

First Physical Activity Report Card for Children and Youth in Lebanon

Patrick Abi Nader, Lina Majed, Susan Sayegh, Lama Mattar, Ruba Hadla, Marie Claire Chamieh, Carla Habib Mourad, Elie-Jacques Fares, Zeina Hawa, and Mathieu Bélanger

Background: Evidence on physical activity (PA) indicators for children and youth at a national level is necessary to improve multilevel support for PA behaviors. Lebanon's first Physical Activity Report Card for children and youth (2018) aimed to fill this gap. **Methods:** In line with the recommended methods of "Global Matrix 3.0," nationally representative data were retrieved from peer-reviewed manuscripts, national surveys, and government reports. In addition to adopting the 10 indicators of "Global Matrix 3.0," publications that discussed weight status were also retained. A grade was assigned for each indicator using a standard rubric: A = 80% to 100%, B = 60% to 79%, C = 40% to 59%, D = 20% to 39%, F = <20%, and INC = incomplete data. **Results:** Four indicators (active play, family and peers, community and environment, and physical fitness) received an "INC." Three indicators (overall PA, active transportation, and school) received a "D." Sedentary behaviors received a "C-." Weight status received a "C." Government received a "C+." Organized sport received an "F." **Conclusions:** PA participation among Lebanese children and youth is low. Stakeholders should aim to improve low PA indicators grades. Gaps in the literature also need to be filled to inform on the status of all indicators.

Keywords: active transport, obesity, sport, sedentary behavior, recreation

In light of the international childhood obesity crisis¹ and the prevailing low proportions (20%) of children and youth who meet the physical activity (PA) guidelines of 60 minutes per day of moderate- to vigorous-intensity PA,² an international alliance of researchers was created.³ In 2014, Active Healthy Kids Canada and subsequently the Active Healthy Kids Global Alliance led international efforts to implement country-specific PA report cards to assess how successful a nation is at promoting and providing PA opportunities for its children and youth.^{4,5} Country-specific report cards were combined into "Global Matrix 1.0"⁴ and "Global Matrix 2.0."⁵ Results from global matrices were to foster collaborations between international stakeholders and open up a platform where different countries learn from the successes and failures of other countries.³

Results from the first 2 iterations of the "Global Matrix" may not be generalizable to all countries. The Republic of Lebanon, a small country (10,452 km²) in the Middle East, has had a very politically unstable history,⁶ and most recently has been one of the 3 primary countries to host the largest number of Syrian refugees.⁷ Among Middle Eastern countries, Lebanon is considered a high

developing country (high development index = 0.763) and uses 3.0% of its total gross domestic product on public health expenditure.⁷ By 2020, Lebanon is expected to have a population greater than 6 million, a population density of 588 persons/km², and a vast majority (88.8%) of its residents living in urban dwellings.⁸ In "Global Matrix 1.0," there were no countries representing the Middle East.⁴ Two countries (Qatar and the United Arab Emirates) represented the Middle East in "Global Matrix 2.0." However, Qatar and the United Arab Emirates are considered as very high developing countries and their profiles are different from Lebanon's.^{7,8}

Previously published report cards are not applicable to the unique Lebanese context. In addition, there have been very few published studies discussing the status of childhood obesity and physical inactivity in this country. In 2003, Sibai et al⁹ reported that 18.6% and 4.8% of Lebanese youth (3–19 y old) were overweight and obese, respectively. The authors also found that lack of PA was associated with greater odds of obesity.⁹ Since then, there has been only one other nationally representative study that evaluated the weight status of Lebanese youth.¹⁰ In this most recent study, authors found that 34.8% and 13.2% of Lebanese youth were overweight and obese, respectively.¹⁰ Furthermore, both studies reported participation in PA using 3 weekly frequency cutoffs (did not participate in any PA during the week, participated in 1–2 session of PA per week, and participated in more than 2 sessions of PA per week).^{9,10} This method of classifying PA participation does not allow the evaluation of whether or not Lebanese youth are meeting PA guidelines. Finally, to date, there have been no national efforts to synthesize and grade available data on the 10 common PA indicators that were adopted by the "Global Matrix 3.0" and weight status.¹¹

Aiming to support PA advocacy efforts in Lebanon, the purpose of this study was to synthesize and grade currently available evidence on the performance of Lebanon on 11 indicators (the 10 PA indicators as recommended by "Global Matrix 3.0")¹¹

Abi Nader and Bélanger are with the Centre de formation médicale du Nouveau-Brunswick, Moncton, New Brunswick, Canada. Abi Nader is also with the Centre de Recherche du Centre Hospitalier de l'Université de Montréal, Montréal, Québec, Canada. Majed is with Sport Science Program, College of Arts and Sciences, Qatar University, Doha, Qatar. Sayegh is with Exercise is Medicine Department, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar. Mattar and Hadla are with Nutrition Program, Department of Natural Sciences, School of Arts and Sciences, Lebanese American University, Beirut, Lebanon. Chamieh, Habib Mourad, and Fares are with the Department of Nutrition and Food Sciences, American University of Beirut, Beirut, Lebanon. Hawa is with The Chain Effect, Beirut, Lebanon. Bélanger is also with the Department of Family Medicine, Université de Sherbrooke, Sherbrooke, Canada; and the Office of Research Services, Vitalité Health Network, Moncton, New Brunswick, Canada. Abi Nader (Patrick.abi.nader@umoncton.ca) is corresponding author.

and weight status). The first physical activity report card for children and youth in Lebanon aspires to guide societal changes through public debates, policy implementation, improvement of current practice, and encouragement of behavior change.⁴

Methods

The first Lebanon Physical Activity Report Card for Children and Youth (2018) was spearheaded by the Lebanese Research Work Group (LRWG), a group of national and international researchers. Collaborators from within Lebanon were from the American University of Beirut, the Lebanese American University, and an active transportation organization, “The Chain Effect.” Collaborators from overseas were from the University of Moncton (Canada), Université de Sherbrooke (Canada), Qatar University (Qatar), and Aspetar Orthopaedic and Sports Medicine Hospital (Qatar).

The LRWG implemented a comprehensive literature review to identify all peer-reviewed literature, national surveys, and gray literature (eg, government reports) that were published on the following 10 PA indicators: overall PA, organized sport and PA, active play, active transportation, sedentary behaviors, physical fitness, family and peers, school, community and environment, and government. In addition, publications on weight status, a benchmark in previous editions of the Global Matrix, were sought. All published nationally representative literature for ages 5–17 years up to December 2017 were identified, and the most recent publications were included in the current investigation. The LRWG also sought available data at the Ministries of Education and Higher Education, Public Health, Youth and Sports and the regional office of the World Health Organization.

One author (P.A.N.) used an exhaustive list of search strategies to identify all articles ever published on the 11 indicators through Ovid Medline. This search was restricted to any research published on Lebanese samples. The search identified 1331 records. Two independent reviewers (P.A.N. and F.G., an experienced research assistant in M.B.’s laboratory) reviewed the titles and abstracts of all articles and decided if articles should be retained for full-text review. For inclusion in further review, titles and abstracts were screened for the 11 PA indicators or their respective benchmarks (Table 1).¹¹ In the first iteration, reviewers (P.A.N. and F.G.) agreed on the selection of 25 articles for further review and disagreed on the selection of 14 articles (ie, only one reviewer selected them for further review) for a Cohen kappa of .78. The 2 reviewers (P.A.N. and F.G.) then discussed their disagreement on the 14 articles, agreed to include 4 and exclude 2 of them and could not agree on the remaining 8 articles. A third reviewer (M.B.), was enlisted to this process, reviewed the remaining 8 articles and recommended to exclude 6 and include 2 of those articles for further review. Through 2 additional independent searches, 2 authors (L.M. and P.A.N.) identified 13 more articles that were added to the full-text review (ie, total 44 articles for full-text review).

