



Original Research

Global Matrix 3.0 physical activity report card for children and youth: a comparison across Europe



T. Coppinger^{a,*}, K. Milton^b, E. Murtagh^c, D. Harrington^d, D. Johansen^e, J. Seghers^f,
T. Skovgaard^e, HEPA Europe Children & Youth Working Group, A. Chalkley^g

^a Cork Institute of Technology, Cork, Ireland

^b Norwich Medical School, University of East Anglia, Norwich, UK

^c University of Limerick, Limerick, Ireland

^d Diabetes Research Centre, University of Leicester, Leicester, UK

^e Research and Innovation Centre for Human Movement and Learning, UCL University College & University of Southern Denmark, Denmark

^f Physical Activity, Sports & Health Research Group, KU Leuven, Brussels, Belgium

^g School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, UK

ARTICLE INFO

Article history:

Received 30 April 2020

Received in revised form

4 July 2020

Accepted 19 July 2020

Available online 24 September 2020

Keywords:

Surveillance

Health promotion

School

Environment

Community

ABSTRACT

Objectives: The Global Matrix of report card grades on physical activity serves as a public health awareness tool by summarising the status of child and youth physical activity prevalence and action. The objectives were to: (1) provide a detailed examination of the evidence informing the 'School' and 'Community and Environment' indicators across all participating European Global Matrix 3.0 countries; (2) explore the comparability of the grades for these two indicators across Europe; (3) detail any limitations or issues with the methods used to assign grades; and (4) provide suggestions on how future grading of the indicators could be improved.

Study design: A comparative review of published methods on the grading of Global Matrix 3.0 indicators across European countries.

Methods: Key documents relating to the European countries involved in the 2018 Global Matrix 3.0 were collated and a template used to extract data for both the 'School' and 'Community and Environment' indicators.

Results: Seventeen of the 20 European Report Card countries (85%) had a grade for schools, and 15 countries (75%) had a grade for community and environment. All countries considered between one and five factors when assigning the grade for these indicators. There were wide disparities in the number and sources of evidence used to assign the grades for both indicators, limiting the comparability of the evidence between different countries.

Conclusion: To enable comparability, the authors recommend moving towards an agreed standardised set of metrics for grading each indicator. Furthermore, it would be useful to develop and share common tools, methods and instruments to collect data in a uniform way across countries, where possible. Such action will ultimately make the Global Matrix a more robust and useful tool for the future.

© 2020 The Author(s). Published by Elsevier Ltd on behalf of The Royal Society for Public Health. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Introduction

Reaching a sufficient level of moderate-to-vigorous physical activity (MVPA) is recognised as a key determinant of health.¹ Yet, an estimated 80.9% of youth (11–17 years) in Central and Eastern Europe do not reach the minimum recommendation of 60 min of daily MVPA.² This is disturbing, as physical inactivity among school-aged children and youth has been found to be associated with adverse physical, mental, social and cognitive health

* Corresponding author. Tel.: +353 21 432 6105.

E-mail addresses: tara.coppinger@cit.ie (T. Coppinger), K.Milton@uea.ac.uk (K. Milton), Elaine.Murtagh@ul.ie (E. Murtagh), dh204@le.ac.uk (D. Harrington), djohansen@health.sdu.dk (D. Johansen), Jan.Seghers@kuleuven.be (J. Seghers), tskovgaard@health.sdu.dk (T. Skovgaard), A.E.Chalkley@lboro.ac.uk (A. Chalkley).

outcomes, lower physical fitness, as well as lower physical activity levels in adulthood.^{3–6}

The Global Matrix of Physical Activity Report Cards was launched in 2014 to benchmark physical activity promotion efforts targeted at children and youth. The matrix serves as an advocacy and information tool for decision makers and stakeholders from across the world by highlighting the global variation in physical activity prevalence and promotion across different countries and where representative data are lacking for specific indicators within countries.

A total of 15 and 38 countries took part in the Global Matrix 1.0 (2014)⁷ and 2.0 (2016),⁸ respectively. In 2018, the Global Matrix 3.0 was initiated, involving 49 countries in the harmonised procedure to develop national report cards. Ten common indicators (see [Box 1](#)) were assigned a letter grade (A+ to F) by using common benchmarks to guide the grade assignment process.⁷ When grading was not possible, typically due to insufficient data, a grading of INC (incomplete) was assigned. A total of 490 grades, including 369 letter grades and 121 INC grades, were assigned in the Global Matrix 3.0.⁹

The Global Matrix 3.0 confirmed that physical activity levels of children and youth are low,⁹ and actions to reduce inactivity are variable across Europe.¹⁰ Schools and the wider community and environment are critical influences on the physical activity levels of children and youth;^{11–14} therefore, changes in these indicators have the potential to affect many children. Consequently, we sought to examine the factors considered when assigning these grades across European countries, to inform future practice. The objectives were to: (1) provide a detailed examination of the evidence informing the ‘School’ and ‘Community and Environment’ indicators across all participating European countries; (2) explore the comparability of the grades for these two indicators across Europe; (3) detail any limitations or issues with the methods used to assign grades; and (4) provide suggestions on how future grading of the indicators could be improved.

