



Strathprints Institutional Repository

Nyström, Christine Delisle and Larsson, Christel and Ehrenblad, Bettina and Eneroth, Hanna and Eriksson, Ulf and Friberg, Marita and Hagströmer, Maria and Lindroos, Anna Karin and Reilly, John J. and Löf, Marie (2016) Results from the Sweden 2016 Report Card on Physical Activity for Children and Youth. *Journal of Physical Activity and Health*, 13 (11 (Su)). S284-S290. ISSN 1543-3080 , <http://dx.doi.org/10.1123/jpah.2016-0307>

This version is available at <http://strathprints.strath.ac.uk/59822/>

Strathprints is designed to allow users to access the research output of the University of Strathclyde. Unless otherwise explicitly stated on the manuscript, Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Please check the manuscript for details of any other licences that may have been applied. You may not engage in further distribution of the material for any profitmaking activities or any commercial gain. You may freely distribute both the url (<http://strathprints.strath.ac.uk/>) and the content of this paper for research or private study, educational, or not-for-profit purposes without prior permission or charge.

Any correspondence concerning this service should be sent to Strathprints administrator: strathprints@strath.ac.uk

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

Running head: 2016 Sweden Report Card

Manuscript type: Brief Report

Key words: child health, diet, obesity, policy, sedentary

Abstract word count: 185

Manuscript word count: 5443

Date of Manuscript Submission: 16 September 2016

Abstract

1
2
3 **Background:** The Sweden 2016 Report Card on Physical Activity (PA) for Children and Youth
4 is a unique compilation of the existing physical and health related data in Sweden. The aim of
5 this paper is to summarize the procedure and results from the report card. **Methods:** Nationally
6 representative surveys and individual studies between 2005-2015 were included. Eleven PA and
7 health indicators were graded using the Active Healthy Kids Canada grading system. Grades
8 were assigned based on the percentage of children/youth meeting a defined benchmark (A: 81-
9 100%, B: 61-80%, C: 41-60%, D: 21-40%, F: 0-20%, or incomplete (INC). **Results:** The
10 assigned grades were: Overall Physical Activity, D; Organized Sport Participation, B+; Active
11 Play, INC; Active Transportation, C+; Sedentary Behaviors, C; Family and Peers, INC; School,
12 C+; Community and the Built Environment, B; Government Strategies and Investments, B; Diet,
13 C-; and Obesity, D. **Conclusion:** The included data provides some support that overall PA is too
14 low and sedentary behavior is too high for almost all age groups in Sweden, even with the many
15 national policies as well as an environment that is favorable to the promotion of PA.

16

17 **Key words:** child health, diet, obesity, policy, sedentary

18

19

20

21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

Introduction

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).^{1,2}

In the NNR,¹ 60 minutes a day of moderate to vigorous physical activity (MVPA) is recommended for children and adolescents,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 1970s³ and Sweden is no exception. Although there has been some Swedish reports indicating that the prevalence is leveling off or stable in children,^{4,5} in the past 30 years the number of overweight children has doubled.⁶ As a combination of low PA and large amounts of SB are related to overweight and obesity,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 Canada⁸⁻¹⁰ and Scotland¹¹ 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.

45 The Active Healthy Kids Swedish working group was established in 2015 to review and
46 compile the most recent, available literature regarding: PA; SB; sports and recreation; and
47 government strategies to promote PA and to allocate grades to the nine main indicators as
48 well as the two supplementary indicators, diet and obesity. Therefore, the main purpose of this
49 paper is to summarize the procedure and results obtained from the Active Healthy Kids
50 Sweden Report Card 2016.

51

52

Methods

53

54 The Active Healthy Kids Sweden Report Card 2016 was developed as part of the Active
55 Healthy Kids Global Alliance (AHKGA).¹² The work was led by Karolinska Institutet, with
56 support from The University of Gothenburg, The Public Health Agency of Sweden, The
57 National Food Agency of Sweden, and private stakeholders. The Swedish research work
58 group (RWG) comprised of nine people, who accumulated all of the available research and
59 policy documents most relevant to the indicators. In October of 2015, three smaller RWG
60 based on each person's expertise were formed and the 11 indicators were divided up
61 accordingly. Each RWG carefully analyzed the relevant studies and documents available, with
62 a focus on the evidence quality, representativeness, sample size, and methodology utilized.

