A study of the Healthy Growth Charter in socially disadvantaged children

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Summary. The Healthy Growth Charter is an educational and health-promoting project aimed at an active involvement of the primary school children in health surveillance and protection. Being duly acquainted of the matter, scholars are asked to fill by their own a questionnaire on height, weight, sport attendance and other items of medical and demographic interest. According to the project, problems suitable of corrective measures, such as amblyopia, are signalled to the families and dealt individually. The project has been previously tested on about 1500 boys and girls from various Italian regions, showing that, despite the limits of self-reported data, it provides information in line with literature. Health inequalities in children remain an important problem also in Italy, and a second test of the Healthy Growth Charter was launched in a group of socially disadvantaged children. As reported in this paper, overweight, reduced physical activity, visual problems and other items markedly differed in this with respect to the previous study. These results provide some indication on the potential role of social disadvantage and poverty on health status of children. To better tackle the problem of health inequalities, the actual surveillance systems should be empowered, preferably with an active educational involvement of children, translating the information into public health intervention policies.

Key words: children, health inequalities, body weight, visual problems, sport practice.

Riassunto *(Uno studio della Carta del Benessere, in bambini socialmente svantaggiati)*. La Carta del Benessere è un progetto educativo, contraddistinto da un attivo coinvolgimento di bambini delle scuole primarie nella sorveglianza, tutela e promozione della salute. Dopo essere stati informati dell'iniziativa, gli scolari sono invitati a compilare da soli un questionario su peso, altezza, sport praticati ed altre voci d'interesse medico e demografico. Secondo il progetto, i problemi suscettibili di misure correttive, come l'ambliopia, sono segnalati alle famiglie e affrontati individualmente. Il progetto è stato precedentemente testato su circa 1500 bambini e bambine appartenenti a numerose regioni italiane, fornendo risultati sostanzialmente in linea con quelli riportati in letteratura. Poiché in Italia, come in tutti i paesi, le disuguaglianze sanitarie su base economica e sociale sono un problema rilevante, un secondo studio con l'utilizzo della Carta del Benessere è stato condotto in un gruppo di bambini socialmente ed economicamente svantaggiati. Come si riferisce in questo lavoro, il sovrappeso, la ridotta attività fisica, i problemi visivi e la pratica di discipline sportive sono risultati marcatamente diversi rispetto allo studio precedente. Questi risultati forniscono alcune indicazioni sul ruolo potenziale della povertà e dello svantaggio sociale sullo stato di salute dei bambini. Per affrontare meglio il problema delle disuguaglianze sanitarie, gli attuali sistemi di monitoraggio andrebbero potenziati, preferibilmente con un coinvolgimento attivo del bambino sul piano educativo, e le informazioni raccolte andrebbero tradotte in provvedimenti di sanità pubblica.

Parole chiave: bambini, diseguaglianze sanitarie, peso corporeo, problemi visivi, pratica di sport.

INTRODUCTION

The relation among education, health and wealth is circular, as person's level of culture, income, and occupational status are strong determinants of health status, while a good health status allows greater access to resources and wellbeing [1-4]. Socioeconomic status is a particularly important determinant for child health, as poverty has been found to be associ-

ated with malnutrition, poor health, and unstimulating home environments, which detrimentally affect children growth [5]. Social disadvantage may also be associated with poor physical activity and obesity, which expose children to the so-called metabolic syndrome earlier in life [6, 7]. The years of development play a crucial role in creating and maintaining health inequalities through to adulthood [8]. Hence, to ensure good health in all ages it is of the utmost importance to invest in health education activities for young people and to create an environment which favours physical activity [9, 10].

According to the Children's Environment and Health Action Plan for Europe [11], an "Effective action for protecting children's health should emphasize:

- primary prevention, *i.e.* policies, programmes and plans aimed at improving the state of the physical environment (air, water, soil, noise), in particular through the integration of children's needs into housing, transport, infrastructure and planning;
- equity, *i.e.* giving priority to protection of children at highest risk, and particularly of children who are neglected, abandoned, disabled, institutionalized or exploited, or who are suffering the consequences of armed conflict and forced migration, by improving access to preventive health and social protection services;
- poverty reduction, *i.e.* policies addressing the multidimensional aspects of poverty among children;
- health promotion, i.e. actions aimed at preventing and reducing exposures to environmental health hazards by adopting healthy lifestyles, achieving sustainable consumption patterns and helping to create healthy and enabling human settlements".