Methods

A total of 20 European countries contributed to the Global Matrix 3.0 (see [Table 1](#) for a summary of grades). The process for assignment of the grades involved the establishment of a team within each country that developed a set of indicators and appraised the country's performance. The process and grades are published in long and short forms, as well as in the main scientific paper (www.activehealthykids.ca). Key documents relating to the participating European countries were collated. A template was developed to aid with data extraction (see [Additional file 1](#)), which captured information on: the grade assigned for each indicator;

Box 1

The 10 indicators in the Global Matrix 3.0.

- Overall physical activity
- Organised sports and physical activity
- Active play
- Active transportation
- Sedentary behaviours
- Physical fitness
- Family and peers
- School
- Community and environment
- Government

details of the data used to assign the grade; the source of the data; an indication of the quality of the data; and any reported issues or challenges in assigning the grade.

The template was piloted whereby four members of the team (AC, EM, KM and TC) each completed the template for two countries. The data were reviewed to determine consistency in the types of information and the level of detail provided. Where inconsistencies were evident, revisions to the template were made and more explicit guidance on completion was added. Only publicly available information contained within the scientific and/or long and short forms of the report cards was used, and only sources of evidence used to inform the 2018 report card grade were considered. Subsequently, all members of the team were informed on how to use the template and what information was to be extracted.

The relevant team member(s) took responsibility for leading the data extraction for their own country. All other countries were allocated arbitrarily among the team members. If anything was unclear or information was unavailable, the original author and/or country card lead for that country was contacted for further information.

Results

[Fig. 1](#) displays the School and Community and Environment grades for European countries.

Schools

[Table 2](#) provides a summary of the factors used to assign the school grade for each country. In total, 17 of the 20 European Report Card countries (85%) had a grade for schools, using between one and five school factors to assign their grade. Guernsey, Scotland and Wales did not have a grade for schools and were excluded (shaded in [Table 2](#)). Details of the factors considered in assigning the grades are provided below in order of the number of countries using that factor.

Physical education

The most frequently reported factor on which the school grades were based was physical education (PE), with all but two countries (Finland and the Netherlands) considering this indicator ($n = 15$). For some countries, this indicator was based on PE being compulsory, as mandatory in legislation (Czech Republic, Estonia, Germany, Lithuania, Portugal, Slovenia and Sweden). In addition to mandatory PE, some countries were asked to self-report their adherence to the legislative requirement, which was also considered when assigning the grade (Denmark, France, Jersey and Spain). For one country, the average minutes of PE offered to pupils were used (England). For some countries, the PE indicator was based on the proportion of children reporting to take part in a mandatory amount of PE (Belgium and Poland). For Bulgaria, the indicator was based on children and their parents' assessment of the quality of PE classes.

Qualifications/quality of teachers delivering PE

Two-thirds of schools that considered PE as a factor also considered the qualifications or quality of the teachers responsible for PE ($n = 10$). For France, this indicator was based on it being mandatory for PE lessons (in high schools) to be delivered by a trained specialist. For the majority, however, it was based on the proportion of PE teachers with specialist PE training (Belgium, Czech Republic, Denmark, England, Estonia, Germany and Lithuania). Bulgaria used children and their parents' perceptions of the quality of teachers; Slovenia reported that they have ‘highly competent PE teachers’ with no further explanation offered.

Table 1
A summary of the grades for each European country included within the Global Matrix 3.0.