63

64 The nine main indicators were: (1) overall physical activity levels, (2) organized sport
65 participation, (3) active play, (4) active transportation, (5) sedentary behaviors, (6) family and
66 peers, (7) school, (8) community and the built environment, and (9) government strategies and
67 investments and the two supplementary indicators were (10) diet and (11) obesity. Similar to
68 Scotland's report card,¹¹ diet and obesity were included as they are important health
69 indicators. Each of the 11 indicators were then assigned a grade, representing the percentage

70 of children and adolescents meeting a defined benchmark:⁸ A is 81-100%, B is 61-80%, C is
71 41-60%, D is 21-40%, and F is 0-20%. If there was no data or insufficient data for an
72 indicator it was marked as incomplete (INC). A plus (+) or minus (-) was assigned if an
73 indicator was not clearly within a defined letter value. Each RWG assigned a preliminary
74 grade to the indicators they were responsible for and in April 2016 the whole RWG convened
75 to discuss and finalize the grades. The compilation of the evidence and the grades was done
76 following the Active Healthy Canada PA Report Card protocol.⁸

77

78 Relevant publications between 2005 and 2015 were included in this report card for children
79 and adolescents (0-18 years of age). The main data sources are presented in Table 1. For the
80 PA indicators a search on PubMed was conducted on October 26, 2015 with the search terms
81 “physical activity”, “Sweden/Swedish”, and “children”. Also, “sedentary behavior”,
82 “television viewing”, and “active transportation” were used. Inclusion criteria was: English or
83 Swedish language, age 0-18 years, published between 2005-2015, healthy children, and PA
84 assessed using objective methods or questions that had been validated against objective
85 methods. Studies were only included once and articles that reported data from Swedish
86 children combined with other populations of children were not included. The PubMed search
87 retrieved 341 articles and 43 of them fulfilled the inclusion criteria above. However, only four
88 of these articles¹³⁻¹⁶ were included in this report card since the other 39 articles did not
89 provide any estimates of the percentage of children and adolescents meeting the PA
90 recommendations. In total, four studies objectively measured MVPA¹³⁻¹⁶ and one subjectively
91 measured SB (screen time i.e. TV/DVD/video viewing)¹³ in relation to the recommendations.
92 The amount of children reaching the recommendation for overall PA was assessed via those
93 who fulfilled the recommendations of greater than 60 minutes of MVPA in accordance with
94 the NNR.¹ For SB, as no concrete recommendation for Swedish children is available, we

95 applied the Canadian recommendation for SB which is no more than two hours of recreational
96 screen time per day for children aged 5-17¹⁷ and one hour for children aged 2-4 years.¹⁸

97

98 Overweight and obesity prevalence has recently been published for 8 and 12 year old
99 children¹⁹, and other sources²⁰⁻²² were used to complement this data. The Health Behavior in
100 School-aged Children (HBSC)²³ study, adopted by the WHO Regional Office Europe, is a
101 survey that has been conducted every fourth year for the past 30 years in 11, 13, and 15 year
102 olds using an international standardized questionnaire. The data from HBSC 2013/14²³ was
103 used in the report card and provided information on MVPA, SB (screen time i.e. TV and
104 DVD viewing and playing video games), organized sport, and diet. A detailed description of
105 the survey design and methodological development of the HBSC study can be found on their
106 website.²⁴

107

108 Three national surveys^{23,25,26} were utilized for grading the diet indicator. Three dietary
109 variables (fruits and vegetables, fish, and sweetened beverages) that represent healthy and
110 unhealthy eating behaviors respectively were chosen, as they were readily available in all
111 three studies. The Swedish Dietary Survey 2003²⁵ comprises of the most recent nationally
112 representative data regarding the intakes of foods and drinks of 4, 8, and 11 year old children.
113 Even though this survey was published before 2005 it was included as it is the most recent
114 national survey from the National Food Agency. Briefly, the children together with their
115 parents filled in an estimated food diary where they wrote down everything they ate and drank
116 during four consecutive days.²⁵ The Nordic Monitoring Survey of Food, 2011 (NFFQ)²⁶ was a
117 validated questionnaire, performed over the phone in every Nordic country for children aged
118 7 to 12 years. Additionally, the HBSC 2013/14²³ survey's dietary information was also
119 utilized.

120

121 Active transportation is any self-propelled transport (e.g. walking or biking) and it was
122 assessed using the report from the Children's Routes to School Survey that has been
123 conducted every third year for the past 16 years. This questionnaire targets parents of children
124 from 6 to 15 years of age and asks questions pertaining to how their children get to and from
125 school.²⁷ Scientific and public databases of national and local authorities were searched for
126 the indicators regarding school and government strategies and investments and relevant
127 national policy documents were reviewed and their content assessed.²⁷⁻³⁶ Additional
128 information regarding data on the number of municipalities with sustainable urban mobility
129 plans was acquired via personal contact with the Swedish Association of Local Authorities
130 and Regions as well as The Swedish Transport Administration.