Health status and health inequalities in children are regularly measured by the Health Behaviour in School-aged Children (HBSC), a World Health Organization collaborative study which regularly surveys the health behaviours of school children at ages 11, 13 and 15 in 41 countries of Europe and North America. According to the 2005-2006 HBSC survey, health inequalities in Italian children are over the average score of the OECD countries [12]. Recently data on body weight and height, food habits, obesity and physical activity of Italian children were gathered within two independent projects, called "OKkio alla salute" and Healthy Growth Charter (HGC).

"OKkio alla salute" is coordinated by the Istituto Superiore di Sanità (ISS) [13] and consists of a survey system to be repeated at 4 years intervals, comprising:

- a medical visit, in which height and weight are measured with a weighing machine and a metre in the presence of a teacher;
- a questionnaire on nutritional habits, physical and other daily activities, to be filled by children;
- a questionnaire on the above items (nutritional habits, physical and other daily activities), to be filled by parents;
- a questionnaire on educational programs played by the school, either alone or in collaboration with external institutions.

The first survey according to "OKkio alla salute" was conducted on about 45 000 Italian children, belonging to more than 2000 schools [13-15]. According to the Body Mass Index (BMI), 23.6% of all the measured children was overweight and 12.3% was obese. Children living in the northern regions of Italy presented a lower prevalence of overweight as compared to children living in central and southern Italian regions. Campania region presented the highest proportion of overweight (27.8%) and obese (21%) children. As regarding physical activity, 26% of the interviewed children reported not to have practised any physical activity (including sports or non structured outdoor activity) the day preceding the survey, with important differences among regions, from 17% in Veneto to 32% in Sardinia.

HGC project is coordinated by the Noopolis Foundation and was presented at the European Council held in Strasbourg, 7-10 May, 2007. Its main features are:

- the survey is part of educational campaigns, aimed at providing an information on items of health interest, such as doping and nutrition needs;
- being duly acquainted of the matter, children are asked to self fill a questionnaire on height, weight, sport attendance and other items of medical and demographical interest;
- problems suitable of corrective measures, such as overweight and amblyopia, are signalled to the families to be dealt individually;
- the survey is to be repeated annually, at the beginning of school courses as part of the educational career;
- each child is followed along the growth process, so as to assess the long term effects of carried-out interventions;
- the project relies on informatics for data collection, storage and elaboration, resulting in a data bank anonymously available to scientists, health workers and Governmental authorities;
- the entire system has been simplified and economical costs minimized, so as to render it generalizable to the whole Italian school population.

The first HGC survey was sponsored by the Comitato Olimpico Nazionale Italiano (CONI) within an educational campaign against doping [16-18]. It was carried-out on 1522 boys and girls, aged 8-12 years, living in 14 Italian regions. In this survey, the prevalence of obesity was around 12%. Sport practice turned out to be more frequent than in the "OKkio alla salute" survey and more frequent in North than South of Italy. In about 8% of the children there was a different visual capacity between the two eyes, indicating the potential presence of amblyopia. This percentage was higher than that reported in other studies [19, 20], that evaluated the presence of amblyopia with conventional ophthalmic examinations.

This paper describes the results of a second study of the HGC carried-out in a population of children economically and socially disadvantaged.

SUBJECTS AND METHODS

This was a cross-sectional study, carried-out at the "Fondazione Idis - Città della Scienza" within the "Children Summer", a semi-residential campus for children aged 4-11 years and more. This campus is ongoing since 1997. At the end of the school year, children spend the whole day from 9 a.m. to 4 p.m., Monday through Friday, in this structure. They are divided in groups by age and are followed by personnel of the Foundation. The activities and workshops are designed to enhance the artistic and creative skills, in connection with labs and sport activities. During the creative workshops, the children have the possibility of manufacturing objects of different materials, including ceramics, in a friendly environment. Sports include swimming, archery, fencing and others. The courses are aimed at: developing scientific knowledge; stimulating physical activity; enhancing expressiveness and creative abilities; sensitizing children on environmental issues. The "Children Summer" is supported by the City of Naples, Department of Social Policy, in favor of children from families with disadvantaged socio-economic conditions. The present study was performed during the months of June and July 2009.

All the children present at the Campus during the third week of June 2009 were given the questionnaire of the study.

Children were explained by their teachers about meaning and scope of the HGC project, and they were solicited for comments and suggestions. After each session children were administered an anonymous self-filled questionnaire containing the following questions:

- Are you a boy or a girl?
- How old are you?
- How much do you weigh?
- How tall are you?
- Can you read the blackboard from the back of the classroom?
- Can you still read the blackboard with your hand over your right eye?
- Can you still read the blackboard with your hand over your left eye?
- Do you wear eyeglasses?
- Do you wear dental appliance?
- Do you hear well?
- Have you often headache?
- When? After reading?
- Do you have difficulties in reading?
- Do you know what hepatitis is?
- Do you play sports?
- If yes, which one?
- Alone or in a team?