Country ^a	BE	BG	CZ	DE	DK	EN	EE	ES	FI	FR	GG	JE	LT	NL	PL	PT	SC	SE	SL	WA
Overall physical activity	F	D+	D	D-	D-	C-	D-	D	D	D	D	D-	C-	C	D-	D	F	D+	A-	D+
Organised sports and physical activity	B	C+	B-	B	A-	D+	C	B	C+	C-	C+	INC	C	B	D	B-	B	B+	C+	C+
Active play	INC	C+	D-	D-	INC	INC	F	C-	C	INC	INC	INC	INC	B	INC	INC	INC	INC	D	C-
Active transport	C+	B-	C+	C-	B+	C-	D	B-	B+	C-	D	D+	C-	B-	C	C-	C	C	C	D+
Sedentary behaviour	C	D	D-	D-	D+	D+	F	B+	D-	D-	C	C	C-	C-	D	C-	F	C+	B+	F
Physical fitness	INC	INC	C+	INC	INC	C-	INC	INC	C	B-	INC	D	C+	INC	C-	C	INC	INC	A-	INC
Family and peers	C+	D	C+	B-	INC	INC	D	INC	B-	INC	INC	C	D	INC	C-	C	INC	INC	B+	D
School	B-	C	B+	B+	A-	B+	C+	C+	A	B	INC	B-	C+	C	B	A	INC	C+	A	INC
Community and environment	B	C	B	B+	B+	C	B	INC	B+	INC	INC	C	C	INC	C	B	B-	A	B	INC
Government	B	INC	C+	INC	A-	INC	B	INC	A-	C	D	D	C	INC	C+	B	C	B	A	C+
Average	C	C-	C	C	B-	C-	D+	C+	C+	C-	D+	D+	C-	C+	C-	C+	D+	C+	B	D+

^a BE = Belgium; BG = Bulgaria; CZ = Czech Republic; DE = Germany; DK = Denmark; EN = England; EE = Estonia; ES = Spain; FI = Finland; FR = France; GG = Guernsey; JE = Jersey; LT = Lithuania; NL = the Netherlands; PL = Poland; PT = Portugal; SC = Scotland; SE = Sweden; SI = Slovenia; WA = Wales. INC, incomplete.