131

132

Results

133

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

137

138 *1. Overall Physical Activity: D*

139

140 Due to differences found within the number of children reaching the goal of 60 minutes of
141 MVPA per day throughout childhood and adolescence, three age groups were created and a
142 subsequent grade was given to each age group. The grades were: pre-school children (2-5
143 years), D; school aged children (6-11 years), C+; and adolescents (12-15 years), F. The
144 overall grade of D was an average of the grades for the three age groups. In pre-schoolers,

145 when using accelerometers, 12% of girls and 22% of boys reached 60 minutes of MVPA per
146 day.¹³ For school aged children, when using self-report in this age group 13% of girls and
147 21% of boys aged 11 years reached 60 minutes of MVPA.²³ When using objective measures
148 for this age group, the results are inconsistent with the most recent study, the IDEFICS study
149 (Sweden), showing that 43% of boys and 18% of girls aged 8-9 years met the MVPA
150 recommendation.¹³ Three older reports in this age group used lower cut-points for MVPA and
151 reported that as many as 93-100% of 8-11 year old children (boys and girls) fulfilled the
152 recommendation.¹⁴⁻¹⁶ For adolescents, 10% and 15% of 13 and 15 year olds reached the
153 allotted 60 minutes.²³

154

155 2. *Organized Sport Participation: B+*

156

157 Due to a lack of data in this area only children and adolescents aged 11 to 15 were included.
158 According to the HBSC survey²³ approximately 75% of 11 to 15 year olds participate in
159 organized sport at least two times per week. The highest participation was seen in 11 year old
160 boys at 82% and lowest in 15 year old girls at 70%.

161

162 3. *Active Play: INC*

163

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

166

167 4. *Active Transportation: C+*

168

169 For children aged 6 to 15 about 48% and 58% use active transportation to and from school in
170 the winter and summer months respectively.²⁷ A difference in the proportion of children
171 walking and cycling was observed between the winter months (November to March) and the
172 summer months (April to October). As expected, more children walk during the winter and
173 cycle during the summer.²⁷

174

175 *5. Sedentary Behaviors: C*

176

177 Similar to overall PA there were differences seen between the age groups, therefore a grade
178 was assigned to each age group, with pre-school children receiving a D, school aged children
179 a C+, and adolescents a C. For pre-schoolers between 33% and 40% had less than one hour of
180 screen time per day.¹³ For school aged children 47% of boys and 71% of girls had less than
181 two hours of screen time per day as measured via a parental questionnaire.¹³ According to the
182 HBSC survey²³ approximately 62% of 11 to 15 year olds had less than two hours of screen
183 time per day. It is important to note that screen time in both studies included questions
184 regarding TV or DVD viewing and playing video games.

185

186 *6. Family and Peers: INC*

187

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

190

191 *7. School: C+*

192

193 The Education Act²⁸ includes pre-school and after school childcare and emphasizes the
194 promotion of a healthy lifestyle among children. Physical education is mandatory in both
195 primary and secondary schools in Sweden (a minimum of 1.5 and 1.9 hours a week
196 respectively). Furthermore, home and consumer studies is mandatory for all children aged 13
197 years and older. Finally, all schools have to provide a nutritious lunch to every child
198 throughout the compulsory nine years of school, free of charge. The free school lunch
199 program has been in existence since 1948 and mandatory for all municipalities since 1997.

200

201 *8. Community and the Built Environment: B*

202

203 A large proportion of children and youth feel safe in their neighborhood. Approximately 98%
204 and 88% of children and adolescents between 10 and 18 years of age report feeling safe
205 outside where they live during the day and at night, respectively.²⁹ The distance between
206 home and school is within walking or cycling distance for most children. In Sweden, 59% of
207 school aged children have less than two kilometers between their home and their school. This
208 proportion has remained relatively constant since 2003.²⁷ The traffic safety along children's
209 school routes is an area where improvements can be made, as only 51% of parents perceive
210 that their child's route to school is safe.²⁷ Furthermore, all Swedish municipalities have a
211 master plan for their long-term urban planning, and 29% report having sustainable urban
212 mobility plans to help design safe and supportive environments for sustainable transportation
213 modes, such as walking and cycling.³⁰ Finally, the proportion of children between 0 and 15
214 years of age living in urban areas (with at least 30 000 inhabitants) and having access to
215 greenspace within 300m from their home varies between 94% and 100%.³¹