Out of the 839 questionnaires distributed, 618 (74%) were filled in all items by 251 girls (40.6%) and 367 boys (59.4%). The age classes mostly represented were respectively 9 and 11 years. The remaining 221 questionnaires (26%) were filled partially and were not considered in the present analysis.

The questionnaire data were entered into a computer and analysed anonymously with SPSS 18 for Mac.

A descriptive analysis was carried-out on frequencies according to sex and age. Due to the explorative and methodological nature of the study, no inferential statistical analysis was performed. The Body Mass Index (BMI) was calculated as ratio of weight divided by squared height in meters [21]. We defined overweight and grade 2 thinness by age and sex the specific cut off values of BMI, calculated in a large international survey [22, 23]. For each considered item we compared the frequency of the specific answers in the present and in the previous study, that was carried-out in primary school children [16-18].

RESULTS

In *Table 1* are reported the mean BMIs by age and sex in comparison with the corresponding results obtained in the previous study on the population of primary school children [16-18].

Boys in all age classes had higher BMIs than girls with the exception of the class of age of 8 years. BMI by age showed a "U" shape distribution with higher BMI at younger and older ages. The mean BMIs of socially or economically disadvantaged children attending the "Città della Scienza" campus were generally higher that those measured in the unselected school children population. This difference was present in all classes of age and sex, except for boys of 8 years

Table 1 | *Mean weight (kilograms) and height (metres) by age and sex*

Age years	Girls	Boys
≤ 7	No. = 13	No. = 21
Weight	29.5 ± 11.0	33,2 ± 10,1
Height	1.21 ± 0.16	1,28 ± 0,19
8	No. = 32	No. = 37
Weight	32.5 ± 5.9	33.5 ± 10.3
Height	1.26 ± 0.11	1.35 ± 0.06
9	No. = 50	No. = 67
Weight	35.5 ± 7.6	36.0 ± 11.4
Height	1.36 ± 0.10	1.39 ± 0.39
10	No. = 56	No. = 57
Weight	36.0 ± 6.5	37.7 ± 8.5
Height	1.41 ± 10.0	1.38 ± 0.11
11	No. = 61	No. = 61
Weight	39.9 ± 6.8	43.4 ± 10.2
Height	1.45 ± 0.10	1.46 ± 0.12
12	No. = 25	No. = 66
Weight	46.5 ± 7.1	47.8 ± 11.0
Height	1.55 ± 0.10	1.50 ± 0.10
≥ 13	No. = 14	No. = 58
Weight	52.3 ± 10.7	53.6 ± 13.0
Height	1.57 ± 0.09	1.61 ± 0.10
Thinness (%)	5 (2.0) [2.1]	12 (3.3) [2.5]
Overweight (%)	70 (27.9) [23.6]	138 (37.6) [27.3]

± numbers are standard deviations.

Percentages estimated in the previous study are represented within squared brackets.

Table 2 | *Prevalence of the risk condition for amblyopia and use of lenses or dental devices by age and sex*

Age years	Girls	Boys
≤ 7		
Amblyopia risk	2 (15.4)	4 (21.1)
use of lenses	2 (15.4)	2 (9.5)
use of dental devices	2 (15.4)	0 (0)
8		
Amblyopia risk	8 (32.0)	6 (20.0)
use of lenses	3 (10.3)	10 (28.6)
use of dental devices	1 (3.4)	0 (0)
9		
Amblyopia risk	5 (12.2)	14 (21.9)
use of lenses	9 (18.8)	14 (21.9)
use of dental devices	3 (6.3)	9 (14.1)
10		
Amblyopia risk	8 (15.1)	6 (10.8)
use of lenses	10 (17.9)	7 (12.7)
use of dental devices	10 (17.9)	7 (12.7)
11		
Amblyopia risk	6 (11.8)	1 (1.9)
use of lenses	13 (21.3)	8 (13.1)
use of dental devices	9 (15.9)	7 (11.2)
12		
Amblyopia risk	1 (4.8)	9 (15.0)
use of lenses	7 (28.0)	10 (15.6)
use of dental devices	6 (26.6)	10 (15.6)
≥13		
Amblyopia risk	2 (14.3)	7 (14.0)
use of lenses	2 (14.3)	12 (20.7)
use of dental devices	2 (14.3)	11 (18.1)
Total		
Amblyopia risk	32 (12.7) [9.7]	47 (12.8) [7.2]
use of lenses	46 (18.3) [27.2]	63 (17.2) [22.5]
use of dental devices	33 (14.2) [21.0]	44 (11.3) [24.0]

of age and girls older than 11 years. A similar trend was observed when the comparison was restricted to children of the previous study living in the South of

Italy (data not shown). In the present study the average body weight of boys was about 3 kg higher than in girls, varying from a minimum of 1 kg or less in the age class of 8 and 9 years, to a maximum of about 4 kg in the age class of 7 years. Concerning height, boys were in average 3 cm taller than girls, with marked differences among age classes being the girls taller than boys at the age of 9, 10 and 12 years.

