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The Health Equilibrium Initiative-Is it Possible to Prevent Intervention-Generated Inequality?

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Abstract

Introduction: Obesity is unequally distributed between socio-economic Groups. Public health interventions may, unintentionally, contribute to widen health gaps. The approach Community based participatory research (CBPR) offers potential to narrow such gaps. CBPR needs to be adapted to the Nordic context and thus tested in appropriate settings. The aim was to examine the potential for a CBPR intervention to decrease childhood obesity in an underserved community in a major Swedish city.

Methods: Activities were planned together with target groups, using Social Cognitive Theory. Activities were documented by structured reports aiming at developing knowledge and minimizing risk of harm. From determinants for healthy behavior (reciprocal determination, self-efficacy, learning by observation, facilitation and expectations of outcome) strategies for health promotion were formed. Viewpoints from collaborators were collected. Families in schools in areas where many had low education, low income and where many were recent immigrants, were invited to examinations that were discussed in the context of the participatory intervention. Examinations included anthropometric measurements, interviews on life style habits and neuropsychological assessments. Data were analyzed by independent sample t-test, Chi-square tests, one way Anova, content analysis and the CANTAB protocols, respectively.

Results: Changes on structural levels were initiated during the intervention. Guidelines to remove sweets from schools were difficult to implement. 35% (n=119) of the initially invited sample participated at follow-up. At follow-up there was no difference between children in control and intervention schools. There was no evidence for links between weight and cognitive development in children.

Conclusion: For participatory public health interventions time must be allocated to develop them in concert with target groups. To justify efforts and costs all steps should be thoroughly documented, transparent and evaluated. Policies to minimize sweets in schools need increased support from management levels. Participatory interventions can provide insights that cannot be obtained by traditional methods.

Keywords: Childhood obesity; Cognitive function; Community based participatory research; Health Equity; Intervention-generated inequality; Self-efficacy; Schools; Empowerment; Program planning and evaluation; Social cognitive theory

Abbreviations ADHD: Attention Deficit/Hyperactivity Disorder; BMI: Body Mass Index; CANTAB: Cambridge Neuropsychological Test Automated Battery; CBPR: Community Based Participatory Research; HEI: Health Equilibrium Initiative; MOT: Motor Screening; RVP: Rapid Visual Information Processing; SCT: Social Cognitive Theory; SWM: Spatial Working Memory

Introduction

Health is improving in Sweden on a population level but this differs by subgroups. In some respects, health inequity continues to increase [1]. As in other wealthy and middle income countries, obesity represents a growing threat to health, unequally distributed between groups with different education and income [2]. Explanations for this are suggested on societal as well as individual levels. For example, Otero et al. argue for an association between political and economic regime on one hand and obesity prevalence on the other, describing the "neo-liberal diet" as especially obesogenic in poorer groups [3] while a common approach within the field is to explore individual life style habits without relating them to societal context. Given the stigmatization of obesity, reversed causation may also play a role by discrimination of people with obesity [4].

Efforts have been made to counteract obesity by primary and secondary prevention or treatment. Counter intuitively, these interventions may widen the clefts between groups, particularly individuals already having better health and better conditions in life, and those who have not [5,6]. Bambra et al. found that community capacity building was one factor that supported leveling out of inequalities [7]. This aligns with the paradigm that empowerment is pivotal in a range of contexts such as improving health for underserved groups [8] or managing care for patients with CVD and diabetes [9]. The significance of empowerment, closely connected with participation

and shared power, has been associated with the common and problematic "gaps" between public servants (i.e. the people planning, conducting and evaluating interventions) and the disadvantaged groups, with respect to education, life conditions, values, social and cultural capital. To carry out a successful intervention there is a need to understand prerequisites and needs on a deeper level. Drawing on this, Community based participatory research (CBPR) is often used in interventions in different areas, including obesity prevention [10-12]. To adapt the methodology to a Nordic context, the tools of it need to be tested in appropriate settings. Health Equilibrium Initiative (HEI) (in Swedish: "Jämvikt") is a model for intervention, building on CBPR and previously used in several municipalities in Gothenburg with promising results [13]. The aim of this study was to examine the potential for a CBPR intervention to decrease numbers of childhood overweight and obesity in an underserved community in Gothenburg, the second largest city in Sweden.