216

217 *9. Government Strategies and Investments: B*

218

219 PA and a healthy diet are two out of eleven objective domains of the national public health
220 policy. National policy documents have a life-course approach and increase accountability
221 through cross-sectional approaches.³² These include “Sports for Life”³³ and “Sports Wants”,³⁴
222 as well as a strategic plan for the collaboration between the Sports Confederation and schools
223 in order to promote sports in schools.³⁵ The agencies responsible for transportation and urban
224 planning have policies and guidelines addressing PA and active transportation. Furthermore,
225 in Sweden there is “The Right of Common Access” which is guaranteed in the Swedish
226 Constitution since 1994 and allows everyone to move around freely in the countryside.³⁶

227

228 *10. Diet: C-*

229

230 As we split the diet into three domains, a grade was given to each one. The assigned grades
231 were: fruits and vegetables, F; fish, C; and sugar sweetened beverages, C. Fruits and
232 vegetables received an F because less than 20% of four year olds consumed the recommended
233 400g per day.²⁵ Furthermore, the frequencies of fruit and vegetable consumption in the
234 NFFQ²⁶ and the HBSC survey²³ demonstrate that few children are fulfilling the
235 recommendation (500g per day for children older than ten years). In regards to fish
236 consumption, approximately 43% of children ate fish for lunch or dinner twice per week.²⁶
237 When comparing the Swedish Dietary Survey 2003²⁵ and the NFFQ²⁶ (2011) there is some
238 evidence suggesting that sugar sweetened beverage consumption is decreasing. Finally, based
239 on questions regarding sugar sweetened beverages and sweets the NNFQ²⁶ concluded that
240 approximately 50% of children fulfill the recommendation of less than 10% of their total
241 energy from added sugar. Therefore, an overall grade of C- was assigned to the diet indicator.

242

243 *11. Obesity: D*

244

245 In four year olds in the Stockholm region approximately 11% are overweight or obese as
246 defined by BMI,²² with other regions observing slightly higher values (17% for girls and 13%
247 for boys).²¹ A recent study in 8 and 12 year olds found that 12% of boys and 11% of girls at
248 eight years of age and 16% of boys and 13% of girls at 12 years of age were overweight or
249 obese.¹⁹ According to the HBSC international report²⁰ 11% of 11 year olds, 13% of 13 year
250 olds, and 16% of 15 year olds were overweight or obese. Even though the evidence from the
251 study by de Munter et al.¹⁹ has shown that the prevalence of overweight and obesity has
252 decreased in 8 year old children and remained approximately the same in 12 year olds, it is
253 still far too high.

254

255 **Discussion**

256

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

259

260 Overall PA levels seem to be low across all age groups in Sweden. However, the grade D for
261 overall PA needs to be interpreted with caution for numerous reasons. Firstly, the grade is
262 based on a combination of national data based on self-report and a few studies using objective
263 measures that are not nationally representative. This is a limitation since objective measures
264 are recommended for PA intensities,^{37,38} and correlations between subjective and objective
265 methods for assessing PA in young people are low to moderate.³⁹ Furthermore, both methods
266 have limitations. Although, the self-reported data was based on the widely used HBSC
267 questionnaire,²³ it has not been validated in Swedish children as well as self-reported data can

268 be prone to recall bias and misinterpretation of questions.⁴⁰ The evidence included using
269 objective measures is limited by different accelerometer protocols, especially the use of
270 different cut-points.^{37,38,40} To illustrate, for school aged children, the most recent study
271 (IDEFICS) applied a cut-point of 2296 counts per minute (cpm) for MVPA resulting in 43%
272 of boys and 18% of girls meeting the MVPA recommendation,¹³ while corresponding figures
273 for two older reports using 1000 cpm as a cut-point were 93-100%.^{14,16} A recent report
274 concluded that when using different cut-points differences in the number of children meeting
275 the recommendation may range from 3-5% (>3000 cpm), up to 87% (>2000 cpm), and up to
276 100% (>1000 cpm).⁴⁰ To the best of our knowledge, there is no consensus on which cut-
277 points are the most appropriate to use, however, recently 2000-3500 cpm³⁹ or 2300 cpm⁴¹
278 have been recommended, suggesting that the reports showing that almost all school aged
279 children fulfilled the recommendations may be an overestimation. Another limitation of this
280 report is that, in accordance with a previous review using European data,³⁸ only a small
281 proportion of the included studies using objective measures reported adherence to the MVPA
282 recommendation. We can only speculate about how this fact has affected our grade, however,
283 we performed additional calculations utilizing reported mean values and standard deviations
284 (and assuming normally distributed data) for the reports using cut-offs above 2000 cpm.
285 These rough calculations showed that approximately 13%,^{42,43} and 75%⁴⁴ of school aged
286 children and 53%⁴⁴ of adolescents fulfilled the MVPA recommendation. Finally, the evidence
287 for a low grade in preschoolers included only one study, however, it used up-to-date
288 methodology,¹³ and recent data from two studies in Swedish four year olds are also showing
289 high levels of SB^{45,46} and low levels of vigorous PA.⁴⁵ To conclude, we determined the grade
290 D for overall PA since the included data suggested low levels of PA across all age groups.
291 However, the grade should be interpreted with caution due to the use of both self-reported and
292 objective measures, the limited number of studies, and the methodological issues discussed