Table 2 shows the prevalence of the risk condition for amblyopia and the use of lenses or dental devices by age and sex in the present and previous study [18].

In the present study more boys and girls were at risk for amblyopia in all classes of age than in the previous study (12.8%, against 8%) *(Figure 1)*. The percentage of children wearing eye glasses was lower than in the previous study, being respectively 18.3% in boys and 17.2% in girls compared respectively to 27.2% and 22.5% of the previous study *(Figure 1)*. The percentage of children wearing corrective dental appliances was also lower than in the previous study in all classes of age, averaging 12.5% against 22.5% *(Figure 1)*.

According to responses to the question "Do you hear well?", the percentage of children with hearing problems was 2%. This item was not considered in the previous study. Literature data, derived from more objective measurements, range from 5% to 11% [24-26].

The percentage of children suffering from headache was 72%, to be compared with literature data ranging from 11% to 82% [27-28]. The "after reading" percentage of headache was 40%, and the percentage of children having "difficulties in reading" was 18%. There is no comparative value neither in the previous study on the general population nor in literature.

The percentage of children knowing "What hepatitis is" was 44%. The corresponding question in the previous study dealt with the Mediterranean anemia, which was known by 50% of children [18].

Table 3 lists the sports played by children in the present and previous study [16-18].

In present study the frequency of children who did not play any sport was 47.2%, which was nearly two times higher than in previous study (26.0%) *(Figure 1)*.
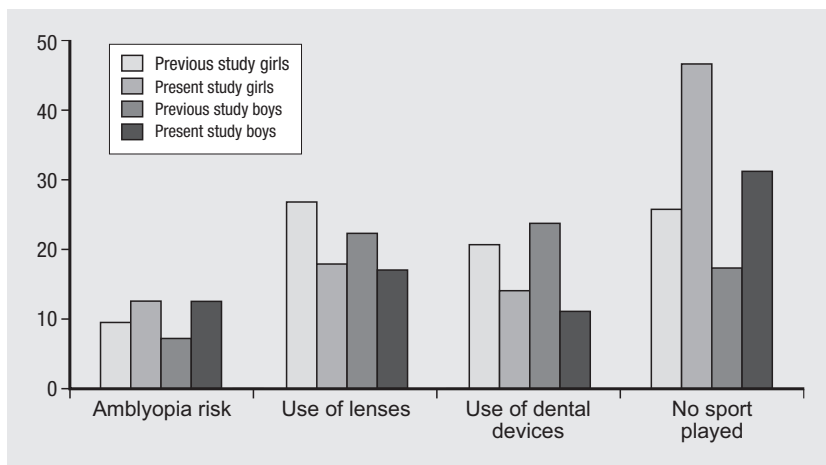

Fig. 1 | *Comparison of prevalence (%) of selected characteristics in the population of the study (present study) and in a previous study carried out in a non selected population of schoolchildren.*

Table 3 | *Sports played by age and sex*

Sports played	Girls	Boys
Athletics	8 (4.7)	16 (4.8)
Dance	92 (53.5)	9 (2.7)
Basket	5 (2.9)	42 (12.6)
Football	15 (8.7)	274 (82.3)
Tennis	3 (1.7)	11 (3.3)
Swimming	22 (12.8)	31 (9.3)
Volleyball	35 (20.3)	19 (5.7)
Cycling	1 (0.6)	3 (0.9)
Gymnastics	31 (18.0)	1 (0.3)
None	154 (47.2) [26.0]	153 (31.5) [17.5]

Numbers in round brackets are percentages within sex.
Numbers in squared brackets are percentages within sex in the previous study.

Almost 50% of girls preferred dance, followed by volleyball, gymnastics, swimming and football. The latter was practiced by girls much more than in the previous study (8.7% against 1.6%). Dance was the number one also in the previous study, but with a lower rate of preference, followed by swimming and volleyball. The vast majority of boys played football, followed by basket, swimming and volleyball. Football was the number one for boys also in the previous study, although with a lower rate of preference, followed by swimming and basket.

Concerning the question whether sport was practiced "Alone or in a team", the answers were 7% "alone" against 93% "in a team".