Materials and Methods

Sample and recruitment for the measurements

Families (consisting of at least one child and one parent) in schools in areas where many have low education, low income and where many are recent immigrants were invited to anthropometric measurements and interview. Most of the children were born in 2006 some in 2007 and at baseline they were thus seven (or six) years old. The recruitment procedure included introduction of the health promotion aspect of the research to school nurses and other school staff as well as visiting parental meetings to present the project. At parental meetings in six of the seven participating schools, examinations were discussed in the context of the following participatory intervention. A total 208 parents participated, 342 families were contacted with written information and invitation to the study. An interpreter was offered. Procedures similar to the ones normally used by schools were used to transfer information to parents. Thus, the information sent out at baseline was only in Swedish. For the follow-up study, the invitation letter was translated to Arabic, Somali, Polish and Turkish. Families that did not return the form were contacted once by phone. We also left notes in the school to parents whom we had not succeeded to contact.

Examinations included anthropometric measurements, interviews on physical activity, food patterns and other factors, including perceived ability to affect one's health, and neuropsychological assessments. Food patterns were examined by the healthy diet score which was constructed for this study. Methods have been described in detail elsewhere [14]. For parents who could not accompany their children due to working hours, siblings or other circumstances, we offered to fetch the child from after school activities, perform examinations, and accompany them back. School nurses requested that HEI measurements include fat mass, based on a suspicion that some children who by the definition of the International obesity task force [15] are classified as normal weight nevertheless carry an unhealthy amount of body fat.

Process evaluation

Activities were planned using Social Cognitive Theory (SCT) and were, on organizational as well as on population levels, documented by structured reports. A number of determinants for healthy behavior are defined in SCT, of which the ones used in HEI were reciprocal determination, self-efficacy on individual and collective levels, learning by observation, facilitation and expectations of outcome [16]. From these, strategies to support people to positive changes of lifestyle habits were formed. The reports included reflections building on critical consciousness (i.e. was there a risk that this activity functioned as exclusionary toward any individual or group?). The purpose of the cautious documentation was to develop knowledge about participatory research on a community level and to minimize risk of harm by continuously reflecting and discussing. Viewpoints from collaborators were also collected by a special form.

Analysis

Independent sample t-test, Chi-square tests, One way Anova was used for the statistical analyses of the anthropometric data and the interview form. The structured reports were analyzed by content analysis [17]. The neuropsychological data were analyzed and interpreted according to the CANTAB protocols (Cambridge Cognition, 2011). Bivariate Pearsons Correlation, paired-sample t-test and linear regression were performed in GNU PSPP v42.1.4.

Results

HEI Processes

Bottom-up and top-down: HEI provided scientifically based knowledge regarding different aspects of health, while initiating, encouraging and facilitating cooperation and action. The intention was to work from bottom-up as well as from top-down. The intervention was initiated in close cooperation with municipal health planners aiming to anchor it at management levels of the community organization. However, it was not until the end of the intervention that we managed to arrange a meeting with one of the heads of the education sector. At the school level HEI generally was warmly welcomed but there was a lack of continuity regarding support and commitment.

Dialogues with children, school staff and parents

Main performance objectives, constructed in dialogue with parents, children and school staff, were to increase numbers of children that had a healthy lunch daily and to ban sweets and cakes from the school food environment. HEI also engaged in supporting a parental group, formed in one of the schools, and in a community-initiated effort to unite sports and other organizations in the area around the common goal of decreasing the health gap. In all, HEI was involved in fifty-eight meetings with school staff (school management level, school nurses, teachers, kitchen staff and recreational leaders), seven meetings in the parental group and twelve in the group for the organizations.

