Results from the Sweden 2016 Report Card on Physical Activity for Children and Youth

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Abstract

**Background:** The Sweden 2016 Report Card on Physical Activity (PA) for Children and Youth is a unique compilation of the existing physical and health related data in Sweden. The aim of this paper is to summarize the procedure and results from the report card. **Methods:** Nationally representative surveys and individual studies between 2005-2015 were included. Eleven PA and health indicators were graded using the Active Healthy Kids Canada grading system. Grades were assigned based on the percentage of children/youth meeting a defined benchmark (A: 81-100%, B: 61-80%, C: 41-60%, D: 21-40%, F: 0-20%, or incomplete (INC). **Results:** The assigned grades were: Overall Physical Activity, D; Organized Sport Participation, B+; Active Play, INC; Active Transportation, C+; Sedentary Behaviors, C; Family and Peers, INC; School, C+; Community and the Built Environment, B; Government Strategies and Investments, B; Diet, C-; and Obesity, D. **Conclusion:** The included data provides some support that overall PA is too low and sedentary behavior is too high for almost all age groups in Sweden, even with the many national policies as well as an environment that is favorable to the promotion of PA.

**Key words:** child health, diet, obesity, policy, sedentary
Sweden is a northern European nation with approximately 9.9 million inhabitants. Even though each of the Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) has their own public health and national food agencies, over the past four decades they have worked together through the Nordic Council of Ministers to formulate the Nordic Nutrition Recommendations (NNR). The NNR have been published every eight years and provides guidelines for both children and adults regarding dietary composition and recommended nutrient intakes as well as levels of physical activity (PA).\textsuperscript{1,2}

In the NNR,\textsuperscript{1} 60 minutes a day of moderate to vigorous physical activity (MVPA) is recommended for children and adolescents,\textsuperscript{2} however no specific recommendation is provided for sedentary behavior (SB), it is just stated to reduce these activities. Worldwide, trends in the number of children who are overweight or obese have been increasing since the 1970s\textsuperscript{3} and Sweden is no exception. Although there has been some Swedish reports indicating that the prevalence is leveling off or stable in children,\textsuperscript{4,5} in the past 30 years the number of overweight children has doubled.\textsuperscript{6} As a combination of low PA and large amounts of SB are related to overweight and obesity,\textsuperscript{7} the compilation of this data is vital for policy makers, researchers, and various stakeholders in order to assess problem areas and intervene in appropriate ways. The Active Healthy Kids Report Cards from Canada\textsuperscript{8-10} and Scotland\textsuperscript{11} have shown to be an effective and efficient method to summarize the available literature, which will hopefully aid in the adoption and creation of PA strategies and policies that are most appropriate for Swedish children and adolescents.
The Active Healthy Kids Swedish working group was established in 2015 to review and compile the most recent, available literature regarding: PA; SB; sports and recreation; and government strategies to promote PA and to allocate grades to the nine main indicators as well as the two supplementary indicators, diet and obesity. Therefore, the main purpose of this paper is to summarize the procedure and results obtained from the Active Healthy Kids Sweden Report Card 2016.

Methods

The Active Healthy Kids Sweden Report Card 2016 was developed as part of the Active Healthy Kids Global Alliance (AHKGA). The work was led by Karolinska Institutet, with support from The University of Gothenburg, The Public Health Agency of Sweden, The National Food Agency of Sweden, and private stakeholders. The Swedish research work group (RWG) comprised of nine people, who accumulated all of the available research and policy documents most relevant to the indicators. In October of 2015, three smaller RWG based on each person’s expertise were formed and the 11 indicators were divided up accordingly. Each RWG carefully analyzed the relevant studies and documents available, with a focus on the evidence quality, representativeness, sample size, and methodology utilized.