One author (P.A.N.) reviewed and retrieved relevant data from all retained articles. To ensure accuracy in the full-text review process, each of the coauthors conducted independently the same review process on up to 5 articles each. Individual meetings were held when needed between the first author and coauthors to verify that all important information were retrieved in the best way. Agreement on the exclusion or inclusion of articles after this step was very high (Cohen kappa of .80). Data from nationally representative samples of relevant literature were extracted for inclusion in the grading of each indicator. Finally, the LRWG used

the following grading criteria (A = 80%–100%, B = 60%–79%, C = 40%–59%, D = 20%–39%, F = <20%, and INC = incomplete data) to assign a grade for each indicator.¹¹ Where appropriate, the LRWG considered trends over time and actual efforts being done in the Lebanese context to help inform grades for certain indicators.

Results and Discussion

There were sufficient data to grade 7 out of 11 indicators (Table 2). The government indicator received the highest grade “C+,” and the organized sport indicator received the lowest grade “F.” Three indicators (overall PA, active transportation, and school) received a “D,” whereas weight status and sedentary behaviors received a “C” and a “C–,” respectively. All other indicators (active play, family and peers, community and environment, and physical fitness) received an “INC” due to the unavailability of nationally representative data. Three studies with nationally representative data were used to grade 5 indicators.^{10,13,14} Two indicators were graded with data collected by 2 national organizations.^{16,20} The other 41 studies were excluded from grading because of lack of nationally representative data or because the included studies were more recent (see Appendix).

Overall PA

The grade of “D” for the overall PA indicator was determined using 2 sources of data. Data in the Lebanese Food and Nutrition Security study were collected from December 2014 to November 2015.¹³ This study included a nationally representative sample on the target population of the report card (5–17 y old). The published study of Jomaa et al¹³ presented data on a portion of the target population, and through contact with the first author, the estimates for the full sample were received. Jomaa et al (unpublished data) reported that 54.1% of children and youth achieved 420 minutes of moderate- to vigorous-intensity PA during a 7-day period. Data in that study were collected with a modified version of the Children and Youth Physical Activity Questionnaire.²¹ Participants were provided a list of 20 activities, and they were asked to report if they participated in these activities, on how many occasions during the past 7 days, and for how long. The authors then combined the total weekly self-reported moderate- to vigorous-intensity PA and classified as “active” those who met the PA guidelines for at least 60 minutes per day (ie, 420 min/wk).¹³ More recent nationally representative data were also available to address the overall PA indicator from the Global School-Based Student Health Survey (GSHS).¹⁴ GSHS data were collected in 2016; however, they only included a sample of adolescents between the ages of 13 and 17 years.¹⁴ In that study, adolescents reported during the past 7 days on how many days they achieved 60 minutes of PA, and authors computed the frequency of adolescents who reported 60 minutes of daily PA. They found that 12.2% of adolescents engaged in 60 minutes of PA every day during the past week.¹⁴

Combining these 2 studies, it is noticeable that one is more recent than the other, and one partially represents the target population of the report card. Therefore, the expected grade “C” from one study¹³ was brought down, whereas the expected grade “F” from the other study¹⁴ was brought up to a midrange “D.” Compared with its Middle Eastern neighbors (Qatar and the United Arab Emirates), Lebanon appears to have a slightly larger success at keeping its children and youth physically active.^{22,23} However,

Table 1 Global Matrix Indicators and Benchmarks Used to Guide the Grade Assignment Process¹¹

Indicators	Benchmarks
Overall physical activity	% of children and youth who meet the Global Recommendations on Physical Activity for Health, which recommend that children and youth accumulate at least 60 min of moderate- to vigorous-intensity physical activity per day on average. Or, percentage of children and youth meeting the guidelines on at least 4 d/wk (when an average cannot be estimated).
Organized sport and physical activity	% of children and youth who participate in organized sport and/or physical activity programs.
Active play	% of children and youth who engage in unstructured/unorganized active play at any intensity for more than 2 h/d. % of children and youth who report being outdoors for more than 2 h/d.
Active transportation	% of children and youth who use active transportation to get to and from places (eg, school, park, mall, friend's house).
Sedentary behaviors	% of children and youth who meet the Canadian Sedentary Behavior Guidelines (5–17 y olds: no more than 2 h of recreational screen time per day). Note: the guidelines currently provide a time limit recommendation for screen-related pursuits but not for non-screen-related pursuits.
Weight status	% of children and youth who meet the WHO's BMI-for-age reference standards.
Physical fitness	Average percentile achieved on certain physical fitness indicators based on the normative values published by Tomkinson et al. ¹²
Family and peers	% of family members (eg, parents, guardians) who facilitate physical activity and sport opportunities for their children (eg, volunteering, coaching, driving, paying for membership fees and equipment). % of parents who meet the Global Recommendations on Physical Activity for Health, which recommend that adults accumulate at least 150 min of moderate-intensity aerobic physical activity throughout the week or do at least 75 min of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. % of family members (eg, parents, guardians) who are physically active with their children. % of children and youth with friends and peers who encourage and support them to be physically active. % of children and youth who encourage and support their friends and peers to be physically active.
School	% of schools with active school policies (eg, daily PE, daily physical activity, recess, "everyone plays" approach, bike racks at school, traffic calming on school property, outdoor time). % of schools where the majority (≥80%) of students are taught by a PE specialist. % of schools where the majority (≥80%) of students are offered the mandated amount of PE (for the given state/territory/region/country). % of schools that offer physical activity opportunities (excluding PE) to the majority (>80%) of their students. % of parents who report their children and youth have access to physical activity opportunities at school in addition to PE classes. % of schools with students who have regular access to facilities and equipment that support physical activity (eg, gymnasium, outdoor playgrounds, sporting fields, multipurpose space for physical activity, equipment in good condition).
Community and environment	% of children or parents who perceive their community/municipality is doing a good job at promoting physical activity (eg, variety, location, cost, quality). % of communities/municipalities that report they have policies promoting physical activity. % of communities/municipalities that report they have infrastructure (eg, sidewalks, trails, paths, bike lanes) specifically geared toward promoting physical activity. % of children or parents who report having facilities, programs, parks, and playgrounds available to them in their community. % of children or parents who report living in a safe neighborhood where they can be physically active. % of children or parents who report having well-maintained facilities, parks, and playgrounds in their community that are safe to use.
Government	Evidence of leadership and commitment in providing physical activity opportunities for all children and youth. Allocated funds and resources for the implementation of physical activity promotion strategies and initiatives for all children and youth. Demonstrated progress through the key stages of public policy making (ie, policy agenda, policy formation, policy implementation, policy evaluation, and decisions about the future).

Abbreviations: BMI, body mass index; PE, physical education; WHO, World Health Organization.