293 above. Our report card clearly highlights the need for national surveys using objective
294 measures of PA in Sweden in order to provide a more accurate and solid basis for future
295 report cards. For adolescents, accelerometry will be included in the national dietary survey
296 beginning in the autumn of 2016 and hopefully in the future all age groups will be covered.
297

298 A grade of “C” was assigned to SB. As Sweden’s recommendation for SB is to reduce the
299 amount of time participating in these activities,¹ we have utilized the Canadian
300 recommendations of less than one or two hours of recreational screen per day for children
301 aged 2-4¹⁸ and 5-17 years,¹⁷ respectively to grade this indicator. Similar to overall PA, and
302 probably due to the lack of a concrete recommendation for SB in children, very few studies
303 have compared the amount of SB to the above recommendations. The one study that has been
304 conducted in pre-schoolers found that 33% of boys and 40% of girls had less than one hour of
305 screen time per day.¹³ In six to nine year olds it was found that 49% of boys and 71% of girls
306 had less than two hours of screen time.¹³ When using self-reported data in 11, 13, and 15 year
307 olds it was found that SB was greater at higher ages and more girls than boys met the
308 recommendation in all three age groups.²³

309
310 Three national surveys were used to derive the grade of C- for the diet indicator. Fruits and
311 vegetables as well as fish consumption were used to represent healthful eating behaviors,
312 while sugar sweetened beverage consumption was used to represent unhealthy ones. A
313 limitation is that these three aspects cannot capture the complexity of the total diet. The
314 available data in four year old children is quite old (collected in 2003) and since that time
315 there has been a lot of work in Sweden to promote healthy diets in children, due to the
316 increase in the prevalence of childhood obesity, which may have increased diet quality.
317 However, data from the MINISTOP trial in 4.5 year old children collected in 2014/15,⁴⁷

318 produced very comparable mean intakes of fruits and vegetables as the Swedish Dietary
319 Survey 2003.²⁵ The recommendation for Swedish children is to eat fish two to three times per
320 week and just over 40% of the children were meeting this recommendation.²⁶ Similar results
321 have been found in recent data for Swedish four year olds where they have been reported to
322 eat fish approximately 1.5 times per week .⁴⁶ In regards to sugar sweetened beverages the
323 mean intake was 0.8 dl/day in the MINISTOP trial⁴⁷ where the corresponding intake was 1.9
324 dl/day in the Swedish Dietary Survey 2003.²⁵ This data may be suggesting a decreasing,
325 secular trend in sugar sweetened beverage consumption as seen in the older children, however
326 these findings need to be confirmed. Furthermore, questions between surveys differ which
327 makes it difficult to compare the results against the recommendations. National target levels
328 for PA, diet, and obesity would facilitate researchers to formulate questions and report data
329 relevant to those targets. Furthermore, it is important to carry out regular national dietary
330 surveys in all age groups.

331

332 Although the grades for the 11 indicators were based on the best available data, there were
333 several limitations for this report. First of all, many of the Swedish studies regarding PA and
334 SB only reported the average amount of time that children spent in each PA category and
335 were therefore excluded from this report. Due to lack of time it was not possible to contact
336 each research group to find out this information, but this will be possible for future report
337 cards. Furthermore, a concrete recommendation for SB would be very helpful in order to
338 appropriately assess Swedish children, however in the current NNR¹ more evidence was
339 judged to be needed before a recommendation can be made. It is also important to note that in
340 accordance with other countries^{10,11} the grade for SB was based solely on screen time. This
341 could be a limitation due to the fact that some screen time may be interactive as well as screen
342 time does not account for all SB in children and adolescents. Sweden also needs to use

343 objective measures in national level surveillance as well create strategies to increase
344 participation and completion rates. In regards to active transportation and the built
345 environment collaboration between the health and the urban planning sectors is one possible
346 way to improve the environment for PA. There is also a need for more national data on
347 supportive environments for active transportation for children. Even though many policies
348 exist, further work needs to be conducted to evaluate the implementation of those policies.
349 More research within the school environment also needs to be conducted to investigate if the
350 policies are being fulfilled. Finally, two indicators, active play and family and peers are two
351 areas in which gaps in the research were found and where research needs to be performed.