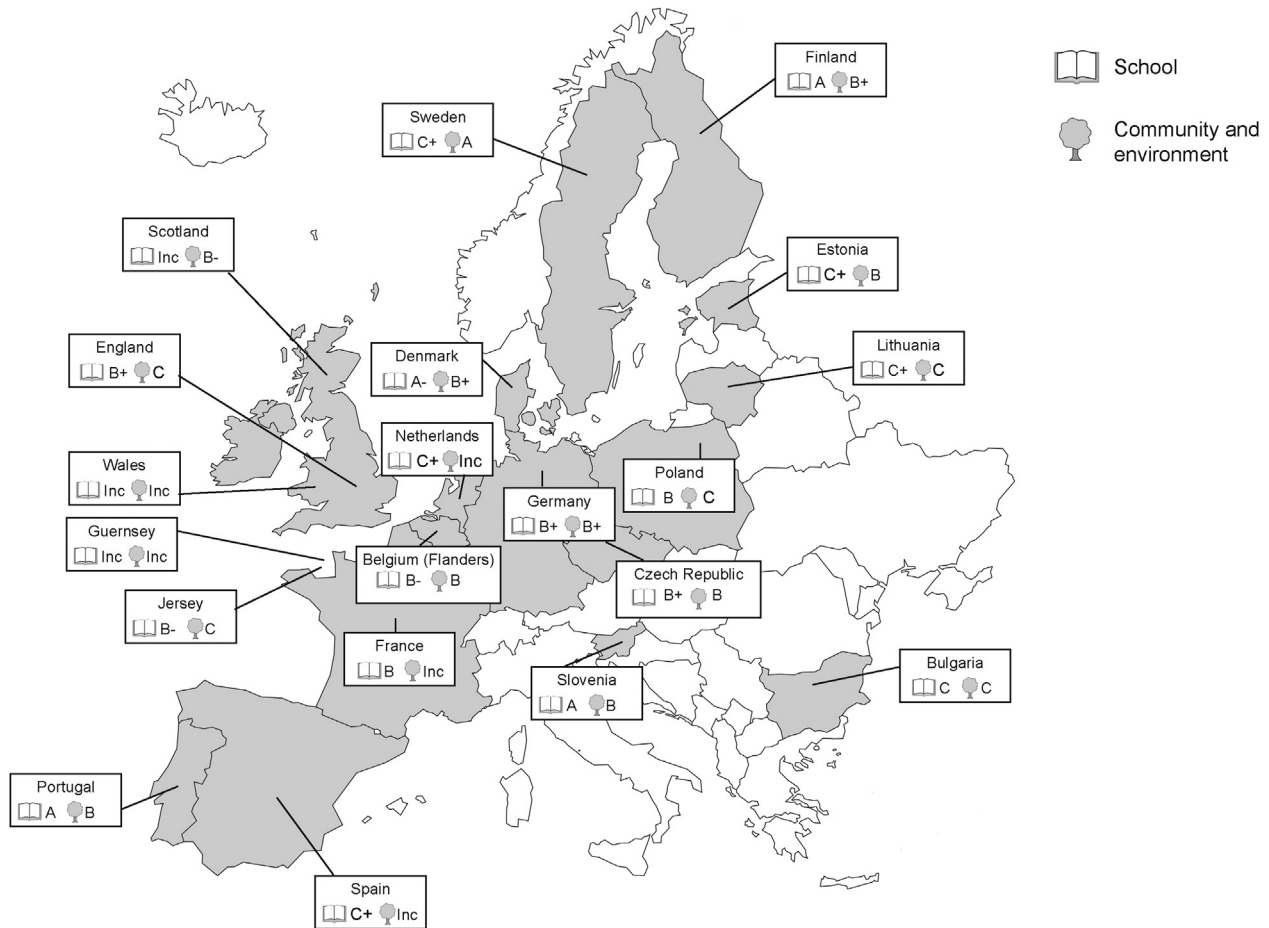


Fig. 1. A map depicting the School and Community and Environment grades for European countries. INC, incomplete.

Sports facilities/equipment

The quality of physical activity and sports facilities and equipment at school was considered in less than half of the included countries ($n = 8$). For most countries, this factor was based on ‘access’ to facilities and equipment (Czech Republic, England, Germany, Jersey, the Netherlands and Slovenia). Bulgaria based this factor on children and parents’ views on the quality of sports facilities at school. Denmark considered both access and teacher appraised quality.

Active school policies

Six countries considered the number of schools that had developed policies that promote physical activity as part of the school day (Czech Republic, Denmark, England, Finland, Jersey and Lithuania).

After school/extra-curricular sports and physical activity

Five countries considered the provision of after school/extra-curricular activities (Belgium, Czech Republic, England, Estonia

Table 2
Summary of indicators for each school grade, by country and frequency.

Country ^a	BE	BG	CZ	DE	DK	EN	EE	ES	FI	FR	GG	JE	LT	NL	PL	PT	SC	SE	SI	WA	Total
Grade	B-	C	B+	B+	A-	B+	C+	C+	A	B	INC	B-	C+	C	B	A	INC	C+	A	INC	INC
Physical education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓			15
Qualifications/Quality of teachers teaching PE	✓	✓	✓	✓	✓	✓	✓			✓			✓							✓	10
Sports facilities/equipment		✓	✓	✓	✓	✓						✓		✓						✓	8
Active school policies			✓		✓				✓			✓	✓								6
After-school/Extra-curricular sports and physical activities	✓			✓		✓		✓												✓	5
Sports and PA during sports/lunch							✓	✓													2
National active school initiative									✓											✓	2
Health education lessons	✓																				1
Access to facilities outside school hours								✓													1
Total	4	3	5	3	4	5	4	3	2	2		3	3	1	1	1		1	5		

^a BE = Belgium; BG = Bulgaria; CZ = Czech Republic; DE = Germany; DK = Denmark; EN = England; EE = Estonia; ES = Spain; FI = Finland; FR = France; GG = Guernsey; JE = Jersey; LT = Lithuania; NL = the Netherlands; PL = Poland; PT = Portugal; SC = Scotland; SE = Sweden; SI = Slovenia; WA = Wales. INC, incomplete.

and Slovenia), which was based on the availability of physical activity and sports opportunities. Estonia also included having an opportunity to take part in sports competitions out-of-school hours.

Sports and physical activity during recess/lunch

The provision of pupil-reported physical activity opportunities during break and lunch times was considered in two countries (Estonia and Spain).

National active school initiative

Taking part in a national 'active school' initiative was considered in two countries (Finland and Slovenia). The school grade for Finland was exclusively based on the number of schools participating in the Finnish Schools on the Move initiative,¹⁵ which aims to add physical activity opportunities into a recess and academic lessons. In Slovenia, the Healthy Lifestyle Programme was introduced to build more and better-quality physical activity opportunities into primary schools, with two additional PE lessons per week.

Health education lessons

One country (Belgium) specifically referred to 'health education' lessons as distinct from PE.

Access to facilities outside of school hours

Only Spain considered the accessibility of sports facilities outside of school hours to be important in assigning the school grade.

Community and environment

Overall, 15 countries (75%) had a grade for the community and environment, and Table 3 provides a summary of the one to five factors considered when assigning the grade. France, Guernsey, the Netherlands, Spain and Wales did not have a grade and were excluded from the analysis (shaded in Table 3). Details of the factors considered in assigning the grades are provided below, in order of the number of countries using that factor.

Perceptions of neighbourhood safety

The most frequently considered factor of the Community and Environment was perceptions of neighbourhood safety, which was considered in 10 of the 15 countries (Belgium, Bulgaria, Czech Republic, England, Estonia, Germany, Jersey, Lithuania, Scotland and Sweden). In three countries, this was based on the proportion of children that reported living in a safe neighbourhood where they can be physically active (Czech Republic Estonia and Sweden), whereas in four other countries, the judgement was based on parental ratings of safety (England, Germany, Lithuania and Scotland). In Jersey, the rating could be made by children or parents, and in Bulgaria, it was not specified whose perception was considered. Belgium was the only country to consider specific aspects of safety including road traffic and crime.