The nine main indicators were: (1) overall physical activity levels, (2) organized sport participation, (3) active play, (4) active transportation, (5) sedentary behaviors, (6) family and peers, (7) school, (8) community and the built environment, and (9) government strategies and investments and the two supplementary indicators were (10) diet and (11) obesity. Similar to Scotland’s report card, diet and obesity were included as they are important health indicators. Each of the 11 indicators were then assigned a grade, representing the percentage
of children and adolescents meeting a defined benchmark. A is 81-100%, B is 61-80%, C is 41-60%, D is 21-40%, and F is 0-20%. If there was no data or insufficient data for an indicator it was marked as incomplete (INC). A plus (+) or minus (-) was assigned if an indicator was not clearly within a defined letter value. Each RWG assigned a preliminary grade to the indicators they were responsible for and in April 2016 the whole RWG convened to discuss and finalize the grades. The compilation of the evidence and the grades was done following the Active Healthy Canada PA Report Card protocol.

Relevant publications between 2005 and 2015 were included in this report card for children and adolescents (0-18 years of age). The main data sources are presented in Table 1. For the PA indicators a search on PubMed was conducted on October 26, 2015 with the search terms “physical activity”, “Sweden/Swedish”, and “children”. Also, “sedentary behavior”, “television viewing”, and “active transportation” were used. Inclusion criteria was: English or Swedish language, age 0-18 years, published between 2005-2015, healthy children, and PA assessed using objective methods or questions that had been validated against objective methods. Studies were only included once and articles that reported data from Swedish children combined with other populations of children were not included. The PubMed search retrieved 341 articles and 43 of them fulfilled the inclusion criteria above. However, only four of these articles were included in this report card since the other 39 articles did not provide any estimates of the percentage of children and adolescents meeting the PA recommendations. In total, four studies objectively measured MVPA and one subjectively measured SB (screen time i.e. TV/DVD/video viewing) in relation to the recommendations. The amount of children reaching the recommendation for overall PA was assessed via those who fulfilled the recommendations of greater than 60 minutes of MVPA in accordance with the NNR. For SB, as no concrete recommendation for Swedish children is available, we
applied the Canadian recommendation for SB which is no more than two hours of recreational screen time per day for children aged 5-17\textsuperscript{17} and one hour for children aged 2-4 years.\textsuperscript{18}

Overweight and obesity prevalence has recently been published for 8 and 12 year old children\textsuperscript{19}, and other sources\textsuperscript{20-22} were used to complement this data. The Health Behavior in School-aged Children (HBSC)\textsuperscript{23} study, adopted by the WHO Regional Office Europe, is a survey that has been conducted every fourth year for the past 30 years in 11, 13, and 15 year olds using an international standardized questionnaire. The data from HBSC 2013/14\textsuperscript{23} was used in the report card and provided information on MVPA, SB (screen time i.e. TV and DVD viewing and playing video games), organized sport, and diet. A detailed description of the survey design and methodological development of the HBSC study can be found on their website.\textsuperscript{24}

Three national surveys\textsuperscript{23,25,26} were utilized for grading the diet indicator. Three dietary variables (fruits and vegetables, fish, and sweetened beverages) that represent healthy and unhealthy eating behaviors respectively were chosen, as they were readily available in all three studies. The Swedish Dietary Survey 2003\textsuperscript{25} comprises of the most recent nationally representative data regarding the intakes of foods and drinks of 4, 8, and 11 year old children. Even though this survey was published before 2005 it was included as it is the most recent national survey from the National Food Agency. Briefly, the children together with their parents filled in an estimated food diary where they wrote down everything they ate and drank during four consecutive days.\textsuperscript{25} The Nordic Monitoring Survey of Food, 2011 (NFFQ)\textsuperscript{26} was a validated questionnaire, performed over the phone in every Nordic country for children aged 7 to 12 years. Additionally, the HBSC 2013/14\textsuperscript{23} survey’s dietary information was also utilized.
Active transportation is any self-propelled transport (e.g. walking or biking) and it was assessed using the report from the Children’s Routes to School Survey that has been conducted every third year for the past 16 years. This questionnaire targets parents of children from 6 to 15 years of age and asks questions pertaining to how their children get to and from school.\textsuperscript{27} Scientific and public databases of national and local authorities were searched for the indicators regarding school and government strategies and investments and relevant national policy documents were reviewed and their content assessed.\textsuperscript{27-36} Additional information regarding data on the number of municipalities with sustainable urban mobility plans was acquired via personal contact with the Swedish Association of Local Authorities and Regions as well as The Swedish Transport Administration.