352

353

Conclusion

354

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

362

363

Acknowledgements

364

365 We would like to thank Jeppe D Larsen for providing the picture for the front cover. This
366 work was not supported by any grants.

- 367 **References**
- 368
- 369 1. Nordic Council of Ministers *Nordic nutrient recommendations*. Copenhagen, Denmark;
370 2012.
- 371 2. World Health Organization. *Global recommendations on physical activity for health*.
372 *Global Strategy on Diet, Physical Activity and Health*. Geneva, Switzerland; 2010.
- 373 3. Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J*
374 *Pediatr Obes*. 2006;1(1):11-25.
- 375 4. Bergstrom E, Blomquist HK. Is the prevalence of overweight and obesity declining
376 among 4-year-old Swedish children? *Acta paediatr*. 2009;98(12):1956-1958.
- 377 5. Moraesus L, Lissner L, Sjoberg A. Stable prevalence of obesity in Swedish schoolchildren
378 from 2008 to 2013 but widening socio-economic gap in girls. *Acta paediatr*.
379 2014;103(12):1277-1284.
- 380 6. Marild S, Bondestam M, Bergstrom R, Ehnberg S, Hollsing A, Albertsson-Wikland K.
381 Prevalence trends of obesity and overweight among 10-year-old children in western
382 Sweden and relationship with parental body mass index. *Acta Paediatr*.
383 2004;93(12):1588-1595.
- 384 7. Hills AP, Okely AD, Baur LA. Addressing childhood obesity through increased physical
385 activity. *Nat Rev Endocrinol*. 2010;6(10):543-549.
- 386 8. Colley RC, Brownrigg M, Tremblay MS. A model of knowledge translation in health: the
387 Active Healthy Kids Canada Report Card on physical activity for children and youth.
388 *Health Promot Pract*. 2012;13(3):320-330.

- 389 9. Barnes JD, Colley RC, Tremblay MS. Results from the Active Healthy Kids Canada 2011
390 report card on physical activity for children and youth. *Appl Physiol Nutr Metab.*
391 2012;37(4):793-797.
- 392 10. Gray CE, Barnes JD, Cowie Bonne J, et al. Results from Canada's 2014 Report Card on
393 Physical Activity for Children and Youth. *J Phys Act Health.* 2014;11 Suppl 1:S26-32.
- 394 11. Reilly JJ, Dick S, McNeill G, Tremblay MS. Results from Scotland's 2013 Report Card
395 on Physical Activity for Children and Youth. *J Phys Act Health.* 2014;11 Suppl 1:S93-97.
- 396 12. Active Healthy Kids Global Alliance. Available at: <http://www.activehealthykids.org/>.
397 Accessibility verified July 26, 2016.
- 398 13. Kovacs E, Siani A, Konstabel K, et al. Adherence to the obesity-related lifestyle
399 intervention targets in the IDEFICS study. *Int J Obes (Lond).* 2014;38 Suppl 2:S144-151.
- 400 14. Lofgren B, Stenevi-Lundgren S, Dencker M, Karlsson MK. The mode of school
401 transportation in pre-pubertal children does not influence the accrual of bone mineral or
402 the gain in bone size--two year prospective data from the paediatric osteoporosis
403 preventive (POP) study. *BMC Musculoskelet Disord.* 2010;11:25.
- 404 15. Pagels P, Raustorp A, De Leon AP, Martensson F, Kylin M, Boldemann C. A repeated
405 measurement study investigating the impact of school outdoor environment upon physical
406 activity across ages and seasons in Swedish second, fifth and eighth graders. *BMC public
407 health.* 2014;14:803.
- 408 16. Dencker M, Thorsson O, Karlsson MK, et al. Daily physical activity in Swedish children
409 aged 8-11 years. *Scand J Med Sci Sports.* 2006;16(4):252-257.
- 410 17. Tremblay MS, Leblanc AG, Janssen I, et al. Canadian sedentary behaviour guidelines for
411 children and youth. *Appl Physiol Nutr Metab.* 2011;36(1):59-64; 65-71.