Parks/green space

A total of eight countries considered an indicator of parks and green space. For some countries, this indicator was based on the presence of public playgrounds in communities (Germany) or the proportion of children with access to a park (England), with no further detail on how these indicators were assessed. In Belgium

Table 3
Summary of indicators for each community and environment grade, by country and frequency.

Country ^a	BE	BG	CZ	DE	DK	EE	EN	ES	FI	FR	GG	JE	LT	NL	PL	PT	SC	SE	SI	WA	TOTAL
Grade	B	C	B	B+	B+	B	C	INC	B+	INC	INC	C	C	INC	C	B	B-	A	B	INC	INC
Perceptions of neighbourhood safety	✓	✓	✓	✓		✓	✓					✓	✓				✓	✓			10
Green space/parks	✓	✓	✓	✓			✓					✓					✓	✓			8
Sports/recreation facilities	✓	✓		✓	✓	✓	✓		✓			✓									8
Supportive environments/opportunities					✓							✓	✓		✓	✓					4
Supportive policies									✓			✓							✓		3
Sidewalks/cycle paths	✓	✓																			2
Health promotion programmes/initiatives													✓								1
Sport perceived as valued												✓									1
Total	4	4	2	3	2	2	3		2			5	3		1	1	2	2	1		

^a BE = Belgium; BG = Bulgaria; CZ = Czech Republic; DE = Germany; DK = Denmark; EN = England; EE = Estonia; ES = Spain; FI = Finland; FR = France; GG = Guernsey; JE = Jersey; LT = Lithuania; NL = the Netherlands; PL = Poland; PT = Portugal; SC = Scotland; SE = Sweden; SI = Slovenia; WA = Wales. INC, incomplete.

and Bulgaria, the indicator was explicitly based on children reporting easy access to parks. In Scotland, the rating was based on the number of children with at least one play area within their neighbourhood, and in Sweden, it was based on the proportion of children with access to green space within 300 m of their home. In the Czech Republic, access to parks was assessed objectively via a geographic information system. In addition to the presence of green space, the extent to which parks and playgrounds are well maintained was factored into the grade assigned in Belgium. The grade in Jersey was based on perceptions of maintenance of parks, rather than provision.

Sports/recreation facilities

A total of eight countries considered sports and recreational facilities when assigning the Community and Environment grade. For two countries, this was based on children's self-reported access to facilities (Bulgaria and Denmark); for one, it was based on once per week usage (England) and another considered resident satisfaction with sports and recreational facilities (Belgium). In Estonia, the importance of accessible sporting facilities was acknowledged, although no system was in place for assessing provision. Similarly, in Germany, most cities provided facilities such as soccer pitches, although it was not clear how such provision was assessed. As with parks and green space, the grade for Jersey was based on perceptions of maintenance of facilities, rather than provision. In Finland, the grade was based on school facilities and sports grounds being provided free of charge. In Denmark, in addition to the proportion of children reporting access to sporting facilities, the equitability of access was taken into consideration.

Supportive environments/opportunities

Four countries considered whether residents perceived the neighbourhood environment to be supportive of physical activity. These perceptions came from children and adolescents (Denmark and Poland), parents (Lithuania), or not specified (Portugal).

Supportive policies

The presence of supportive policies for physical activity was factored into the grade assigned to three countries (Finland, Jersey and Slovenia). Jersey based their grade partly on the Fit for the Future strategy,¹⁶ which committed to investing in infrastructure for physical activity. The grade in Slovenia was largely based on the legal requirement for municipalities to produce an annual programme of sport, whereas Finland considered the proportion of municipalities with a physical activity strategy.

Sidewalks/cycle paths

Two countries considered children's self-reported access to sidewalks and/or cycle paths (Belgium and Bulgaria).

Health promotion programmes/initiatives

In Lithuania, the grade was partly based on the number of municipalities implementing health promotion programmes.

The public's value of physical activity and sport

In Jersey, the grade was partly based on the proportion of the public that perceives sport and physical activity as important and valued.

Discussion

This analysis provides a comparison of the factors considered when assigning the grades for the School and Community and Environment indicators of the Global Matrix 3.0 on physical

activity for children and youth among participating European countries.