Lebanon's results remain concerning, as they suggest that at least 60% of Lebanese children and youth are not attaining sufficient levels of PA. In reality, this proportion could be even larger, as it has been well documented that measurement of PA behavior with self-report generally overestimates the behavior.²⁴ Regardless, the large prevalence of Lebanese children and youth not meeting the PA guidelines is concerning given that they may be missing out on the benefits of PA participation and may therefore be at greater risk for a host of chronic diseases.²⁵

Organized Sport and PA

A 28-year longitudinal study found that participating in organized sports during childhood could promote a healthy lifestyle during

adulthood.²⁶ To maintain a healthy lifestyle during adulthood, it is therefore essential that Lebanese children and youth participate in organized sports.²⁶ The indicator for organized sports and PA received an "F," but this was a rough estimate of the situation in Lebanon, as data that were available for this indicator were not optimal. Specifically, the Ministry of Youth and Sports reported that 4.5% of youth participated in organized sports. However, only data on the number of individuals who participated in events/competitions that were overseen by the ministry were available. This precludes the measurement of all other ways that one can participate in organized sports and PA (ie, regular participation of children and youth in clubs, organized after school programs, and competitive sports teams). Moreover, it was not possible to tell if the total number provided by the ministry excluded duplicate

Table 2 Grades Assigned to Each Indicator With Rational and Study Characteristics

PA indicator	Grade	Results/rational	Source of data	Publication year	Measurement of data	Sample
Overall PA	D	54.1% achieved 420 min of weekly MVPA	Jomaa et al ¹³ and Jomaa et al (unpublished data)	2016	Self-reported: Modified version of the Children and Youth Physical Activity Questionnaire	Nationally representative 1079 children and youth aged between 5 and 17 y
Organized sport	F	12.2% achieved 60 min of daily MVPA on the past 7 d	Global School-Based Student Health Survey—WHO ¹⁴	2017	Participants who were physically active at least 60 min/d on all 7 d, during the 7 d before the survey	Nationally representative 5708 adolescents aged between 13 and 17 y
Active play	INC	4.5% of all students (n = 924,570) ¹⁵ in Lebanon participated in PA events/competitions overseen by the Ministry of Youth and Sports	Ministry of Youth Sports ¹⁶	2017	Data collected and tracked by the Ministry of Youth and Sports. Number of students who participated in PA events/competitions overseen by the ministry	n = 41,962 from 2474 schools
Active transportation	INC	Only one publication had a representative sample that could have been used to address this indicator. ¹⁰ However, based on the format of available data, authors were not able to conduct any custom analysis	Nasreddine et al ¹⁰	2014	Self-reported	Nationally representative 939 children and youth aged between 6 and 19 y
Active	D	36.8% rode a bicycle or walked to school	Global School-Based Student Health Survey—WHO (unpublished data)	Data collected in 2016	Self-reported: students who rode a bike or walked to school during the past 7 d	Nationally representative 5708 adolescents aged between 13 and 18 y
Sedentary behaviors	C–	52.4% met the screen time recommendation of no more than 2 h/d ¹⁴	Global School-Based Student Health Survey—WHO ¹⁴	2017	Self-reported: participants reported how much time they spend during a typical or usual day on screen time activities	Nationally representative 5708 adolescents aged between 13 and 17 y
Weight status	C	48% of children and youth were overweight or obese ¹⁰	Nasreddine et al ¹⁰	2014	Objectively assessed: height and weight were measured and WHO cutoffs were used for BMI classification	Nationally representative 939 children and youth aged between 6 and 19 y
Physical fitness	INC	No data	No data	No data	No data	No data
Family and peers	INC	22.2% of Lebanese children aged 3–13 y lacked friends to play with, and 27.8% reported being limited by finances. ¹⁷ However, these data were not nationally representative and were more than a decade old	Friends Salameh et al ¹⁷	2009	Self-reported: question used not clear but in Table 3 of the manuscript: researchers reported on the proportion of children that lacked pupils to play with, and that had their activity limited by financial difficulties	15 schools chosen from greater Beirut region (5 public, 5 private, and 5 semiprivate) N = 1268, age 3–13 y
School	D	58.7% participated in at least 1 session of PE during the school year every week	Global School-Based Student Health Survey—WHO (unpublished data)	Data collected in 2016	Self-reported: participants reported on how many days they went to PE each week, during the school year	Nationally representative 5708 adolescents aged between 13 and 18 y

(continued)

Table 2 (continued)

PA indicator	Grade Results/rational	Source of data	Publication year	Measurement of data	Sample
Community and environment	INC 33% and 50.9% of children aged 3–13 y had limited participation in PA due to safety concerns and lack of outdoor space, respectively ¹⁷	Salameh et al ¹⁷	2009	Self-reported: Salameh et al: questions used not clear but in Table 3 of the manuscripts: authors reported the percent of children or parents who report living in a safe neighborhood where they can be physically active, and the percent of children or parents who report having well-maintained facilities, parks, and playgrounds in their community that are safe to use	Salameh et al: 15 schools chosen from greater Beirut region (5 public, 5 private, and 5 semiprivate) and N = 1268, age 3–13 y
	32.6% and 39.8% of children felt unsafe playing or walking in their neighborhoods, respectively ¹⁸	Usta and Farver ¹⁸	2005	Usta and Farver: children rated how safe they feel at home, in school, playing in neighborhood, and walking home from school	Usta and Farver: Children living in Beirut N = 405, age 8–12 y
	A qualitative study reported that parents were concerned about their children's safety. ¹⁹ None of the mentioned studies had nationally representative samples	Habib-Mourad et al ¹⁹	2014	Habib-Mourad et al: parents participated in focus groups	Habib-Mourad et al: N = 13 focus groups, and N = 82 parents participated in all focus groups
Government	C+ The Ministries of Public Health, Education and Higher Education, and WHO regional office in collaboration with K2P are implementing a policy brief to promote school-based PA opportunities	American University of Beirut—K2P	2018	Contact with K2P stakeholders and information from K2P's website	N/A

Abbreviations: BMI, body mass index; INC, incomplete data; K2P, Knowledge to Policy; MVPA, moderate- to vigorous-intensity PA; N/A, not applicable; PA, physical activity; PE, physical education; WHO, World Health Organization.

records; therefore, it is possible that the same individual was counted multiple times. In future report cards, it is advised to use more comprehensive data collection methods to improve the accuracy in the grading of this indicator.

Currently available data for organized sports and PA indicator suggest that Lebanon is succeeding with very few children and youth. In “Global Matrix 2.0,” other countries such as Qatar and Kenya graded this indicator “D” and “C,” respectively.^{22,27} When it comes to Qatar, 30% of the children are involved in at least one organized sport per year.²² There is also a National Sport Day and multiple organizations that promote participation in organized sports.²² On the other hand, in Kenya, almost half of the schools offer several opportunities for children and youth to participate in organized sports and PA.²⁷ Authors from the LRWG are aware of multiple organized sports programs that are offered at schools and clubs in Lebanon; however, these are not well documented. Other than improving the tracking of children and youth’s participation in organized sports and PA, Lebanon may also benefit from adopting the “National Sport Day” as in the case of Qatar.²²

Active Play

Active play involves unstructured social or solitary playful activities occurring intermittently but significantly above the resting metabolic rate.⁵ It is benchmarked by the percent of children and youth who engage in unorganized active play for more than 2 hours a day and percent of children and youth who report being outdoors for more than 2 hours a day.¹¹

Given the nature of active play and difficulty in recording time spent doing an activity, studies with relevant data are scarce in many countries⁵ including Lebanon. One nationally representative cross-sectional study by Nasreddine et al¹⁰ investigated PA levels in association with overweight and central fatness in a sample of 6- to 19-year-old males and females. However, based on the type and format of data collected, further custom analysis by the authors to compute pertinent active play score was implausible, and an “INC” grade was assigned to this indicator.

