 (reference)	1.9	1.0 (reference)	4.6	1.0 (reference)
Participation status***										
T0+ / T1-	23.1	1.95 (1.26-3.02)	12.9	1.31 (1.75-2.27)	11.6	1.08 (0.61-1.92)	8.0	1.44 (0.72-2.85)	10.9	1.30 (0.73-2.533)
T0- / T1+	13.6	1.12 (0.77-1.63)	7.2	0.87 (0.52-1.43)	7.3	0.81 (0.49-1.32)	5.4	1.13 (0.62-2.03)	9.2	1.47 (0.93-2.33)
T0+/T1+	13.1	1.0 (reference)	6.6	1.0 (reference)	7.1	1.0 (reference)	4.0	1.0 (reference)	6.2	1.0 (reference)
Child's weight status (according to Cole & Lobstein, 2012)										
Normal/thin	14.0	1.0 (reference)	6.0	1.0 (reference)	6.2	1.0 (reference)	4.2	1.0 (reference)	6.3	1.0 (reference)
Overweight	14.0	1.04 (0.71-1.53)	9.9	1.61 (1.01-2.57)	10.6	1.66 (1.06-2.61)	5.5	1.15 (0.64-2.09)	9.1	1.33 (0.83-2.14)
Obese	18.2	1.47 (0.91-2.38)	19.3	3.12 (1.89-5.17)	17.7	2.62 (1.57-4.35)	8.4	1.47 (0.74-2.92)	14.0	1.93 (1.11-3.33)
Intervention exposure										
Missing	17.7	1.28 (0.84-1.95)	11.0	1.65 (0.88-2.07)	10.6	1.71 (0.93-3.16)	6.5	1.58 (0.74-3.38)	9.5	1.35 (0.75-2.42)
Low exposure	12.9	1.0 (reference)	4.6	1.0 (reference)	5.0	1.0 (reference)	2.8	1.0 (reference)	5.5	1.0 (reference)
Medium exposure	12.5	1.16 (0.78-1.73)	5.0	0.99 (0.54-1.84)	6.1	1.15 (0.65-2.04)	3.4	1.11 (0.52-2.38)	5.2	0.88 (0.49-1.57)
High exposure	10.9	1.13 (0.74-1.72)	6.0	1.13 (0.62-2.07)	6.1	1.08 (0.60-1.95)	4.3	1.24 (0.60-2.59)	6.6	1.05 (0.60-1.84)
All	14.2		7.4		7.6		4.6		7.2	

* Percentages indicating *agree* or *moderately agree* with statements regarding negative aspects of the IDEFICS intervention; ** Odds ratios and 99%-confidence intervals; *** T₀₊: parents participated in the baseline survey (T₀); T₁₊: parents participated in the follow up (T₁); values in **bold** indicate statistical significance

Table 4: Percentage of parents agreeing with a series of statements given in response to the following question: *How would you evaluate the IDEFICS intervention overall, so far?*