Of 17 European countries (85%) that had a grade for schools, PE was the most common factor considered when assigning the grade, followed by qualifications/quality of teachers delivering PE and sports facilities/equipment. The current evidence-base suggests that whole-of-school programmes that include multiple components across the whole school day are most effective for increasing physical activity levels in the school setting.¹⁴ Despite this, many countries considered just one or two specific actions when assigning their grade. This could introduce some bias in the results by providing an incomplete assessment and undermining the role of schools in providing opportunities for children's physical activity. For example, research indicates that having an active school travel policy can lead to increases in physical activity.¹⁷ However, this was not considered when assigning the school grade, as active transportation (including to and from school) is a separate indicator in the Global Matrix. In addition, the playground environment was not explicitly considered by any of the included countries. It is possible that this was considered within the 'facilities and equipment' factor, whereby some parents and pupils were asked to rate the school facilities and equipment, but whether playgrounds were considered within this indicator was not explicit.

Of the 15 countries (75%) that had a grade for Community and Environment, perceptions of neighbourhood safety were the most common factor considered, followed by the presence of green space/parks and sports/recreation facilities. Research demonstrates that these are important indicators of children's physical activity. For example, positive associations have been found between perceptions of safety and physical activity in youth, with children who perceive their local areas as safe to be more likely to have higher levels of physical activity.¹¹ Conversely, crime is associated with a perceived lack of safety, and as a result, is often cited as a barrier to physical activity.¹² In addition, children (aged 9–12 years), whose parents perceived a higher presence of recreational facilities in their neighbourhood, have also been found to be more active in these recreational spaces.¹³

There was a large variation in how the grades were assigned by different countries across Europe. Such subjective assessment may provide an unreliable comparison across Europe. This was evident in both the number and types of factors taken into consideration for each indicator. For the school indicator, for example, among the three countries that achieved grade A (Slovenia, Finland and Portugal), Slovenia based their grade on five factors (PE, qualifications/quality of teachers teaching PE, sports facilities/equipment, after school/extra-curricular sports and physical activity, national active school initiative); Finland on two factors (active school policies and national active school initiative) and Portugal on one element of school provision (PE). Similarly, in relation to Community and Environment, Sweden was graded an A based on two factors (perceptions of neighbourhood safety and green space/parks) in comparison with Jersey, which was graded a C based on five factors (perceptions of neighbourhood safety, green space/parks, sports/recreation facilities, supportive policies and sport perceived as valued). It is possible that Jersey may have scored higher if it had considered only the two factors that were considered by Sweden.

To increase comparability between countries and add clarity to the process, more detailed instructions for the indicators and benchmarks are needed.¹⁸ This could be facilitated by a basic set of common metrics for each indicator. For example, given that 85% of European countries considered PE when assigning the school grade and two-thirds of countries based their Community and Environment grade on perceptions of safety, it may be beneficial for all European countries to use these metrics in the future, as standard.

In addition to a common metric, common sources of evidence should also be considered and/or the use of standardised questions or tools. For example, data related to schools, community and environment from the WHO Health Behavior in School-Aged Children (HBSC) survey¹⁹ could be used as one of the common data sources due to it being used by 49 countries, every 4 years (<http://www.hbsc.org/>). The WHO Global Monitoring Framework,²⁰ which is being used to monitor implementation of the Global Action Plan on Physical Activity,²¹ may also provide useful comparable data for some of the report card indicators.

It is also important to ensure that the factors considered when assigning grades for each indicator remain consistent over time. Spain was included in the Global Matrix 2016 when the National Active School Initiative was considered when assigning the school grade. Despite continuing to have the National Active School Initiative in 2018, as no 'new' sources of data were available, this and other factors were not taken into consideration. This may have led to a lower grade than warranted, due to failure to account for ongoing initiatives. It could also lead to confusion within a country as to whether these initiatives are in place.

Despite the differences highlighted with each of indicators, there does appear to be some commonality among the countries. Slovenia, Finland and Denmark are the countries scoring best for both indicators (A or A– for school, B or B+ for community). Future research would benefit from examining these countries in more detail to determine what lessons could be learnt and applied to other countries in the region.

This is the first study globally to scrutinise the comparability of the report card indicators globally. Moreover, it did so following a systematic process, minimising the likelihood of misreporting. The biggest limitation of this study was that the main sources of data (i.e. the short and long forms of the report card and/or the scientific paper) were not all available for all countries. In addition, for some countries, the information was not available in an accessible format. For example, the short and long report cards were only available in the national language, not in English, for Estonia, Denmark and the Czech Republic. We liaised with contacts in these countries to populate the data extraction template in an attempt to overcome this limitation.