Several countries that participated in “Global Matrix 2.0” reported various grades. Ghana, Kenya, and the Netherlands lead with a “B.”⁵ Based on the existing data and expert consensus, it was estimated that over half of Kenyan children and youth participate in active play.²⁷ In Kenya, children spend on average about 6 hours outdoors either before or after school and on weekend days.²⁷ In the Netherlands, overall 70% of children between the ages of 4 and 11 years engaged in active play.²⁸ Slovenia, New Zealand, and Zimbabwe showed high prevalence of active children and youth overall, mostly determined by cultural norms and lifestyle rather than a choice.⁵

In Lebanon, studies investigating prevalence of active play among children and youth, as well as factors facilitating and/or hindering such activities, namely the built environment, safety, and sociocultural issues are needed.

Active Transportation

Active transportation was measured by the percentage of children and youth who use active transportation means to get to and from places (eg, school, park, mall, friends’ homes). Active transportation can be an easy, cost-effective way of introducing more regular, low impact, healthy PA into children’s existing daily routines.²⁹ In Lebanon, active transportation received a score of “D,” with 36.8%

of adolescents (13–18 y) self-reporting riding a bicycle or walking to school based on the results of the “Lebanon GSHS survey 2016.”¹⁴ One study with a nationally nonrepresentative sample found that 25.6% of children aged 3–13 years from public schools in the greater Beirut region used active means of transportation.¹⁷ As such, it is expected that fewer children might be participating in active transportation, hence, why the LRWG decided to downgrade the active transportation score from a “D+” to a “D.”

Transportation is a very localized topic, and the conditions conducive to active transportation (at least to and from schools) are dependent on a variety of factors, namely whether the area is rural or urban, the geographic distribution of schools, topography, and whether the child attends a private or public school (children attending private schools spend on average longer distances commuting to school).³⁰ Compared with other countries, Lebanon’s active transportation grade of “D” remains low, with ample room for improvement.⁵ Broader data collection methods inclusive of nationally representative samples for children and youth and on all active transportation means are required to gain a better understanding of this indicator. Moreover, promoting and educating on active transportation can be a quick way to raise general PA levels among Lebanese children,²⁹ which may lead to desirable health effects.²⁵

Sedentary Behaviors

Sedentary behavior is defined as any waking behavior characterized by an energy expenditure ≤ 1.5 metabolic equivalents while in a sitting reclining or lying posture.³¹ Two sources of data were considered to address the sedentary behaviors indicator. Data from the “Lebanon GSHS survey 2016” revealed that among adolescents aged 13–17 years, 52.4% met the screen time recommendations of no more than 2 hours per day.¹⁴ The GSHS data did not provide information on youth below 13 years of age; however, one study with a large nonrepresentative sample suggested that 40.7% of 6–11 years old met the daily screen time recommendations.³² Considering the limitations of both studies together, it was decided to base the grading for the sedentary behaviors on the lowest boundary of the range of results obtained for this indicator, which is equivalent to a “C–.” Previous report cards showed that Slovenia lead the sedentary behaviors indicator with a “B+,” whereas, Canada, China, Estonia, South Korea, Nigeria, Scotland, and South Africa lagged with an “F.”⁵ Lebanon’s grade was closer to the top range; however, this should not be a sign of relief. Evidence from other emerging economies shows that economic growth may lead to increased sedentary leisure activities.³³

Weight Status and Physical Fitness

Overweight and obesity received a “C,” based on the results of a single cross-sectional study for 6–19 years of age.¹⁰ Indeed, this study constituted the only nationally representative sample for children and adolescents since 1997.^{9,34} Data collected between 2008 and 2009 revealed a high prevalence (48%) for overweight and obesity mostly affecting boys (57.9%) compared with girls (37.8%) and children of 6–11 years (57.3%) compared with adolescents of 12–19 years (41.1%).¹⁰ These figures show an alarming increase in overweight and obesity in Lebanon over a 12-year period, with obesity doubling from 6.5% in 1997 to 13.2% in 2009 and overweight increasing from 21.7% in 1997 to 34.8% in 2009.^{9,10} Those rates of overweight and obesity do not reflect the

current weight status of Lebanese children and youth therefore making it difficult in this investigation to compare Lebanon with other neighboring countries. The observed increase in the rates of overweight and obesity remains a public health concern, as obesity in the young age may lead to adult obesity, and overweight or obese children are at greater risk of developing at a younger age diseases that were once specific to adults such as diabetes, hypertension, and other cardiovascular diseases.³⁵ Other than conducting ongoing investigations on the current weight status of children and youth, Lebanese stakeholders should therefore take more serious actions to prevent the development of overweight and obesity.

In terms of research gaps, perhaps the most striking result is the complete absence of data on all benchmarks of the fitness indicator (grade: INC) related to aerobic and muscular fitness and flexibility in Lebanese children and adolescents. It is important to mention that levels of PA and physical fitness (especially for aerobic fitness) are 2 distinct components used independently as good predictors of some health risks in children and adolescents.

Family and Peers

This indicator is defined as any member within the family who can control or influence the PA opportunities and participation of children and youth in their environment.⁵ Parents, family, home environment, and friends have been consistently shown to have collective influence on the level of PA of youth, both through modeling behavior and provision of social support. Notably, peer problems were shown to be associated with increased time allocated to sedentary behavior and inactivity.^{36–38} PA and active play during childhood and adolescence not only increase self-esteem but also are particularly important because of their significant relationship with activity in adulthood.³⁶

Surveys addressing family and peers' effect on PA among youth are scarce in Lebanon. Only one study, carried out a decade earlier, indicated that 22.2% of Lebanese children aged 3–13 years lacked friends to play with, and 27.8% reported being limited by finances.¹⁷ These data, however, do not satisfy any of the 5 benchmarks used to identify the indicator,¹¹ and they were not from a nationally representative sample. Therefore, and similar to many countries with inadequate data such as the United States and England,⁵ an "INC" grade was assigned for family and peers indicator.

Based on literature, family-based interventions in parallel with positive peer-centered activities at schools and the community could positively influence PA levels in children and adolescents.³⁹ Researchers aiming at promoting a healthy lifestyle among the Lebanese population should initiate studies investigating domestic and social covariates of physical activities among the youth.

School

Children spend a considerable amount of time at school; thus, the school environment can potentially influence their PA behaviour.⁴⁰ Policies, infrastructure, accountability for policy implementation, and PA options in the school environment can influence the opportunities and participation of children and youth in PA at school.⁴¹

The Center for Educational Research and Development recommends that all children and adolescents should receive 2 hours of weekly physical education (PE).⁴² Custom analysis with the "Lebanon GSHS survey 2016"¹⁴ revealed that 58.7% of adolescents aged 13–18 years attended at least 1 session of PE every week during

the past school year. On the other hand, published results from the same study revealed that 22% of the sample (13–17 y, ie, excluding 18 y old) participated in 3 or more days of PE every week during the past year.¹⁴ Therefore, the percentage of individuals who met the expectation of the Center for Educational Research and Development were in between 22% and 58%. No other studies addressed any other benchmarks for the school indicator. Given that nationally representative data were only available for ages 13–18 years with no results for the proportion of adolescents meeting the exact recommendations of 2 hours of weekly PE, a "D" score was deemed most appropriate for this indicator.