	It has helped me know more about healthier eating		It helped me in enabling my child to be more active		It helped me in enabling my child to sleep well		It helped me in enabling my child to watch less TV		It helped us to have more relaxed family time together	
	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**
Parent's maximum educational level according to ISCED (International Standard classification of education)										
Missing	43.8	1.85 (1.02-3.33)	35.2	1.85 (1.02-3.36)	25.7	1.85 (0.96-3.58)	24.5	1.70 (0.86-3.32)	28.7	1.81 (0.96-3.41)
Level 0/1/2	58.7	2.15 (1.45-3.19)	41.8	1.98 (1.34-2.94)	36.0	2.46 (1.61-3.76)	37.4	2.30 (1.50-3.52)	41.0	2.51 (1.66-3.80)
Level 3	48.9	1.90 (1.48-2.45)	33.5	1.64 (1.26-2.15)	27.0	1.89 (1.40-2.55)	27.4	1.82 (1.34-2.46)	29.0	1.70 (1.27-2.27)
Level 4	27.0	1.39 (1.03-1.88)	19.5	1.30 (0.93-1.80)	13.8	1.47 (1.01-2.16)	13.6	1.55 (1.05-2.27)	14.6	1.30 (0.89-1.86)
Level 5/6	26.3	1.0 (reference)	18.2	1.0 (reference)	12.4	1.0 (reference)	12.5	1.0 (reference)	14.5	1.0 (reference)
Parent's income-level (country-specific categories based on the average net equivalence income)										
Missing	44.9	1.16 (0.80-1.67)	34.2	1.34 (0.90-2.01)	26.7	1.58 (0.97-2.55)	27.1	1.30 (0.81-2.08)	30.0	1.33 (0.85-2.08)
Low income	62.1	1.45 (0.98-2.14)	43.5	1.57 (1.04-2.38)	36.5	1.92 (1.17-3.15)	39.7	1.64 (1.01-2.66)	40.9	1.70 (1.07-2.70)
Low to medium income	48.6	1.32 (0.92-1.90)	35.0	1.55 (1.04-2.31)	28.0	1.92 (1.19-3.10)	26.6	1.35 (0.84-2.16)	28.4	1.41 (0.90-2.22)
Medium income	29.5	1.02 (0.73-1.42)	19.3	1.06 (0.73-1.55)	14.6	1.36 (0.86-2.16)	13.8	1.03 (0.66-1.62)	15.6	1.09 (0.71-1.67)
Medium to high income	22.4	0.84 (0.59-1.21)	14.8	0.89 (0.59-1.36)	9.7	0.997 (0.59-1.68)	8.9	0.78 (0.47-1.31)	11.5	0.92 (0.57-1.48)
High income level	21.6	1.0 (reference)	13.8	1.0 (reference)	7.8	1.0 (reference)	8.8	1.0 (reference)	10.0	1.0 (reference)
Participation status***										
T0+ / T1-	37.8	0.63 (0.43-0.92)	28.0	0.84 (0.57-1.26)	20.7	0.83 (0.53-1.30)	22.5	0.87 (0.56-1.37)	24.6	0.86 (0.56-1.32)
T0- / T1+	39.8	1.14 (0.85-1.53)	29.2	1.13 (0.83-1.53)	24.0	1.38 (0.99-1.94)	25.2	1.58 (1.12-2.21)	27.4	1.36 (0.99-1.88)
T0+/T1+	36.9	1.0 (reference)	25.1	1.0 (reference)	19.0	1.0 (reference)	18.8	1.0 (reference)	20.5	1.0 (reference)
Child's weight status (according to Cole & Lobstein, 2012)										
Normal/thin	33.9	1.0 (reference)	23.7	1.0 (reference)	18.0	1.0 (reference)	18.1	1.0 (reference)	19.9	1.0 (reference)
Overweight	47.4	1.15 (0.85-1.55)	33.8	1.19 (0.88-1.61)	26.1	1.06 (0.76-1.48)	27.1	1.06 (0.76-1.47)	29.6	1.16 (0.84-1.60)
Obese	60.6	1.42 (0.95-2.14)	40.0	1.17 (0.79-1.73)	32.0	1.05 (0.69-1.60)	31.8	0.93 (0.61-1.42)	33.5	1.01 (0.66-1.54)
Intervention exposure										
Missing	40.3	1.72 (1.17-2.54)	29.5	1.70 (1.12-2.60)	22.3	1.63 (1.01-2.63)	22.6	1.71 (1.05-2.78)	25.5	1.92 (1.19-3.08)
Low exposure	22.6	1.0 (reference)	13.8	1.0 (reference)	10.1	1.0 (reference)	10.7	1.0 (reference)	10.7	1.0 (reference)
Medium exposure	35.3	1.69 (1.21-2.37)	23.0	1.66 (1.15-2.39)	16.5	1.48 (0.97-2.27)	16.3	1.36 (0.89-2.08)	18.1	1.56 (1.03-2.35)
High exposure	49.3	2.44 (1.75-3.42)	35.3	2.54 (1.78-3.63)	29.1	2.55 (1.70-3.80)	29.4	2.38 (1.59-3.55)	31.2	2.65 (1.79-3.92)
All	37.4		26.1		20.0		20.2		22.0	