Although this paper only focused on the School and Community and Environment indicators, issues with comparability are likely to be present across all report card indicators. To improve the methods used for assigning grades for all report card indicators, the authors recommend:

- Advocating for common questions and/or tools to be used in nationally representative surveys;
- Providing information on the most commonly used metrics for assigning indicator grades globally;
- Providing future Global Report Card contacts with a mandatory/basic metric that should be included to assign a grade. Based on our European analysis, we suggest 'PE' for the school grade and 'perceptions of safety' for the Community and Environment grade;
- Adopting standardised methods to conceptualise and measure all indicators to ensure clarity on the definitions used for all indicators and benchmarks to allow comparisons to be made across countries;
- Allocating more weighting to the factors for which there is strong evidence of effectiveness, for example, for the school indicator, whole-of-school policies to promote physical activity¹⁴ and PE delivered by qualified teachers.²² These factors should also become mandatory to assign the grade; and
- Requiring countries to provide more detail on the measurement method(s) used.

It should be acknowledged that the European region is one of the most advanced globally in terms of national surveillance of physical activity behaviour and its determinants.²³ Because of its capacity for surveillance, it is well-positioned to review and better align the methods used for assigning grades for the report card indicators across countries to improve comparability. In other parts of the world, and particularly low- and middle-income countries, surveillance systems are less well-established and resources are often limited. Furthermore, other parts of the world have important contextual differences, which present challenges to the ways in which data are collected and interpreted. It remains important to include these countries in such global initiatives, despite limitations in our ability to draw direct comparisons on the report card indicators. We propose that the European countries trial any standardised approaches developed for future indicators and benchmarks used in the Global Matrix initiative to explore whether more standardised approaches are possible, at least in some parts of the world.

Conclusion

Public health surveillance is the cornerstone of public health practice.²⁴ Surveillance of physical activity is essential for monitoring progress towards benchmarks, setting priorities and informing policy.²⁵ The Global Matrix provides a useful method of consolidating the best available evidence and information on children's physical activity and its promotion globally, enabling comparisons and trends to emerge. However, this study demonstrates that there is a high degree of variability in the factors and data sources used to assign grades in two key settings that impact children's physical activity. To enable comparability, the authors recommend moving towards an agreed standardised set of measures that all countries adhere to, where possible, which will ultimately make the Global Matrix a more robust and useful tool for the future.

Author statements

Acknowledgements

The authors wish to acknowledge members of the HEPA Europe children and young people working group and the Global Matrix Report Card Country leads who assisted with data extraction: Susana Aznar, Katariina Kämppi, Marie Löf, Jorge Mota, Tim Takken, Tuija Tammelin, Blanca Roman Vinas. We would like to thank Esther Hope for the production of the map and Mark Tremblay from the Active Healthy Kids Global Alliance for his feedback on an earlier draft of the manuscript.

Ethical approval

None sought.

Funding source

None declared.

Competing interests

None declared.

Author's contributions

AC conceived the idea for the paper. AC, TC, KM and EM conceptualised the scope and methods. TC coordinated the data

extraction, which was undertaken by all authors with support from members of the HEPA Europe children and young people working group (see Acknowledgements). All authors contributed to writing and revising the manuscript. All authors approved the final version of the manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2020.07.025>.