Collaboration with school nurses

School nurses, in regional meetings and on other occasions, indicated that sweets and cakes were frequently consumed by children and wanted HEI to take a lead in proposing a set of rules to exclude such foods from schools. Also, there was a request to establish and support networks for staff working with food and health promotion in different places in the communities (schools, preschools, sports organizations, after-school programs, playgrounds), using a model developed in another part of the city. Such a network was started but after a few meetings, views on healthy food differed too much within the group and the network did not continue to function. Efforts to secure school food environment included a letter, initiated by HEI and processed by the school nurses, to the director of schools in one of the

communities. The letter was sent to the director just before the end of the project period. Eventually it resulted in rules aimed at restricting access to sweets, cakes and sugar sweetened beverages. However, it is not yet known to what extent the rules were implemented.

Another track of the intervention was to facilitate cooperation between community and primary care regarding care and treatment of children with overweight and obesity. Dieticians from HEI participated in networks in primary care, aiming at building bridges and offering expertise, during ten meetings. These network activities, however, were terminated as result of organizational changes.

By request from different actors (schools, save the children, sports clubs, cultural associations), HEI initiated and participated in 47 other activities together with community members (health lessons, dialogues, lectures) on the themes of healthy food, stress, and physical activity to support change of life style habits on the individual level.

Participants

The participation rate for the baseline measurements was 42% (145 families); with 46% at the intervention schools and 40% at control schools, respectively. Out of the remaining 197 families, we never managed to make contact with 45 (13% of all families). Reasons for denying participating included both fear of stigmatization, if children were overweight and language difficulties. There was also a lack of confidence, made manifest by one family that sent back the consent form with the message: "Use Swedish children as guinea pigs instead. Enough is enough".

Control and intervention schools were situated in areas of similar socioeconomic status, with low mean income and education and high unemployment [18]. At baseline, neither gender, height, BMI, waist circumference (WC), waist/height ratio (WHtR), healthy food index nor perceived ability to affect health differed significantly between the intervention and control groups (Table 1). Children in control schools were significantly older (mean 0.2 y), and heavier (mean 0.4 kg). Children in intervention schools were more likely to consider themselves sedentary than children in control schools, but at follow-up there was no difference in this respect.

Variable		Intervention 47 % participation	Control 53% participation	p-level difference
Age		7.4 y	7.5 y	0.05
Gender		51 % boys	54 % boys	0.71
Height		127.7 cm	127.4 cm	0.75
Weight		26.8 kg	29.6 kg	0.04
BMI		16.3	16,9	0.22
fat %		19.5 %	19.9 %	0.68
Waist circumference (WC)		58.5	59.3	0.49
waist/height ratio (WHtR)		0.46	0.46	0.62
Food index		30.8	30.1	0.29
IOTF cut offs	Underweight	n=2 2.9 %	n=2 2.6 %	0.90
	normal weight	n=53 78 %	n=54 69 %	0.16
	Overweight	n=8 12 %	n=15 19 %	0.20
	obesity	n=5 7.4 %	n=6 7.8 %	0.92
Consider themselves:				
Sedentary		n=12 18.2 % (6 girls, 6 boys)	n=3 3.8 % (all of them girls)	0.005
"in between"		n=21 31.8 % (10 girls 11 boys)	n=29 37.7 % (14 girls 15 boys)	0,46
Active		n=33 50 % (15 girls 18 boys)	n=45 58.4 % (18 girls 27 boys)	0,31
Do not believe that they can affect their health		n=34 51.5 %	n=32 43.8 %	0,36
Believe that they can affect their health by healthy food and/or exercise		n=23 34.8 %	n=35 47.9 %	0.12
Believe that they can affect their health by psychosocial means		n=9 13.6 %	n=6 8.2 %	0.30

Table 1: Data on children in intervention and control schools at baseline

A total 26 children (14% in intervention schools and 15% in control schools) dropped out of the study, the main reason being that they had moved from the area. Thus, 119 children, 35% of the initially invited sample but 83% of those examined at baseline, participated at follow-up. Since nineteen new children consented to participate, 138 children were examined and interviewed in 2015. To check whether obese children were underrepresented in the present study, we asked schools for data on BMI measurements in school health care. Three of the seven schools provided such data, showing that for these schools obese children participated to the same extent as did other children.