	It helped me develop practical ways to eat more healthily with my child		I felt involved in / able to contribute to aspects of the intervention that concerned my child		The intervention has helped my family to adopt a healthier lifestyle		I approve of the intervention		The intervention also has negative aspects [§]	
	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**	% agree*	OR (99%-CI)**
Parent's maximum educational level according to ISCED (International Standard classification of education)										
Missing	35.4	1.81 (0.97-3.36)	37.3	1.70 (0.95-3.06)	27.8	1.73 (0.91-3.29)	58.5	1.42 (0.81-2.50)	13.2	1.99 (0.80-4.99)
Level 0/1/2	47.7	2.29 (1.53-3.43)	48.1	1.95 (1.33-2.85)	41.3	2.69 (1.78-4.07)	65.5	1.14 (0.78-1.67)	14.0	2.55 (1.37-4.75)
Level 3	34.6	1.60 (1.22-2.11)	37.7	1.68 (1.30-2.16)	28.8	1.91 (1.42-2.56)	60.0	1.18 (0.93-1.48)	9.6	1.69 (1.07-2.66)
Level 4	18.4	1.26 (0.90-1.77)	22.8	1.31 (0.96-1.79)	13.6	1.23 (0.84-1.79)	43.9	0.99 (0.76-1.29)	6.2	1.14 (0.65-2.02)
Level 5/6	19.6	1.0 (reference)	22.2	1.0 (reference)	14.4	1.0 (reference)	52.8	1.0 (reference)	6.3	1.0 (reference)
Parent's income-level (country-specific categories based on the average net equivalence income)										
Missing	35.4	1.20 (0.80-1.79)	37.3	1.18 (0.81-1.72)	28.9	1.33 (0.85-2.07)	56.9	1.09 (0.78-1.52)	12.9	1.18 (0.62-2.28)
Low income	49.3	1.44 (0.95-2.18)	49.5	1.45 (0.98-2.15)	41.8	1.66 (1.06-2.62)	72.2	1.51 (1.06-2.16)	12.0	1.58 (0.81-3.07)
Low to medium income	34.3	1.18 (0.79-1.77)	37.9	1.24 (0.85-1.79)	26.6	1.24 (0.80-1.94)	60.2	1.13 (0.82-1.56)	8.3	1.16 (0.59-2.26)
Medium income	18.5	0.85 (0.58-1.24)	23.1	0.89 (0.63-1.26)	15.2	1.01 (0.66-1.56)	50.1	0.90 (0.68-1.19)	6.3	0.93 (0.49-1.73)
Medium to high income	15.4	0.78 (0.51-1.17)	19.0	0.83 (0.57-1.21)	11.1	0.78 (0.49-1.25)	43.9	0.75 (0.56-1.01)	5.9	0.98 (0.50-1.92)
High income level	16.0	1.0 (reference)	18.7	1.0 (reference)	11.2	1.0 (reference)	48.8	1.0 (reference)	5.3	1.0 (reference)
Participation status***										
T0+ / T1-	28.3	0.82 (0.54-1.24)	31.0	0.79 (0.54-1.16)	25.5	1.01 (0.66-1.55)	48.0	0.67 (0.47-0.95)	10.5	1.18 (0.66-2.11)
T0- / T1+	29.0	1.18 (0.86-1.62)	31.4	1.05 (0.78-1.42)	23.7	1.23 (0.88-1.72)	49.7	0.89 (0.68-1.16)	13.2	1.66 (1.02-2.70)
T0+/T1+	26.8	1.0 (reference)	29.8	1.0 (reference)	20.8	1.0 (reference)	57.1	1.0 (reference)	7.0	1.0 (reference)
Child's weight status (according to Cole & Lobstein, 2012)										
Normal/thin	24.3	1.0 (reference)	28.0	1.0 (reference)	19.7	1.0 (reference)	52.7	1.0 (reference)	8.1	1.0 (reference)
Overweight	37.3	1.24 (0.91-1.69)	37.9	1.13 (0.84-1.51)	28.7	1.09 (0.79-1.51)	61.2	1.08 (0.81-1.43)	8.9	1.03 (0.62-1.71)
Obese	44.3	1.16 (0.78-1.73)	42.0	1.02 (0.69-1.51)	34.1	1.03 (0.68-1.56)	68.8	1.19 (0.80-1.78)	9.4	0.99 (0.51-1.90)
Intervention exposure										
Missing	29.6	1.47 (0.95-2.27)	33.1	1.47 (0.94-1.84)	24.6	1.52 (0.95-2.43)	53.0	1.18 (0.86-1.63)	11.7	1.38 (0.71-2.69)
Low exposure	15.2	1.0 (reference)	19.1	1.0 (reference)	11.8	1.0 (reference)	46.5	1.0 (reference)	4.9	1.0 (reference)
Medium exposure	24.6	1.57 (1.08-2.28)	26.5	1.31 (0.94-1.84)	18.3	1.37 (0.92-2.06)	55.3	1.48 (1.12-1.96)	6.0	1.26 (0.65-2.44)
High exposure	38.1	2.39 (1.67-3.44)	40.0	2.02 (1.45-2.80)	30.1	2.09 (1.42-3.08)	66.5	2.05 (1.53-2.75)	6.9	1.39 (0.72-2.68)
All	27.3		30.2		21.8		54.9		8.3	