412

- 413 18. Tremblay MS, Leblanc AG, Carson V, et al. Canadian Sedentary Behaviour Guidelines
414 for the Early Years (aged 0-4 years). *Appl Physiol Nutr Metab*. 2012;37(2):370-391.
- 415 19. de Munter J, Friedl A, Lind S, et al. Stability in the prevalence of Swedish children who
416 were overweight or obese in 2003 and 2011. *Acta Paediatr*. 2016. PubMed doi:
417 10.1111/apa.13351.
- 418 20. World Health Organization. *Health behaviour in school-aged children (HBSC) study:
419 international report from the 2013/2014 survey*. Copenhagen, Denmark; 2016.
- 420 21. Uppsala-Örebro Region Care Program. *Overweight and obesity among children and youth
421 - prevention and treatment*. Sweden; 2015.
- 422 22. Stockholm County Council. *Child healthcare yearly report*. Stockholm, Sweden. 2013.
- 423 23. The Public Health Agency of Sweden. *The health behaviour in school-aged children in
424 Sweden*. Stockholm, Sweden; 2013-2014.
- 425 24. Health Behaviour in School-Aged Children. *World Health Organization collaborative
426 cross-national survey*. Available at: <http://www.hbsc.org/>. Accessibility verified July 26,
427 2016.
- 428 25. The National Food Agency Sweden . *The National Dietary Survey - Intake of foods and
429 nutrients in Swedish children*. Uppsala, Sweden; 2004.
- 430 26. Rasmussen LB, Andersen LF, Borodulin K, Enghardt Barbieri H, Fagt S, Matthiessen J,
431 Sveinsson T, Thorgeirsdottir H, Trolle E. *Nordic monitoring of diet, physical activity and
432 overweight: First collection of data in all Nordic Countries 2011*. Copenhagen, Denmark:
433 The Nordic Council of Ministers; 2012.
- 434 27. Swedish Transport Administration. *Children's routes to school*. Borlänge, Sweden; 2012.
- 435 28. Swedish National Agency for Education. Physical Education and Health. Available at:
436 <http://www.skolverket.se/laroplaner-amnen->

- 437 ochkurser/gymnasieutbildning/gymnasieskola/idr?tos=gy&subjectCode=IDR&lang=sv.
- 438 Accessibility verified May 10, 2016.
- 439 29. Statistics of Sweden. Living Conditions Survey of Children 2013-2014. Available at:
- 440 [http://www.scb.se/en/Finding-statistics/Statistics-by-subject-area/Living-](http://www.scb.se/en/Finding-statistics/Statistics-by-subject-area/Living-conditions/Living-conditions/Living-Conditions-Survey-of-Children/)
- 441 [conditions/Living-conditions/Living-Conditions-Survey-of-Children/](http://www.scb.se/en/Finding-statistics/Statistics-by-subject-area/Living-conditions/Living-conditions/Living-Conditions-Survey-of-Children/). Accessibility
- 442 verified May 10, 2016.
- 443 30. Swedish Municipalities and Regions. Swedish Association of Local Authorities and
- 444 Regions. Available at:
- 445 <http://skl.se/tjanster/englishpages/municipalitiescountycouncilsandregions.1088.html>.
- 446 Accessibility verified May 10, 2016.
- 447 31. Statistics of Sweden. Data on green space from 2010. Available at:
- 448 [http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START_MI_MI0805_MI0805B/G](http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START_MI_MI0805_MI0805B/GronOmrBef300M/?rxid=828974bb-aab6-4375-8354-0594330cad9e)
- 449 [ronOmrBef300M/?rxid=828974bb-aab6-4375-8354-0594330cad9e](http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START_MI_MI0805_MI0805B/GronOmrBef300M/?rxid=828974bb-aab6-4375-8354-0594330cad9e). Accessibility verified
- 450 May 10, 2016.
- 451 32. Ministry of Health and Social Affairs. *Public health objectives*. Stockholm, Sweden;
- 452 2002.
- 453 33. Swedish Sports Confederation. *Sports for life - Strategic plan for the sports movement's*
- 454 *public health work*. Stockholm, Sweden; 2009.
- 455 34. Swedish Sports Confederation. *Sports wants - policy programme of ideas*. Stockholm,
- 456 Sweden; 2009.
- 457 35. Swedish Sports Confederation. *Strategic plan for sports community work on health in*
- 458 *schools*. Stockholm, Sweden; 2008.
- 459 36. Swedish Environmental Protection Agency. *Benefits of spending time outdoors*.
- 460 Stockholm, Sweden; 2011.