Anthropometry

At baseline: For the whole group of children, there was no correlation between any of the anthropometric measurements and sleep, healthy food index, enjoying physical activity, after school activity, whether warm and sweaty at exercise, or if they regarded themselves as active. Intra-correlations between the anthropometric measurements BMI, WHtR, WC and fat percent ranged from 0.7 (WHtR by fat percent) to 0.9 (waist by BMI and fat percent by BMI). Children categorized as overweight (OW) by IOTF had a mean percent of body fat at 25.2; children with obesity mean=32.0% and normal weight children's mean body fat was 17.5%.

Follow-up: There was no difference between intervention and control schools regarding BMI z-score or number of children with overweight and obesity at follow-up (Table 2). Mean fat in the obese children increased by 2.8%. For the OW children this number was 5.2% and for the NW children 1.7%.

Food pattern

Baseline: At baseline, the healthy diet score was normally distributed. There was no difference between intervention and control regarding total score. There was a significant positive association between this index and obesity, i.e. children with obesity reported healthier eating.

Follow up: There was no difference between intervention and control groups regarding change in the total score. For the whole group of children there was a very slight non-significant improvement. No significant change in breakfast-eating-a small decrease in numbers of children that had breakfast daily, which is to be expected in this age.

Perceived ability to affect one's health

Regarding both food pattern and obesity, children that believed that they could affect their health did not differ from those that did not believe so. This was true at baseline as well as follow-up.

Total 45.5% of the children who participated at the age of nine (2015) did not believe that they could affect their health.

After two years of intervention there was no significant difference between intervention and control schools regarding any of the variables, including perceived belief to affect one's health.

Neuropsychological assessments

A subset of 3 schools (1 intervention, 2 controls) was randomly selected to also include CANTAB neuropsychological assessments. At baseline 65 children completed the battery and 53 of these (82%) performed the same tasks at follow-up. Additional children participated at the second measurement point to give n=64 (Table 2).

	Intervention 47 % participation			**Control 53% participation**			**p-value difference**
	Change	SD	SD Error mean	Change	SD	SD Error mean	
BMI	0.89	1.09	0.14	0.66	1.55	0.20	0.58
BMI z-score	-0.035	0.037	0.005	- 0.028	0.0379	0.0048	0.30
Mean fat (%)	0.47	3.33	0.44	0.08	2.33	0.29	0.02
Waist (cm)	3.4	3.78	0.51	2.4	5.66	0.71	0.81
WtHR	-0.1	0.03	0.004	-0.1	0.058	0.007	0.57

Table 2: Changes in anthropometric measurements for intervention and control schools.

A paired t-test compared these variables at follow-up relative to baseline for the n=53 children participating at both measurement points. For MOT, Mean Latency did not change (p=0.24) while Mean Error significantly decreased (p=0.008). The RVP A prime score did not change between baseline and follow-up (p=0.117). For SWM, the Between Errors score significantly decreased (p=0.004) and the Strategy score showed a similar strong trend to decrease (p=0.053).

To test the relationship between markers of weight and cognitive development a bivariate Pearson correlation was performed on those children with healthy weight (n=43). Overweight and obese were excluded due to lack of statistical power. Mostly there were no significant correlations between these variables except for the following. BMI was inversely related to SWM between Errors (R=-0.32, p=0.038) while fat % inversely correlated to MOT Mean Error (R=-0.32, p=0.045) and SWM between Errors (R=-0.32, p=0.036).