§ Due to a translation error for this item the replies from parents in Belgium had to be excluded; * Percentages indicating *agree* with statements regarding the IDEFICS intervention overall; ** Odds ratios and 99%-confidence intervals; *** T₀₊: parents participated in the baseline survey (T₀); T₁₊: parents participated in the follow up (T₁); values in **bold** indicate statistical significance

Figure 1: Percentage of parents (dis)agreeing with a series of statements given in response to the following question: *Do you think the following aspects of IDEFICS will make a lasting positive difference to your child's behaviour and/or your family's behaviour?*

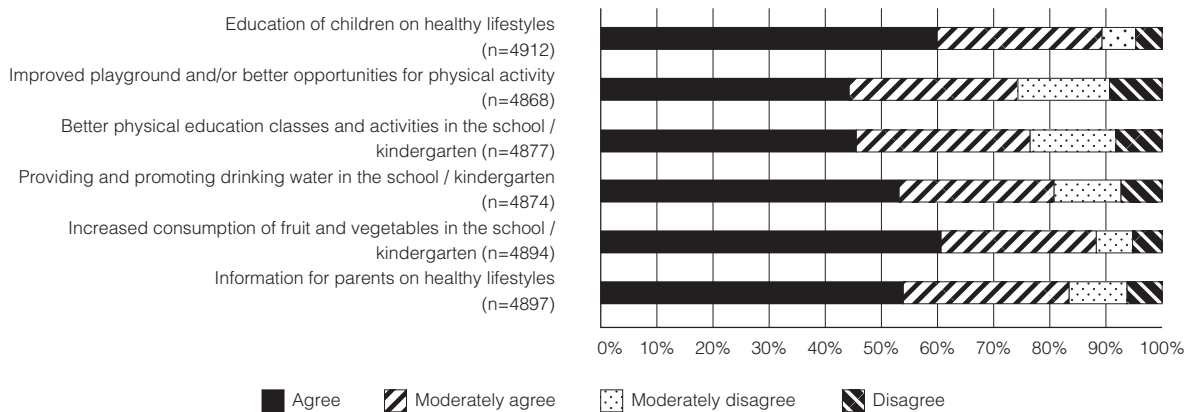


Figure 2: Percentage of parents (dis)agreeing with a series of statements given in response to the following request: *Please let us know if different aspects of the IDEFICS intervention are having any negative aspects so far as you or your child are concerned*