References

- World Health Organization. *Global recommendation on physical activity for health*. 2010. http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/. [Accessed 20 December 2019].
- Guthold R, Stevens GA, Riley LM, Bull FC. Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1.6 million participants. *Lancet Child Adolesc Health* 2019;**4**(1):23–35. [https://doi.org/10.1016/S2352-4642\(19\)30323-2](https://doi.org/10.1016/S2352-4642(19)30323-2).
- Sallis JF, Bull F, Guthold R, Heath G, Inoue S, Kelly P, et al. Lancet physical activity series 2 executive committee. Progress in physical activity over the olympic quadrennium. *Lancet* 2016;**388**(10051):1325–36. [https://doi.org/10.1016/S0140-6736\(16\)30581-5](https://doi.org/10.1016/S0140-6736(16)30581-5).
- Kremer P, Elshaug C, Leslie E, Toumbourou JW, Patton GC, Williams J. Physical activity, leisure-time screen use and depression among children and young adolescents. *J Sci Med Sport* 2014;**17**(2):183–7. <https://doi.org/10.1016/j.jsams.2013.03.012>.
- Blair SN, Cheng Y, Holder SJ. Is physical activity or physical fitness more important in defining health benefits? *Med Sci Sports Exerc* 2001;**33**(6):S379–99. <https://doi.org/10.1097/00005768-200106001-00007>.
- Telama R, Yang X, Viikari J, Välimäki I, Wanne O, Raitakario. Physical activity from childhood to adulthood: a 21-year tracking study. *Am J Prev Med* 2005;**28**(3):267–73. <https://doi.org/10.1016/j.amepre.2004.12.003>.
- Tremblay MS, Barnes JD, Gonzalez SA, Katzmarzyk PT, Onywera VO, Reilly JJ, et al. Global Matrix 2.0 Research Team. Global matrix 2.0: report card grades on the physical activity of children and youth comparing 38 countries. *J Phys Act Health* 2016;**13**(11 Suppl 2):S343–66. <https://doi.org/10.1123/jpah.2016-0594>.
- Tremblay MS, Gray CE, Akinroye K, Harrington DM, Katzmarzyk PT, Lambert EV, et al. Physical activity of children: a Global Matrix of grades comparing 15 countries. *J Phys Act Health* 2014;**11**(S1):S113–25. <https://doi.org/10.1123/jpah.2014-0177>.
- Aubert S, Barnes JD, Abdeta C, Abi Nader P, Adeniyi AF, Aguilar-Farias N, et al. Global matrix 3.0 physical activity report card grades for children and youth: results and analysis from 49 countries. Table 1. *J Phys Act Health* 2018;**15**(Suppl 2):S251–73. <https://doi.org/10.1123/jpah.2018-0472>.
- Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. *Lancet Glob Health* 2018;**6**(10):e1077–86. [https://doi.org/10.1016/S2214-109X\(18\)30357-7](https://doi.org/10.1016/S2214-109X(18)30357-7).
- Lenhart CM, Wiemken A, Hanlon A, Perket M, Patterson F. Perceived neighborhood safety related to physical activity but not recreational screen-based sedentary behavior in adolescents. *BMC Publ Health* 2017;**17**:722. <https://doi.org/10.1186/s12889-017-4756-z>.
- Carver A, Timperio A, Crawford D. Playing it safe: the influence of neighbourhood safety on children's physical activity. A review. *Health Place* 2008;**14**(2):217–27. <https://doi.org/10.1016/j.healthplace.2007.06.004>.
- D'Haese S, Van Dyck D, De Bourdeaudhuij I, Deforche B, Cardon G. The association between the parental perception of the physical neighborhood environment and children's location-specific physical activity. *BMC Publ Health* 2015;**15**:565. <https://doi.org/10.1016/j.scispo.2014.08.084>.
- Ganzar LA, Ranjit N, Saxton D, Hoelscher DM. Association of school physical activity policies with student physical activity behavior. *J Phys Act Health* 2019;**16**(5):340–7. <https://doi.org/10.1123/jpah.2018-0057>.
- Blom A, Tammelin T, Laine K, Tolonen H. Bright spots, physical activity investments that work: the Finnish Schools on the Move programme. *Br J Sports Med* 2018;**52**:820–2. <https://doi.org/10.1136/bjsports-2017-097711>.
- Government of Jersey. *Fit for the Future: a five-year strategy for sport and physical activity in Jersey 2014-2018*. 2014. . [Accessed 26 November 2019].
- Pang B, Kubacki K, Rundle-Thiele S. Promoting active travel to school: a systematic review (2010–2016). *BMC Public Health* 2017;**17**(638). <https://doi.org/10.1186/s12889-017-4648-2>.
- Aubert S, Barnes JD, Tremblay MS. Evaluation of the process and outcomes of the Global Matrix 3.0 of physical activity grades for children and youth. *J Exerc Sci Fit* 2020;**18**:80–8. <https://doi.org/10.1016/j.jesf.2020.01.002>.
- World Health Organization. *Health behaviour in school-aged children*. 2019. <http://www.hsbc.org>. [Accessed 21 November 2019].
- World Health Organization. *Global monitoring Framework*. 2019. https://www.who.int/nmh/global_monitoring_framework/en/. [Accessed 25 November 2019].
- World Health Organization. *Global action plan on physical activity and health 2018-2030: more active people for a healthier world*. 2018. <https://www.who.int/ncds/prevention/physical-activity/gappa/action-plan>. [Accessed 2 December 2019].
- Law B, Bruner B, Scharoun Benson S, Anderson K, Gregg M, Hall N, et al. Associations between teacher training and measures of physical literacy among Canadian 8- to 12-year-old students. *BMC Publ Health* 2018;**18**(2):1039. <https://doi.org/10.1186/s12889-018-5894-7>.
- Breda J, Jakovljevic J, Rathmes G, Mendes R, Fontaine O, Hollmann S, et al. Promoting health-enhancing physical activity in Europe: current state of surveillance, policy development and implementation. *Health Pol* 2018;**122**(5):519–27. <https://doi.org/10.1016/j.healthpol.2018.01.015>.
- World Health Organization. *A guide for population-based approaches to increasing levels of physical activity: what works*. Geneva: World Health Organization; 2007.
- Tremblay MS, Barnes JD, Cowie Bonne J. Impact of the active Healthy kids Canada report card: a 10-year analysis. *J Phys Act Health* 2014;**11**(S1):S3–20. <https://doi.org/10.1123/jpah.2014-0167>.