- 461 37. Reilly JJ, Penpraze V, Hislop J, Davies G, Grant S, Paton JY. Objective measurement of
462 physical activity and sedentary behaviour: review with new data. *Arch Dis Child*.
463 2008;93(7):614-619.
- 464 38. Guinhouya BC, Samouda H, de Beaufort C. Level of physical activity among children
465 and adolescents in Europe: a review of physical activity assessed objectively by
466 accelerometry. *Public Health*. 2013;127(4):301-311.
- 467 39. Ekelund U, Tomkinson G, Armstrong N. What proportion of youth are physically active?
468 Measurement issues, levels and recent time trends. *Br J Sports Med*. 2011;45(11):859-
469 865.
- 470 40. Konstabel K, Veidebaum T, Verbestel V, et al. Objectively measured physical activity in
471 European children: the IDEFICS study. *Int J Obes*. 2014;38 Suppl 2:S135-143.
- 472 41. Trost SG, Loprinzi PD, Moore R, Pfeiffer KA. Comparison of accelerometer cut points
473 for predicting activity intensity in youth. *Med Sci Sports Exerci*. 2011;43(7):1360-1368.
- 474 42. Tanha T, Wollmer P, Thorsson O, et al. Lack of physical activity in young children is
475 related to higher composite risk factor score for cardiovascular disease. *Acta paediatrica*.
476 2011;100(5):717-721.
- 477 43. Dencker M, Tanha T, Wollmer P, Karlsson MK, Andersen LB, Thorsson O. Tracking of
478 physical activity with accelerometers over a 2-year time period. *J Phys Act Health*.
479 2013;10(2):241-248.
- 480 44. Ortega FB, Konstabel K, Pasquali E, et al. Objectively measured physical activity and
481 sedentary time during childhood, adolescence and young adulthood: a cohort study. *PLoS*
482 *One*. 2013;8(4):e60871.
- 483 45. Leppanen MH, Nystrom CD, Henriksson P, Pomeroy J, Ruiz JR, Ortega FB, Cadenas-
484 Sánchez C, Löf M. Physical activity intensity, sedentary behavior, body composition and

- 485 physical fitness in 4-year-old children: Results from the MINISTOP trial. *Int J Obes.*
486 2016;40(7):1126-1133.
- 487 46. Döring N, Ghaderi A, Bohman B, Heitmann BL, Larsson C, Berglind D, Hansson L,
488 Sundblom E, Magnusson M, Blennow M, Tynelius P, Forsberg L, Rasmussen F.
489 Motivational interviewing to prevent childhood obesity: A cluster RCT. *Pediatrics.*
490 2016;137(5).
- 491 47. Delisle Nystrom C, Forsum E, Henriksson H, Trolle-Lagerros Y, Larsson C, Maddison
492 M, Timpka T, Löf M. A Mobile Phone Based Method to Assess Energy and Food Intake
493 in Young Children: A Validation Study against the Doubly Labelled Water Method and
494 24 h Dietary Recalls. *Nutrients.* 2016;8(1).
- 495
496
497
498
499
500
501
502
503
504
505
506
507
508

509 **Table 1. Main Data Sources for the Indicators**

510

Data source	Methods and study population	Variables and their contribution to PA indicators
Individual studies	ActiGraph GT1M, 2-9 years (n=553, PA and n=1750, SB) ¹³	MVPA (1) and SB (5)
	MTI accelerometer model 7164, 7-9 years (n=232) ¹⁴	MVPA (1)
	ActiGraph GT3x+, 7-14 years (n=196) ¹⁵	MVPA (1)
	MTI accelerometer model 7164, 8-11 years (n=229) ¹⁶	MVPA (1)
	Two population based cross-sectional surveys ^{19, 20}	Obesity Prevalence (11)
Health Behavior in School-aged Children ²³	Questionnaire for children aged 11, 13, and 15 years (n=8000)	MVPA (1), SB (5), organized sport (2), and diet (10)
The National Dietary Survey ²⁵	Questionnaire for children aged 4, 8, and 11 year olds (n=2500)	Diet (10)
Nordic Monitoring Survey of Food ²⁶	Questionnaire for 7-12 year olds (n=499)	Diet (10)
Children's Routes to School ²⁷	Questionnaire for parents of children aged 6-15 (n=1730)	Active Transportation (4)

511

512 PA, physical activity; MVPA, moderate to vigorous physical activity; SB, sedentary behavior

513

514

515

516

517

518

519

520

521

522

523

524

525

526

527

528

529

530

531

532

533 **Table 2. Grades According to Physical Activity Indicator in the 2016 Sweden Report Card**
 534 **on Physical Activity for Children and Youth**

535

Indicator	Grades
Overall Physical Activity	D
Organized Sport Participation	B+
Active Play	INC
Active Transportation	C+
Sedentary Behaviors ¹	C
Family and Peers	INC
School	C+
Community and the Built Environment	B
Government Strategies and Investments	B
Diet	C-
Obesity	D

536
 537 *Note.* The grade for each indicator is based on the percentage of children and youth meeting a
 538 defined benchmark. *A* is 81% to 100%; *B* is 61% to 80%; *C* is 41% to 60%; *D* is 21% to 40%; *F*
 539 is 0% to 20%; *INC* is Incomplete data.

540 ¹The sedentary behavior indicator is based on screen time.