\section*{Results}

The 2016 Sweden Report Card is the first compilation of PA levels and related behaviors in Swedish children. The results are summarized in Table 2 and the report card’s front cover is shown in Figure 1.

\subsection*{1. Overall Physical Activity: D}

Due to differences found within the number of children reaching the goal of 60 minutes of MVPA per day throughout childhood and adolescence, three age groups were created and a subsequent grade was given to each age group. The grades were: pre-school children (2-5 years), D; school aged children (6-11 years), C+; and adolescents (12-15 years), F. The overall grade of D was an average of the grades for the three age groups. In pre-schoolers,
when using accelerometers, 12% of girls and 22% of boys reached 60 minutes of MVPA per day.\textsuperscript{13} For school aged children, when using self-report in this age group 13% of girls and 21% of boys aged 11 years reached 60 minutes of MVPA.\textsuperscript{23} When using objective measures for this age group, the results are inconsistent with the most recent study, the IDEFICS study (Sweden), showing that 43% of boys and 18% of girls aged 8-9 years met the MVPA recommendation.\textsuperscript{13} Three older reports in this age group used lower cut-points for MVPA and reported that as many as 93-100% of 8-11 year old children (boys and girls) fulfilled the recommendation.\textsuperscript{14-16} For adolescents, 10% and 15% of 13 and 15 year olds reached the allotted 60 minutes.\textsuperscript{23}

2. \textit{Organized Sport Participation: B+}

Due to a lack of data in this area only children and adolescents aged 11 to 15 were included. According to the HBSC survey\textsuperscript{23} approximately 75% of 11 to 15 year olds participate in organized sport at least two times per week. The highest participation was seen in 11 year old boys at 82% and lowest in 15 year old girls at 70%.

3. \textit{Active Play: INC}

There was an insufficient amount of data regarding active play in Sweden, therefore no grade was assigned.

4. \textit{Active Transportation: C+}
For children aged 6 to 15 about 48% and 58% use active transportation to and from school in the winter and summer months respectively.\(^{27}\) A difference in the proportion of children walking and cycling was observed between the winter months (November to March) and the summer months (April to October). As expected, more children walk during the winter and cycle during the summer.\(^{27}\)

5. *Sedentary Behaviors: C*

Similar to overall PA there were differences seen between the age groups, therefore a grade was assigned to each age group, with pre-school children receiving a D, school aged children a C+, and adolescents a C. For pre-schoolers between 33% and 40% had less than one hour of screen time per day.\(^{13}\) For school aged children 47% of boys and 71% of girls had less than two hours of screen time per day as measured via a parental questionnaire.\(^{13}\) According to the HBSC survey\(^{23}\) approximately 62% of 11 to 15 year olds had less than two hours of screen time per day. It is important to note that screen time in both studies included questions regarding TV or DVD viewing and playing video games.

6. *Family and Peers: INC*

Currently, in Sweden there is insufficient data for this indicator, therefore a grade of incomplete was assigned.

7. *School: C+*
The Education Act includes pre-school and after school childcare and emphasizes the promotion of a healthy lifestyle among children. Physical education is mandatory in both primary and secondary schools in Sweden (a minimum of 1.5 and 1.9 hours a week respectively). Furthermore, home and consumer studies is mandatory for all children aged 13 years and older. Finally, all schools have to provide a nutritious lunch to every child throughout the compulsory nine years of school, free of charge. The free school lunch program has been in existence since 1948 and mandatory for all municipalities since 1997.