Although national policies address the necessity for a mandated number of PE classes at schools and the need to have a PE specialist to teach students,⁴³ the Ministry of Education in Lebanon lacks official documents and statistics on school infrastructure and PE provision. Compared with other countries with previous report cards, Lebanon and Mexico lag with a "D," whereas Slovenia leads with an "A," and Canada improved from a "C+" in 2015 to a "B".⁵

In light of the current findings, it is crucial to have nationally representative studies regarding the PE situation in Lebanese school environments because PE at school can have a powerful influence in promoting PA among youth.⁴⁴

Community and Environment

The physical environment and the community-built setting are major determinants of PA.^{45,46} In fact, when properly present, infrastructure such as sidewalks, parks, safe playgrounds, and accessibility to recreational areas facilitate PA.^{45–47} Moreover, PA-promoting environments have been shown to be directly linked to improved health status and decreased body mass index.^{47,48} On the contrary, when the community and environment are not equipped and do not have the proper infrastructure for walkability, playing, or outdoor activities, the environment becomes a restrictor and a limiting factor for PA.⁴⁹ Other parameters such as pollution or safety play a role in the perception of the community for opportunities to engage in PA.^{50,51}

In the current report card, only 3 studies were identified to address the community and built environment indicator.^{17–19} However, these publications did not assess nationally representative samples, and some included data that were more than a decade old, hence, the "INC" grade. The issue of safety concern was recurrent in the 3 studies, without any precision if it was related to traffic or civil safety.

A closer look at the physical environment in Lebanon reveals a clear scarcity in the proper transportation infrastructure⁵² and marked alterations in its green spaces through chaotic urbanization post-civil war.^{53,54} Furthermore, at a governmental level, there is minimal support for engaging the community in PA.²⁰ Recently, there has been very few punctual initiatives from nongovernmental organizations and the private sector to create programs for promoting PA within the community without specifically targeting children and youth only. To name a few, "Bike To Work 2018,"⁵⁵ "Cycling 2030,"⁵⁵ "Achrafieh 2020 car-free walking day"⁵⁶ are various activities to involve people to "move" and to use less cars.

Government

This indicator was assigned a grade "C+" due to the increasing efforts of both governmental and nongovernmental bodies to

prioritize and enhance PA policies in schools for the prevention of childhood obesity.²⁰ These policies target an integrated school curriculum that offers PA education supported by facilities; space; and equipment to increase playing, recreation, and sports time (during recess, in class, PE classes, breaks). It has been established that health behaviors adopted during childhood and adolescence track into adulthood.⁵⁷ Increased obesity rates among children indicate the urgent need for the development of policies that support and promote PA.^{58,59} In Lebanon, governmental interventions are becoming more targeted on advocacy efforts and knowledge translation into policies. Governmental policies are promising strategies to promote enjoyable lifelong PA through the establishment of physical, social, economic, and educational environments. For instance, the implementation of a school-based health curriculum and development of street layouts or zoning regulations are found to encourage PA.^{60,61} Dunton et al⁶² suggest that the adoption of multiple policy strategies that offer opportunities for PA is important to ensure a sustained behavior change.

Strengths and Limitations

The first Lebanon physical activity report card for children and youth has several strengths. First, a comprehensive search strategy was implemented to identify all publications to date that discussed any of the 11 indicators. This work fills a gap in the literature that needed to occur to support future research. Second, the LRWG was composed of researchers from different institutions representing different fields of expertise with a broad reach. The composition of the LRWG ensured that we were able to identify all possible sources of information and that we had close contacts with relevant stakeholders. Nevertheless, limitations must be acknowledged. The report card relied mainly on 3 sources of information of which only 2^{10,13} were representative of the complete target population (ie, 5–17 y), whereas the third one¹⁴ was representative only of 13–17 years old. The former were limited by the fact that they only included measurements that were applicable to weight status or overall PA indicators but no other indicators could be addressed with the current publications. The latter was the primary source of data for the grading of 3 indicators (active transportation, school, and sedentary behaviors). Therefore, the grades for these indicators may not be generalizable to children younger than 13 years. In addition, as the data sets for the “Lebanon GSHS 2016” were not published online, we relied on custom analyses that the regional office for the World Health Organization was able to provide. These did not always exactly match the benchmark definitions of the report card (eg, for the school indicator, it was not possible to compute the proportion of youth participating in at least 2 sessions of PE per week). Moreover, there was no way to ensure that data used for grading the organized sports and PA indicator were nationally representative.

Conclusions

The first Lebanon physical activity report card for children and youth found that Lebanon scores low on the majority of indicators for PA. Furthermore, data were not available to address several indicators and even available data were not the most optimal to answer how well Lebanon was doing on certain indicators. Future research should aim to implement nationally representative studies that assess how well Lebanon is doing on all PA indicators. Concomitantly, Lebanese stakeholders should join efforts in implementing policies and programs that encourage and facilitate

more participation in PA. Finally, to monitor changes in PA of children and youth, it will be necessary to regularly repeat the synthesis of best available data in the form of a report card.

Acknowledgments

The authors would like to thank Mr. François Gallant and Ms. Cécile Borgi who helped with the literature review. P.A.N. holds a postdoctoral fellowship from New Brunswick Health Research Foundation and Canadian Institute of Health Research—Strategy for Patient-Oriented Research—Maritime SPOR Support Unit.

References

1. The GBD Obesity Collaborators. Health effects of overweight and obesity in 195 countries over 25 years. *N Engl J Med*. 2017; 377(1):13–27. doi:10.1056/NEJMoa1614362
2. Sallis JF, Bull F, Guthold R, et al. Progress in physical activity over the Olympic quadrennium. *Lancet*. 2016;388(10051):1325–1336. PubMed ID: 27475270 doi:10.1016/S0140-6736(16)30581-5
3. Tremblay MS. 2014 Global Summit on the Physical Activity of Children. *J Phys Act Health*. 2014;11(suppl 1):S1–S2. doi:10.1123/jpah.2014-0182
4. Tremblay MS, Gray CE, Akinroye K, et al. Physical activity of children: a global matrix of grades comparing 15 countries. *J Phys Act Health*. 2014;11(s1):S113–S125. doi:10.1123/jpah.2014-0177
5. Tremblay MS, Barnes JD, González SA, et al. 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–S366. doi:10.1123/jpah.2016-0594
6. Maksoud CF, Khalaf SG, Barnett RD, Ochsenwald WL, Richard Bugh G, Kingston P. Lebanon people, language, religion, & history. *Britannica.com*. <https://www.britannica.com/place/Lebanon>. Accessed July 26, 2018.
7. United Nations Development Programme. *Human Development Report 2016. Human Development for Everyone*. New York, NY; 2016. http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf
8. United Nations Department of Economic and Social Affairs Population Division. World population prospects: the 2018 revision, online edition. 2018. <https://esa.un.org/unpd/wpp/Download/Standard/Population/>. Accessed July 26, 2018.
9. Sibai AM, Hwalla N, Adra N, Rahal B. Prevalence and covariates of obesity in Lebanon: findings from the first epidemiological study. *Obes Res*. 2003;11(11):1353–1361. PubMed ID: 14627756 doi:10.1038/oby.2003.183
10. Nasreddine L, Naja F, Akl C, et al. Dietary, lifestyle and socio-economic correlates of overweight, obesity and central adiposity in Lebanese children and adolescents. *Nutrients*. 2014;6(3):1038–1062. PubMed ID: 24618510 doi:10.3390/nu6031038
11. Aubert S, Barnes JD, Abdeta C, et al. Global Matrix 3.0 physical activity report card grades for children and youth: results and analysis from 49 countries. *J Phys Act Health*. 2018;15(s2):S251–S273. doi:10.1123/jpah.2018-0472
12. Tomkinson GR, Carver KD, Atkinson F, et al. European normative values for physical fitness in children and adolescents aged 9–17 years: results from 2 779 165 Eurofit performances representing 30 countries. *Br J Sports Med*. 2018;52(22):1445–14563. doi:10.1136/bjsports-2017-098253
13. Jomaa L, Hwalla N, Constant F, Naja F, Nasreddine L. Water and beverage consumption among children aged 4–13 years in Lebanon:

- findings from a national cross-sectional study. *Nutrients*. 2016;8(9):554. doi:10.3390/nu8090554
14. World Health Organization Lebanon. Global School-based Student Health Survey Lebanon 2017 fact sheet. 2017. http://www.who.int/ncds/surveillance/gshs/Lebanon_2017_GSHS_FS.pdf?ua=1. Accessed April 27, 2018.
 15. Center for Educational Research and Development, Ministry of Education and Higher Education. *National Education 2016–2017 Ø§Ù,, ØªØÙ,, ÛŠÙ... Ø§Ù,, ØªØ§Ù... Beirut, Lebanon: CERD; 2017.*
 16. Ministry of Youth and Sports. *School-Based Report on Educational Activities 2017–2018 Ø§Ù,, Û... ØªØ±Ø³ÙŠØ© Ø§Ù,, ØªØ±ØÙŠØ© Ø§Ù,, Ø£Ù†ØªØ© ÛfØªÙŠØ. Beirut, Lebanon: Ministry of Youth and Sports; 2018.*
 17. Salameh P, Barbour B, Abboud R. Obesity prevalence and associated behaviour in Lebanese children: a pilot study on 1268 students. *J d'Epidémiologie*. 2009;3:23–31. https://www.researchgate.net/profile/Pascale_Salameh/publication/256148459_OBESITY_PREVALENCE_AND_ASSOCIATED_BERA_VIOUR_IN_LEBANESE_CHILDREN_A_PILOT_STUDY_ON_1268_STUDENTS/links/0deec521e19060c66b000000.pdf. Accessed December 19, 2017.
 18. Usta J, Farver JAM. Is there violence in the neighbourhood? Ask the children. *J Public Health*. 2005;27(1):3–11. doi:10.1093/pubmed/fdh204
 19. Habib-Mourad C, Ghandour LA, Moore HJ, et al. Promoting healthy eating and physical activity among school children: findings from Health-E-PALS, the first pilot intervention from Lebanon. *BMC Public Health*. 2014;14(1):940. doi:10.1186/1471-2458-14-940
 20. American University of Beirut. Knowledge to Policy (K2P) Centre for Health. <https://website.aub.edu.lb/k2p/Pages/index.aspx>. Accessed April 27, 2018.
 21. Corder K, Van Sluijs EM, Wright A, Whincup P, Wareham NJ, Ekelund U. Is it possible to assess free-living physical activity and energy expenditure in young people by self-report? *Am J Clin Nutr*. 2009;89:862–870. PubMed ID: 19144732 doi:10.3945/ajcn.2008.26739
 22. Al-Kuwari MG, Ibrahim IA, Hammadi EM, Reilly JJ. Results from Qatar's 2016 Active Healthy Kids report card on physical activity for children and youth. *J Phys Act Health*. 2016;13(11 suppl 2):S246–S250. doi:10.1123/jpah.2016-0397
 23. Zaabi A, Shah SM, Sheek-Hussein M, Abdulle A, Junaibi AA, Loney T. Results from the United Arab Emirates' 2016 report card on physical activity for children and youth. *J Phys Act Health*. 2016;13(suppl 2):S299–S306. doi:10.1123/jpah.2016-0312
 24. Ekelund U, Tomkinson G, Armstrong N. What proportion of youth are physically active? Measurement issues, levels and recent time trends. *Br J Sports Med*. 2011;45(11):859–865. PubMed ID: 21836170 doi:10.1136/bjsports-2011-090190
 25. Janssen I, Leblanc AG. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *Int J Behav Nutr Phys Act*. 2010;7:40. PubMed ID: 20459784 doi:10.1186/1479-5868-7-40
 26. Palomäki S, Hirvensalo M, Smith K, et al. Does organized sport participation during youth predict healthy habits in adulthood? A 28-year longitudinal study. *Scand J Med Sci Sports*. 2018;28(8):1908–1915. doi:10.1111/sms.13205
 27. Onyvera VO, Muthuri SK, Hayker S, et al. Results from Kenya's 2016 report card on physical activity for children and youth. *J Phys Act Health*. 2016;13(11 suppl 2):S195–S200. doi:10.1123/jpah.2016-0359
 28. Burghard M, Knitel K, van Oost I, Tremblay MS, Takken T. Is our youth cycling to health? Results from the Netherlands' 2016 report card on physical activity for children and youth. *J Phys Act Health*. 2016;13(11 suppl 2):S218–S224. doi:10.1123/jpah.2016-0299
 29. Larouche R, John Saunders T, Edward John Faulkner G, Colley R, Tremblay M. Associations between active school transport and physical activity, body composition, and cardiovascular fitness: a systematic review of 68 studies. *J Phys Act Health*. 2014;11:206–227. doi:10.1123/jpah.2011-0345
 30. Abdul Hamid H, Sayed H, Krayem D, Ghaleb J. LEBANON Education Public Expenditure Review. 2017. <https://openknowledge.worldbank.org/bitstream/handle/10986/30065/127517-REVISED-Public-Expenditure-Review-Lebanon-2017-publish.pdf?sequence=1>. Accessed August 16, 2018.
 31. Ainsworth B, Rivière F, Florez-Pregonero A. Measurement of sedentary behaviour in population studies. In: Leitzmann MF, Jochem C, Schmid D, eds. *Sedentary Behaviour Epidemiology*. Cham, Switzerland: Springer International Publishing; 2018:31–56. doi:10.1007/978-3-319-61552-3_2
 32. Samaha M, Hawi NS. Associations between screen media parenting practices and children's screen time in Lebanon. *Telemat Inform*. 2017;34(1):351–358. doi:10.1016/j.tele.2016.06.002
 33. Day K. Physical environment correlates of physical activity in developing countries: a review. *J Phys Act Health*. 2018;15(4):303–314. doi:10.1123/jpah.2017-0184
 34. Hwalla N, Sibai AM, Adra N. Adolescent obesity and physical activity. *World Rev Nutr Diet*. 2005;94:42–50. <http://www.karger.com/Article/Abstract/88205>. Accessed December 12, 2017.
 35. Bhadoria A, Sahoo K, Sahoo B, Choudhury A, Sufi N, Kumar R. Childhood obesity: causes and consequences. *J Family Med Prim Care*. 2015;4(2):187. doi:10.4103/2249-4863.154628
 36. Salvy SJ, Bowker JW, Roemmich JN, et al. Peer influence on children's physical activity: an experience sampling study. *J Pediatr Psychol*. 2008;33(1):39–49. PubMed ID: 17525088 doi:10.1093/jpepsy/jsm039
 37. Duncan SC. Personal, family, and peer correlates of general and sport physical activity among African American, Latino, and white girls. *J Health Dispar Res Pract*. 2015;8(2):12–28.
 38. Cheng LA, Mendoca G, Farias Junior JC. Physical activity in adolescents: analysis of the social influence of parents and friends. *J Pediatr*. 2014;90(1):35–41. doi:10.1016/j.jpeds.2013.05.006
 39. Morrissey JL, Janz KF, Letuchy EM, Francis SL, Levy SM. The effect of family and friend support on physical activity through adolescence: a longitudinal study. *Int J Behav Nutr Phys Act*. 2015;12:103. doi:10.1186/s12966-015-0265-6
 40. Sallis JF, Conway TL, Prochaska JJ, McKenzie TL, Marshall SJ, Brown M. The association of school environments with youth physical activity. *Am J Public Health*. 2001;91(4):618–620. PubMed ID: 11291375 doi:10.2105/AJPH.91.4.618
 41. Sallis JF, McKenzie TL, Beets MW, Beighle A. Physical education's role in public health: steps forward and backward over 20 years and HOPE for the future. *Res Q Exerc Sport*. 2012;83(2):125–135. PubMed ID: 22808697 doi:10.1080/02701367.2012.10599842org
 42. United Nations Educational Scientific and Cultural Organization. Assessment of the level of inclusiveness of public policies in Lebanon. 2013. http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Beirut/images/SHS/Assessment_of_level_of_Inclusiveness_of_Public_Policies_in_Lebanon.pdf. Accessed April 25, 2018.
 43. Habib-Mourad C. An intervention to promote healthy eating and physical activity in Lebanese school children: Health-E-PALS a pilot cluster randomised controlled trial. 2013. <http://theses.dur.ac.uk>. Accessed August 15, 2018.
 44. Payne VG, Morrow JRJ. School physical education as a viable change agent to increase youth physical activity. *Pres Counc Phys Fit Sports Res Dig*. 2009;10(2):1–8. <https://static1.squarespace.com/static/>