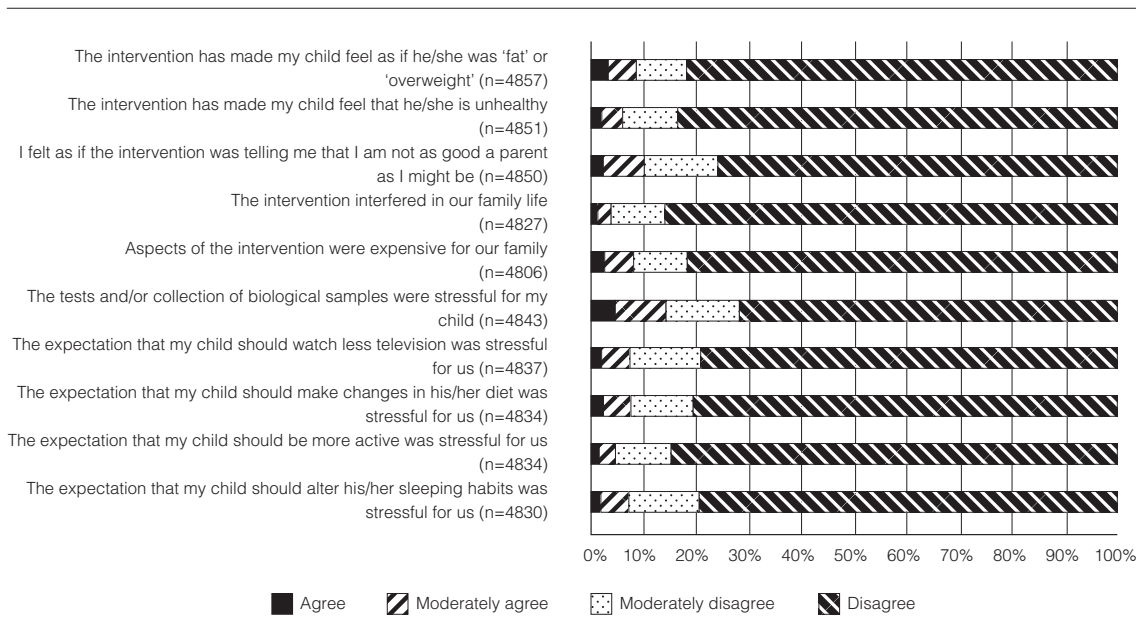
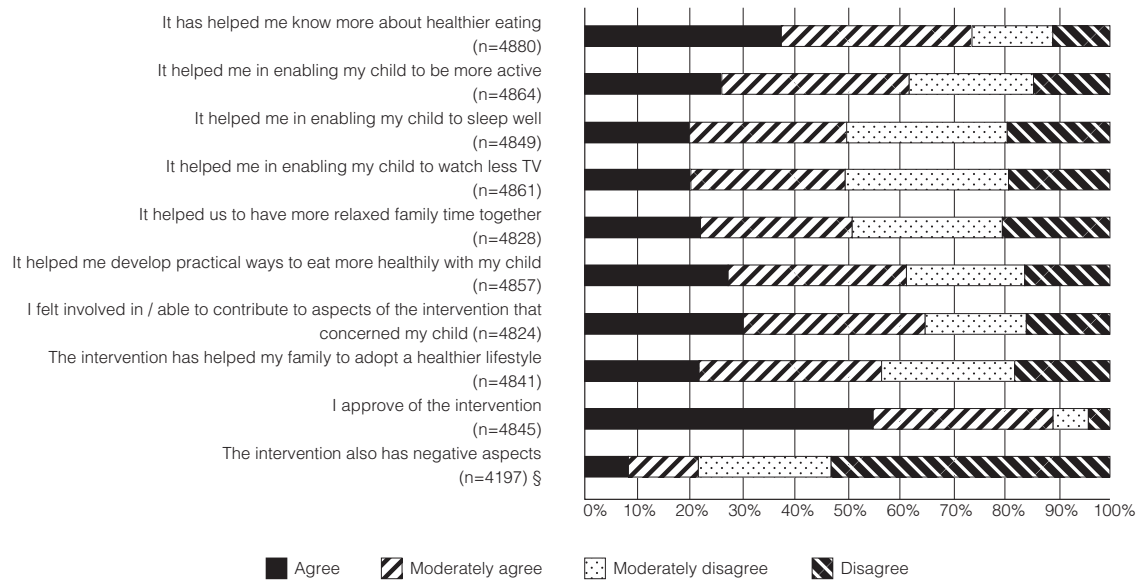


Figure 3: Percentage of parents (dis)agreeing with a series of statements given in response to the following question: *How would you evaluate IDEFICS overall, so far?*



§ Due to a translation error for this item the replies from parents in Belgium had to be excluded