Since weight parameters were significantly correlated at each cross-sectional point, we evaluated whether BMI at follow-up could be predicted by fat percentage or Waist Height Ratio at Baseline using linear regression. The adjusted R square was 0.46, indicating that 46% of the variance in BMI at follow-up could be explained by this model (ANOVA F=37.08, p<0.001). Standardized beta values were significant for fat % (β=0.68, p<0.001) but not for Waist Height Ratio (β=-0.11, p=0.17).

Based on the initial correlations, we then determined whether fat % at follow-up could be predicted by the neuropsychological scores at baseline. Linear regression including all 5 scores gave an adjusted R square of 0.23, indicating that 23% of the variance in fat % at follow-up could be explained by this model (ANOVA F=3.17, p=0.019). Standardized beta values were significant for MOT Mean Error (β=-0.47, p=0.018) and RVP A Prime (β=-0.41, p=0.008) but not for MOT Mean Latency (β=-0.07, p=0.70), SWM between Errors (β=0.10, p=0.55) or SWM Strategy (β=-0.06, p=0.72).

A linear regression model including all data (also underweight, overweight and obese) failed to produce a significant model that could explain the relationship between fat % at follow-up and neuropsychological scores at baseline (adjusted R square=-0.06; ANOVA F=0.42, p=0.831; no significant standardized beta coefficients) (Table 3).

	Baseline (n=65)	**Follow-up (n=64)**
Motor Screening (MOT)		
Mean Latency	972.48	878.46
Mean Error	8.76	7.69
Rapid Visual Information Processing (RVP)		

RVP A prime	0.95	0.95
Spatial Working Memory (SWM)		
Between Errors	23.88	20.02
Strategy	18.40	17.80

Table 3: Mean values for variables from the three CANTAB neuropsychological assessments administered at baseline and follow-up.

Discussion

We assessed whether a community based intervention can improve weight status of children in low SES communities. Changes on structural levels, like improvements of school meals and reduced consumption of sugar in schools, were initiated during the intervention. Participation rates for the measurements were low and after two years there was no difference between children in control and intervention groups.

A primary condition to be able to show an effect would have been to get early access to processes that we could facilitate, while in reality this took an additional year. A secondary condition would have been to recruit a large enough sample of children by inclusion of more schools, as the low participation rate was unexpected despite the use of CBPR.

Anthropometry

The limited number of participants did not allow for meaningful comparison between control and intervention. Results showing that obese children increased their fat more than do overweight and normal weight children imply that their environment fails in supporting them to adopt a healthier lifestyle. By our measurements, BMI z-score and currently used cut-offs seems to be a good proxy for obesity and are also a better indicator of excess fat than WHtR, and waist circumference.

Neuropsychological assessments

In order to collect meaningful data on such a young population of children assessments and questionnaires must be adapted accordingly. The Cambridge Neuropsychological Test Automated Battery (CANTAB) computer assessments have been validated for use in children and can provide good markers for their normal development [19]. Even so, we did not include these assessments with the goal of diagnosis or identification of deficits. Having an aspect of play in the interview may relax the child and since 82% of the children using CANTAB at baseline also returned for follow-up this suggests a positive experience.

It is possible to follow the developmental progress of a child since CANTAB has adapted modes for these ages and standardized general population data [20,21]. Motor Screening (MOT) teaches the subject how to press the screen and is a rough measure of reaction time [22]. Mean Latency, the time it takes to touch the cross on the screen, remained constant at follow-up while Mean error, the precision of their response (lower is better), decreased. This confirms an expected improvement in motor skills with age [23]. Rapid Visual Information Processing (RVP) is a measure of sustained attention which is very sensitive to concentration disturbances in clinical populations [24].