- 572a208737013b7a93cf167e/t/5774018debbd1acaad48cd55/1467220367381/Digest+2009_School+Physical+Education+as+a+Viable+Change+Agent+to+Increase+Youth+Physical+Activity_Series+10+Number+2+%28June%29.pdf. Accessed August 15, 2018.
45. Ding D, Sallis JF, Kerr J, Lee S, Rosenberg DE. Neighborhood environment and physical activity among youth: a review. *Am J Prev Med.* 2011;41(4):442–455. PubMed ID: 21961474 doi:10.1016/j.amepre.2011.06.036
 46. Davison K, Lawson CT. Do attributes in the physical environment influence children's physical activity? A review of the literature. *Int J Behav Nutr Phys Act.* 2006;3(1):19. doi:10.1186/1479-5868-3-19
 47. Task Force on Community Preventative Services. Recommendations to increasing physical activity in communities. *Am J Prev Med.* 2002;22(4):67–72. www.thecommunityguide.org. Accessed July 30, 2018.
 48. Norman GJ, Nutter SK, Ryan S, Sallis JF, Calfas KJ, Patrick K. Community design and access to recreational facilities as correlates of adolescent physical activity and body-mass index. *J Phys Act Health.* 2006;3(s1):S118–S128. doi:10.1123/jpah.3.s1.s118
 49. Loukaitou-Sideris A, Sideris A. What brings children to the park? Analysis and measurement of the variables affecting children's use of parks. *J Am Plan Assoc.* 2010;76(1):89–107. doi:10.1080/01944360903418338
 50. Eyre ELJ, Duncan MJ, Birch SL, Cox VM. Low socio-economic environmental determinants of children's physical activity in Coventry, UK: a qualitative study in parents. *Prev Med Rep.* 2014;1:32–42. PubMed ID: 26844037 doi:10.1016/j.pmedr.2014.09.002
 51. Dannenberg AL, Jackson RJ, Frumkin H, et al. The impact of community design and land-use choices on public health: a scientific research agenda. *Am J Public Health.* 2003;93(9):1500–1508. <https://ajph.aphapublications.org/doi/pdfplus/10.2105/AJPH.93.9.1500>. Accessed August 15, 2018.
 52. Choueiri EM, Choueiri GM, Choueiri BM. Analysis of accident patterns in Lebanon. 4th International Symposium on Highway Geometric Design; June 2–5, 2010; <http://www.databank.com.lb/docs/AnalysisofAccidentPatternsinLebanon2010.pdf>. Accessed August 16, 2018.
 53. Bou Dagher-Kharrat M, El Zein H, Rouhan G. Setting conservation priorities for Lebanese flora—identification of important plant areas. *J Nat Conserv.* 2018;43:85–94. doi:10.1016/j.jnc.2017.11.004
 54. Jomaa I, Auda Y, Abi Saleh B, Hamzé M, Safi S. Landscape spatial dynamics over 38 years under natural and anthropogenic pressures in Mount Lebanon. *Landsc Urban Plan.* 2008;87(1):67–75. doi:10.1016/j.landurbplan.2008.04.007
 55. thechaineffect. The Chain Effect, About [online]. <https://www.thechaineffect.me/>. Accessed April 27, 2018.
 56. achrafieh2020. Achrafieh 2020, About [online]. 2012; <https://www.achrafieh2020.org/about>. Accessed August 16, 2018.
 57. Craigie AM, Lake AA, Kelly SA, Adamson AJ, Mathers JC. Tracking of obesity-related behaviours from childhood to adulthood: a systematic review. *Maturitas.* 2011;70:266–284. PubMed ID: 21920682 doi:10.1016/j.maturitas.2011.08.005
 58. Story M, Nannery MS, Schwartz MB. Schools and obesity prevention: creating school environments and policies to promote healthy eating and physical activity. *Milbank Q.* 2009;87(1):71–100. PubMed ID: 19298416 doi:10.1111/j.1468-0009.2009.00548.x
 59. Alsharairi N. Current government actions and potential policy options for reducing obesity in Queensland schools. *Children.* 2018;5(2):18. doi:10.3390/children5020018
 60. Sallis JF, Cervero RB, Ascher W, Henderson KA, Kraft MK, Kerr J. An ecological approach to creating active living communities. *Annu Rev Public Health.* 2006;27(1):297–322. doi:10.1146/annurev.publhealth.27.021405.102100
 61. Hayne CL, Moran PA, Ford MM. Regulating environments to reduce obesity. *J Public Health Policy.* 2004;25(3-4):391–407. PubMed ID: 15683074 doi:10.1057/palgrave.jphp.3190038
 62. Dunton GF, Cousineau M, Reynolds KD. The intersection of public policy and health behavior theory in the physical activity arena. *J Phys Act Health.* 2010;7(suppl 1):S91–S98. <https://pdfs.semanticscholar.org/054e/943652cbae630b29743445224cf82eb22004.pdf>. Accessed August 28, 2018.