8. Community and the Built Environment: B

A large proportion of children and youth feel safe in their neighborhood. Approximately 98% and 88% of children and adolescents between 10 and 18 years of age report feeling safe outside where they live during the day and at night, respectively. The distance between home and school is within walking or cycling distance for most children. In Sweden, 59% of school aged children have less than two kilometers between their home and their school. This proportion has remained relatively constant since 2003. The traffic safety along children’s school routes is an area where improvements can be made, as only 51% of parents perceive that their child’s route to school is safe. Furthermore, all Swedish municipalities have a master plan for their long-term urban planning, and 29% report having sustainable urban mobility plans to help design safe and supportive environments for sustainable transportation modes, such as walking and cycling. Finally, the proportion of children between 0 and 15 years of age living in urban areas (with at least 30 000 inhabitants) and having access to greenspace within 300m from their home varies between 94% and 100%.

PA and a healthy diet are two out of eleven objective domains of the national public health policy. National policy documents have a life-course approach and increase accountability through cross-sectional approaches. These include “Sports for Life” and “Sports Wants”, as well as a strategic plan for the collaboration between the Sports Confederation and schools in order to promote sports in schools. The agencies responsible for transportation and urban planning have policies and guidelines addressing PA and active transportation. Furthermore, in Sweden there is “The Right of Common Access” which is guaranteed in the Swedish Constitution since 1994 and allows everyone to move around freely in the countryside.

**10. Diet: C-**

As we split the diet into three domains, a grade was given to each one. The assigned grades were: fruits and vegetables, F; fish, C; and sugar sweetened beverages, C. Fruits and vegetables received an F because less than 20% of four year olds consumed the recommended 400g per day. Furthermore, the frequencies of fruit and vegetable consumption in the NFFQ and the HBSC survey demonstrate that few children are fulfilling the recommendation (500g per day for children older than ten years). In regards to fish consumption, approximately 43% of children ate fish for lunch or dinner twice per week. When comparing the Swedish Dietary Survey 2003 and the NFFQ (2011) there is some evidence suggesting that sugar sweetened beverage consumption is decreasing. Finally, based on questions regarding sugar sweetened beverages and sweets the NNFQ concluded that approximately 50% of children fulfill the recommendation of less than 10% of their total energy from added sugar. Therefore, an overall grade of C- was assigned to the diet indicator.
**11. Obesity: D**

In four year olds in the Stockholm region approximately 11% are overweight or obese as defined by BMI, with other regions observing slightly higher values (17% for girls and 13% for boys). A recent study in 8 and 12 year olds found that 12% of boys and 11% of girls at eight years of age and 16% of boys and 13% of girls at 12 years of age were overweight or obese. According to the HBSC international report 11% of 11 year olds, 13% of 13 year olds, and 16% of 15 year olds were overweight or obese. Even though the evidence from the study by de Munter et al. has shown that the prevalence of overweight and obesity has decreased in 8 year old children and remained approximately the same in 12 year olds, it is still far too high.

**Discussion**

The front cover for this report card was selected because it represents how PA can be included in everyday life for all families in Sweden.