RVP A prime, the variable often reported, is a derived measure of performance ranging from 0 to 1 where 1 is maximum [22]. The average RVP A prime scores of 0.95 in this study suggest a high level of performance overall and may also indicate that the 123 mode was too easy for 7 y old children. Spatial Working Memory (SWM) Between Errors is the number of times a subject selects a box where a token had already appeared while Strategy is a measure of how well the subject follows a set pattern to check the boxes [22]. In both cases the children improved in their scores at follow-up relative to baseline, indicating normal development. Strategy had a strong trend to significance and this may indicate that some groups of children still responded in a random fashion or that the difference in cognitive maturation between boys and girls may be more apparent at age 9 compared to 7.

Some studies have identified a relationship between weight and cognitive performance in a positive [25] and negative direction [26]. Due to the small numbers of overweight and obese children in our sample we could only check this relationship in normal weight children. As expected, BMI at follow-up two years later could be predicted by fat % and Waist Height Ratio at baseline.

To some extent this was also true for prediction of fat % at follow-up using the baseline neuropsychological scores. Significant variables were MOT Mean Error, a measure of their precision, and RVP A prime, their attention score. This is probably a reflection of their participation in sports or how often they play video games as both would relate to motor skills and abilities and the amount of exercise. The cognitive development measures from SWM could not predict fat percentage, at least not after 2 years, and no evidence in these data suggest that any links should be made between weight and cognitive development in children.

Intervention processes

Short term interventions that disappear without making a difference or fulfilling expectations contribute to lack of trust between community members and the larger society. HEI attempted to build a healthy food network, implement rules to limit sweets and to facilitate collaboration between different professions in schools-all examples that would have needed more time to become established in this environment. We were aware that interventions such as this need to be long-term. Experiences from using this model of intervention in other communities [13] led us to believe that the interplay with public officials would run more smoothly than turned out to be the case. The reason for this, and for the lack of continuity that was experienced in the collaboration with schools, could be lack of time. There may also be an apprehension that health promotion should include activities in specific domains rather than at the policy level which regulates all aspects of health planning and school curriculum. Such an apprehension would make it difficult to understand why a health promotion model needs to influence multiple aspects of the community and school. A recent review highlights that bottom-up community-based interventions must be supported by top-down political commitment to be successful [27]. Clearly there is a need to further anchor these insights at policy levels.

Policies on national and regional levels recommend that sweets are removed from schools. In this study we found that school nurses generally approved of such guidelines but had difficulties in implementing them. This is interesting, since childhood obesity is worrying many school professionals and there is evidence that making school "sweet-free" does work [28].

Participation

CBPR was chosen partly because of its potential to raise participation rates [29]. Mechanisms for this are based on involvement of the community members, including their options to influence the research. Due to funding procedures, the quantitative part of the present study diverged from this design in two important ways; 1) by being planned before the start of the intervention (thus omitting participants from real influence). 2) By being conducted in the beginning of the intervention (thus without previous anchoring or trust-building). We were aware of this and tried to build relationship with school staff-at this stage teachers and school nurses, inviting them in an early stage to influence how HEI should work in each school.

Contacts were mediated by public health officials. HEI staff initiated personal meetings and was invited to regular staff meetings at schools. The anticipation was that this would motivate staff at schools to give us admittance to the regular meetings to which all parents of school-beginners are invited, and to make them support our practical arrangements concerning measurements. Our documentation show that this was successful in the sense that we were given access to parental meetings, that parents that visited the meetings generally accepted participation and that we were supported with all practical arrangements. However, these meetings were attended to a much less degree than we had thought. Also, sending out information without translation–following "normal school procedure"-was probably a barrier, indicating that such routines implicate an inherent systematic mismatch with vulnerable groups.

However, the translated forms that were used for the follow-up did not attract significantly more participants. The previously-mentioned note sent to us by one family, expressing a strong lack of trust and confidence, may represent feelings and perceptions that occur, in abundance or just in a few cases, in the population that chose not to participate. This may be a reflection of a phenomena called territorial stigmatization [30] referring to the feeling of being outside normal society. Potvin et al., conducting participatory research in an Aboriginal community in Canada, noted that "There was an acute awareness of potential negative outcomes of research in Aboriginal communities, such as community stigmatization and stereotyping." (p 1298) [11].