DISCUSSION AND CONCLUSIONS

This is the second pilot study of the HGC, an educational and healthy project aimed at setting up a permanent surveillance system of the school population, with particular reference to health related problems suitable of preventive or corrective interventions. According to the project, the survey is repeated yearly and each child is followed along his growth, to assess the long-term effects of intervention measures. A distinctive feature of the project is the active involvement of the young population, both in self-evaluation and in educational campaigns in favor of health. Whereas the first pilot study was performed on the general Italian school population, this study was addressed to a group of socially and economically disadvantaged children. Hence, the comparison between the two studies provides some indications on the potential consequences for health of poverty and social disadvantage in the modern society *(Figure 1)*.

The first indication is that the higher prevalence of thin boys among poor observed in the past, that was caused by under-nutrition and by child labor, is now substituted by higher prevalence of overweight and obesity. One possible explanation is that, among the poorer children, overweight and obesity are caused by over-nutrition and by the lack of physical activity due to a disappearance of child labor not balanced by sport related physical activities. Overweight can be controlled with simple and inexpensive measures, such as gymnastics, running and reduction of caloric intake. For this reason the adoption of healthier life habits does not represent a problem strictly related to the social or economic condition, but represents a primary educational issue. We think that health education represents a human right like medical care, clean water, nutrition, clothing and shelter.

The higher prevalence in this study than in previous one of boys and even girls practising outdoor football suggests that, in disadvantaged children, sport activities are mainly restricted to sport disciplines not requiring special equipments and facilities. At the same time, metropolitan and more dense inhabited quarters where most socially and economically disadvantaged persons live, cumulate obstacles to outdoor children activities. For this reason, beside education, public intervention in favor of gyms, swimming pools and other sport facilities are to be encouraged [9, 10].

This study shows that health inequalities in disadvantaged children might be heralded by the high prevalence of vision, hearing and reading problems. In our investigation these problems were captured with simple tools and, more importantly, could be controlled with simple intervention measures. A typical example is amblyopia, which is a frequent condition in childhood that can be easily controlled when early recognized [19]. Although vision screening tests are not a diagnostic substitute for comprehensive eye examination, our "blackboard test" should be appreciated as a simple and economic method for detecting situations at risk, to be addressed to the oculist and afforded with appropriate, corrective measures.

In the present study the percentage of children wearing eyeglasses or corrective dental appliances was consistently lower than in the previous study. In Italy the diagnosis of both visual and dental problems depends to a large extent on the individual initiative of families, as the support of public health service is limited. Families, particularly those disadvantaged, might be not aware of the importance of an early recognition of visual and dental problems, or more likely disadvantaged families cannot afford to pay for a private medical visit. Hence a low percentage of wearing eyeglasses or corrective dental appliance may be regarded as a suitable indicator of social disadvantage at the population level.

The present study was also aimed at re-evaluating the reliability of the HGC project in a setting different from primary school, otherwise maintaining the original tools and procedures. In particular, similarly to the previous investigation in the schools, data collection was coordinated by the persons caring for children and this activity was considered part of their institutional and educational duties. The other principal peculiarity of the HGC investigation was the collection of data self reported by children. This modality has the advantage of not requiring the use of mechanical or

electronic instruments, that normally are not present in the school. The disadvantage is that self-reported anthropometric measures can be biased, resulting in misclassification of BMI status [29-31]. This second investigation, however, confirms that self reported anthropometric measures are capable of catching most of the relevant phenomena expected in different groups. Actually the HGC investigation is capable, even in a cross-sectional setting, of describing the progressive yearly increase of body weight and height and the differences among boys and girls. This second investigation also demonstrates that the HGC methodology is sensitive enough to detect the effects of some social determinants of health on anthropometric measures and on some life habits or styles. These encouraging results are probably due to the fact that children were actively involved in self measurements, becoming protagonists of the investigation and, ultimately, of the defence and promotion of their health. As a matter of fact, both in the present and previous study self reported data appeared essentially in line with more rigorous and expensive studies [12, 32].

Many aspects of the HGC project can be improved. As an example, an acceptable compromise should be found between the children's privacy and the need to use personal information to address the single cases suitable for preventive or corrective measures. Moreover, the screening of under diagnosed medical conditions could be extended to other conditions easily recognizable, such as dyslexia and ADHD (Syndrome of Attention Deficit and Hyperactivity Disorder). Finally, the reliability of self-reported measures should be evaluated with formal studies of concordance, sensitivity and specificity. On the whole, however, the present study appears to confirm the actual value, feasibility and reliability of the HGC.

Conflict of interest statement

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