Overall PA levels seem to be low across all age groups in Sweden. However, the grade D for overall PA needs to be interpreted with caution for numerous reasons. Firstly, the grade is based on a combination of national data based on self-report and a few studies using objective measures that are not nationally representative. This is a limitation since objective measures are recommended for PA intensities, and correlations between subjective and objective methods for assessing PA in young people are low to moderate. Furthermore, both methods have limitations. Although, the self-reported data was based on the widely used HBSC questionnaire, it has not been validated in Swedish children as well as self-reported data can...
be prone to recall bias and misinterpretation of questions.\textsuperscript{40} The evidence included using objective measures is limited by different accelerometer protocols, especially the use of different cut-points.\textsuperscript{37,38,40} To illustrate, for school aged children, the most recent study (IDEFICS) applied a cut-point of 2296 counts per minute (cpm) for MVPA resulting in 43\% of boys and 18\% of girls meeting the MVPA recommendation,\textsuperscript{13} while corresponding figures for two older reports using 1000 cpm as a cut-point were 93-100\%.\textsuperscript{14,16} A recent report concluded that when using different cut-points differences in the number of children meeting the recommendation may range from 3-5\% ( \textgreater 3000 cpm), up to 87\% ( \textgreater 2000 cpm), and up to 100\% ( \textgreater 1000 cpm).\textsuperscript{40} To the best of our knowledge, there is no consensus on which cut-points are the most appropriate to use, however, recently 2000-3500 cpm\textsuperscript{59} or 2300 cpm\textsuperscript{41} have been recommended, suggesting that the reports showing that almost all school aged children fulfilled the recommendations may be an overestimation. Another limitation of this report is that, in accordance with a previous review using European data,\textsuperscript{38} only a small proportion of the included studies using objective measures reported adherence to the MVPA recommendation. We can only speculate about how this fact has affected our grade, however, we performed additional calculations utilizing reported mean values and standard deviations (and assuming normally distributed data) for the reports using cut-offs above 2000 cpm. These rough calculations showed that approximately 13\%\textsuperscript{42,43} and 75\%\textsuperscript{44} of school aged children and 53\%\textsuperscript{44} of adolescents fulfilled the MVPA recommendation. Finally, the evidence for a low grade in preschoolers included only one study, however, it used up-to-date methodology,\textsuperscript{13} and recent data from two studies in Swedish four year olds are also showing high levels of SB\textsuperscript{45,46} and low levels of vigorous PA.\textsuperscript{45} To conclude, we determined the grade D for overall PA since the included data suggested low levels of PA across all age groups. However, the grade should be interpreted with caution due to the use of both self-reported and objective measures, the limited number of studies, and the methodological issues discussed.
above. Our report card clearly highlights the need for national surveys using objective measures of PA in Sweden in order to provide a more accurate and solid basis for future report cards. For adolescents, accelerometry will be included in the national dietary survey beginning in the autumn of 2016 and hopefully in the future all age groups will be covered.

A grade of “C” was assigned to SB. As Sweden’s recommendation for SB is to reduce the amount of time participating in these activities,\(^1\) we have utilized the Canadian recommendations of less than one or two hours of recreational screen per day for children aged 2-4\(^{18}\) and 5-17 years,\(^{17}\) respectively to grade this indicator. Similar to overall PA, and probably due to the lack of a concrete recommendation for SB in children, very few studies have compared the amount of SB to the above recommendations. The one study that has been conducted in pre-schoolers found that 33% of boys and 40% of girls had less than one hour of screen time per day.\(^{13}\) In six to nine year olds it was found that 49% of boys and 71% of girls had less than two hours of screen time.\(^{13}\) When using self-reported data in 11, 13, and 15 year olds it was found that SB was greater at higher ages and more girls than boys met the recommendation in all three age groups.\(^{23}\)