Should the outcomes have been expected?

Baranowski & Lytle [31] review the IDEFICS intervention by the mediating–moderating variable model, stating that since literature does not support causal links between the targeted behaviors and obesity, or the functionality of the mediating variables, or the intervention procedures, one should not have expected the intervention to be successful. HEI had a similar aim and knowledge base as IDEFICS, although it had a more participatory design and a specific focus on low income communities.

In hindsight, it might therefore have been expected that the outcomes of HEI would be negative, with no difference between intervention and control. Since the project was funded for only three years the time between measurements was limited to only two years. This is a short time for a complex intervention to be implemented, mediators to work on behaviors and change of behaviors to have an effect on body weight and previous interventions have shown that effects may only appear after the active phase of the intervention is over [32].

In reference to the absence of "strong causal relationship between each juncture" (intervention procedures-mediating variables-behavior change-health outcome) one might draw the conclusion that the intervention should not have been supported with public funds? We disagree for the following reasons.

1) The linearity of the model is deceptive since causality may travel in both directions. For example, self-efficacy (a mediating variable, step 2 in the model) may be improved by better health outcome (the last step in the model) as well as by increased physical activity (a behavior change, step 3). In a participatory model like HEI, intervention procedures develop in concert with community members and increased self-efficacy in individuals or on group level may affect intervention procedures (the first step). Moreover, absence of evidence for causal relationship does not mean that there is none. Mediating variables like stress and anxiety may change due to global (like refugee crisis) or local (like shootings in neighborhood) factors, and effects on behavior (like stress related over-eating or fear of playing outdoors) may on short sight outweigh measurable effects of interventions.

2) HEI draws upon theories for health behavior and interventions, using a structured documentation for formative and summative purposes. There is limited evidence that use of theory adds to effectiveness [33] but this reasoning refers to the effects of the intervention and not to the potential to evaluate it in an unbiased and transparent way. Throughout the intervention HEI used structured reports formatively, aiming at develop activities with a high level of participation from community members, building empowerment and striving for transparency regarding role, mandate and duration.

3) The many activities and supporting materials to which HEI contributed were developed using evidence based methods. Our structured reports address risk of exclusion and other possible hazards, which often are underestimated in public health work (like misunderstandings because of poor language skills, or people being offended for example by comments on their body weight or profession). Oral and written feedback from our collaborators indicated that the intervention was helpful in increasing empowerment and healthy behaviors. The note from the family resenting participation was the only indication of risk of harm. We strived to minimize such harm by restricting numbers of reminders to answer the invitation to participate (one phone call and one note).

Like Michael Marmot, we say "We need more research. But we also need action on basis of the research we already have" 3. Planning of interventions should not be hindered by an inflated belief that anything that cannot be proved in traditional research is not worth doing. We by no means imply that public health interventions should not be knowledge based, cautious, unbiased, and well documented. On the contrary, this is of utmost importance; not only to add to scientific knowledge but also to minimize the risk of harm being done and to enable systematic assessment and evaluation.

Conclusion

Sufficient time must be allocated for participatory public health interventions to develop them in concert with target groups. To justify efforts and costs, all steps (planning etc.) should be thoroughly documented, transparent and evaluated. Policies to minimize sweets in schools need increased support from management levels to be implemented. Participatory interventions can, although difficult to evaluate for effect, provide insights that cannot be obtained by traditional methods.

Ethics

Ethic approval was obtained from the Ethics review board in Gothenburg, DNR 660–13.

Authors' contributions

MM and LL conceived of the study. MM carried out design, participated in acquisition of data and drafted the manuscript. LL participated in the design and revising of the manuscript. CP contributed to the design of the study, acquisition of data and revision of the manuscript. All authors read and approved of the final manuscript.

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