Three national surveys were used to derive the grade of C- for the diet indicator. Fruits and vegetables as well as fish consumption were used to represent healthful eating behaviors, while sugar sweetened beverage consumption was used to represent unhealthy ones. A limitation is that these three aspects cannot capture the complexity of the total diet. The available data in four year old children is quite old (collected in 2003) and since that time there has been a lot of work in Sweden to promote healthy diets in children, due to the increase in the prevalence of childhood obesity, which may have increased diet quality. However, data from the MINISTOP trial in 4.5 year old children collected in 2014/15,\(^{47}\)
produced very comparable mean intakes of fruits and vegetables as the Swedish Dietary Survey 2003. The recommendation for Swedish children is to eat fish two to three times per week and just over 40% of the children were meeting this recommendation. Similar results have been found in recent data for Swedish four year olds where they have been reported to eat fish approximately 1.5 times per week. In regards to sugar sweetened beverages the mean intake was 0.8 dl/day in the MINISTOP trial where the corresponding intake was 1.9 dl/day in the Swedish Dietary Survey 2003. This data may be suggesting a decreasing, secular trend in sugar sweetened beverage consumption as seen in the older children, however these findings need to be confirmed. Furthermore, questions between surveys differ which makes it difficult to compare the results against the recommendations. National target levels for PA, diet, and obesity would facilitate researchers to formulate questions and report data relevant to those targets. Furthermore, it is important to carry out regular national dietary surveys in all age groups.

Although the grades for the 11 indicators were based on the best available data, there were several limitations for this report. First of all, many of the Swedish studies regarding PA and SB only reported the average amount of time that children spent in each PA category and were therefore excluded from this report. Due to lack of time it was not possible to contact each research group to find out this information, but this will be possible for future report cards. Furthermore, a concrete recommendation for SB would be very helpful in order to appropriately assess Swedish children, however in the current NNR more evidence was judged to be needed before a recommendation can be made. It is also important to note that in accordance with other countries the grade for SB was based solely on screen time. This could be a limitation due to the fact that some screen time may be interactive as well as screen time does not account for all SB in children and adolescents. Sweden also needs to use
objective measures in national level surveillance as well create strategies to increase participation and completion rates. In regards to active transportation and the built environment collaboration between the health and the urban planning sectors is one possible way to improve the environment for PA. There is also a need for more national data on supportive environments for active transportation for children. Even though many policies exist, further work needs to be conducted to evaluate the implementation of those policies. More research within the school environment also needs to be conducted to investigate if the policies are being fulfilled. Finally, two indicators, active play and family and peers are two areas in which gaps in the research were found and where research needs to be performed.

Conclusion

The included data provides some support that overall PA is too low and SB is too high for almost all age groups investigated in the Sweden Report Card 2016 on Physical Activity for Children and Youth. These grades should be interpreted cautiously due to the limited number of included studies and the limitations involved in both self-reported and objective measures. However, this report card shows that many national level policies as well as the community and some features of the built environment are favorable in promoting PA in children and adolescents.

Acknowledgements

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<td>MVPA (1) and SB (5) MVPA (1) MVPA (1) MVPA (1) Obesity Prevalence (11)</td>
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<td>Health Behavior in School-aged Children\textsuperscript{23}</td>
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PA, physical activity; MVPA, moderate to vigorous physical activity; SB, sedentary behavior
Table 2. Grades According to Physical Activity Indicator in the 2016 Sweden Report Card on Physical Activity for Children and Youth

<table>
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<th>Indicator</th>
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<td>Active Play</td>
<td>INC</td>
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<tr>
<td>Active Transportation</td>
<td>C+</td>
</tr>
<tr>
<td>Sedentary Behaviors&lt;sup&gt;1&lt;/sup&gt;</td>
<td>C</td>
</tr>
<tr>
<td>Family and Peers</td>
<td>INC</td>
</tr>
<tr>
<td>School</td>
<td>C+</td>
</tr>
<tr>
<td>Community and the Built Environment</td>
<td>B</td>
</tr>
<tr>
<td>Government Strategies and Investments</td>
<td>B</td>
</tr>
<tr>
<td>Diet</td>
<td>C-</td>
</tr>
<tr>
<td>Obesity</td>
<td>D</td>
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Note. The grade for each indicator is based on the percentage of children and youth meeting a defined benchmark. A is 81% to 100%; B is 61% to 80%; C is 41% to 60%; D is 21% to 40%; F is 0% to 20%; INC is Incomplete data.

<sup>1</sup>The sedentary behavior indicator is based on screen time.