Appendix: Reviewed Studies but Excluded From Grading Indicators of the Report Card

Author	Title	Year	Sample
1. Sibai et al	Ethnic difference in weight loss behavior among secondary school students in Beirut: the role of weight perception	2003	n = 823 youth in grades 10, 11, and 12; 75% were recruited from private schools and 25% from public schools
2. Sibai et al	Prevalence and covariates of obesity in Lebanon: findings from the first epidemiological study	2003	n = 888, nationally representative (age 3–19 y)
3. Usta et al	Is there violence in the neighbourhood? Ask the children	2005	n = 405 children who lived in Beirut (age 8–12 y)
4. Jabre et al	Overweight children in Beirut: prevalence estimates and characteristics	2005	n = 234 children aged 6–8 y
5. Dib et al	Impact of anthropometric, lifestyle, and body composition variables on ultrasound measurements in school children	2005	n = 256, mean age 13.8 y (range 11–18 y)
6. Hwalla et al	Adolescent obesity and physical activity	2005	n = 792, nationally representative (age 6–19 y)
7. Chakar et al	Adolescent obesity in Lebanese private schools	2006	n = 12,299 from 23 private schools (age 10–18 y)
8. Jackson et al	Comparison of BMI-for-age in adolescent girls in 3 countries of the Eastern Mediterranean Region	2007	n = 336 adolescent girls
9. Chakar et al	Growth charts and obesity prevalence among Lebanese private schools adolescents	2007	n = 12,299 from 23 private schools (age 10–18 y)
10. Sabbah et al	Morbidity and associated factors in rural and urban populations of south Lebanon: a cross-sectional community-based study of self-reported health in 2000	2007	n = 524 South Lebanon residents aged ≥14 y
11. Salameh et al	Obesity prevalence and associated behavior in Lebanese children: a pilot study on 1268 students	2009	A convenient sample of 15 schools was chosen from the greater Beirut region (5 private, 5 semiprivate, and 5 public). n = 1268 (age 7–13 y)
12. Fazah et al	Activity, inactivity and quality of life among Lebanese adolescents	2010	n = 1000 Lebanese adolescents aged 14–18 y from 9 schools (3 public and 6 private)
13. Fazah et al	Body mass index and body fat in Lebanese female adolescents	2010	n = 51 adolescents girls aged 12–18 y
14. Kanaan et al	Gender difference in determinants of weight control behaviours among adolescents in Beirut	2010	n = 1294 adolescents aged 13–19 y, from 3 impoverished urban communities
15. Nasreddine et al	Metabolic syndrome and insulin resistance in obese prepubertal children in Lebanon: a primary health concern	2010	n = 87 obese, n = 25 overweight, and n = 28 normal weight were recruited from private and public schools
16. Salameh et al	Obesity associated behavior in adolescents of private schools in Lebanon	2011	n = 1933 adolescents aged 12–18 y from private schools
17. Chakar et al	Public schools adolescents' obesity and growth curves in Lebanon	2011	n = 2547 adolescents aged 11–18 y from 20 public schools
18. Liu et al	Ethnic differences in body fat distribution among Asian pre-pubertal children: a cross-sectional multicenter study	2011	n = 154 children aged 8–10 y were recruited from 5 to 8 schools
19. Salameh et al	Obesity-associated distress in Lebanese adolescents: an exploratory look at a large cohort of students	2011	n = 1933 adolescents aged 12–18 y from private schools
20. Salameh et al	Pattern of obesity and associated diabetes in Lebanese adolescents: a pilot study	2011	n = 300 adolescent aged 11–18 y from private schools in urban settings of Mount Lebanon
21. Liu et al	Ethnic differences in the relationship between body mass index and percentage body fat among Asian children from different backgrounds	2011	n = 155 children living in Beirut aged 8–10 y
22. Nasreddine et al	Trends in overweight and obesity in Lebanon: evidence from two national cross-sectional surveys (1997–2009)	2011	n = 888, nationally representative (age 3–19 y) n = 939 children and youth aged 6–19 y
23. Nasreddine et al	Obesity is associated with insulin resistance and components of the metabolic syndrome in Lebanese adolescents	2012	n = 263 (104 obese, 78 overweight, and 81 normal weight), mean age 16 y
24. Nasreddine et al	Validity of predictive equations developed to estimate body fat from anthropometry and bioelectrical impedance analysis in 8–10 y old children	2012	n = 158 children living in Beirut aged 8–10 y

(continued)

Author	Title	Year	Sample
25. Khayrazad et al	An exploratory study of the critical need for school health programs in Lebanon	2013	n = 50 school principals from 50 schools
26. Habib-Mourad et al	Health-E-Pals: promoting healthy eating and physical activity in Lebanese school children-intervention development	2014	n = 8 schools from 2 different communities in Beirut, n = 374 participants aged 9–11 y
27. El Hage et al	Air conditioning and body mass index in a group of Lebanese adolescents	2014	n = 1050 adolescents aged 13–18 y recruited from 6 public and private schools in Beirut
28. Habib-Mourad et al	Promoting healthy eating and physical activity among school children: findings from Health-E-PALS, the first pilot intervention from Lebanon	2014	n = 8 schools from 2 different communities in Beirut, n = 374 participants aged 9–11 y
29. Hawi et al	Impact of e-Discipline on children's screen time	2015	n = 3141 children aged 7–11 y, recruited from 15 private schools
30. Habib-Mourad et al	Time to act: lessons learned from the first pilot school-based intervention study from Lebanon to prevent and reduce childhood obesity	2015	n = 8 schools from 2 different communities in Beirut, n = 374 participants aged 9–11 y
31. Naja et al	A western dietary pattern is associated with overweight and obesity in a national sample of Lebanese adolescents (13–19 y): a cross-sectional study	2015	n = 446 adolescents aged 13–19 y, nationally representative data (already in use)
32. Mallah et al	Urinary magnesium, calcium, and phosphorus to creatinine ratios of healthy elementary school Lebanese children	2015	n = 1403 children aged 6–10 y selected from 26 schools
33. Abdo et al	Health behaviors among school-aged children: a cross sectional study in Lebanese private schools	2016	n = 1982 adolescents aged 11–20 y from 9 private schools in Beirut and Mount Lebanon
34. Assaad et al	Adolescents' self-perceived and actual weight: which plays a dominant role in weight loss behaviour in Lebanon	2017	n = 278 adolescents aged 13–17 y, nationally representative data (already in use)
35. Samaha et al	Associations between screen media parenting practices and children's time in Lebanon	2017	n = 4770 parents of children aged 6–11 y from private schools
36. El Kassas et al	Exploration of the risk factors of generalized and central obesity among adolescents in north Lebanon	2017	n = 311 children aged 11–16 y, sample from public and private schools in Tripoli
37. Nasreddine et al	Prevalence and correlates of preschool overweight and obesity amidst the nutrition transition: findings from a national cross-sectional study	2017	n = 525 preschoolers aged 2–5 y, sample not the target population of the report card
38. Santina et al	Psychosocial determinants of physical activity at school among Lebanese children: an application of the planned behavior theory	2017	n = 276 children, mean age 11 y, from 2 secondary schools in Sidon, Lebanon
39. El Kassas et al	The dual burden of malnutrition and associated dietary and lifestyle habits among Lebanese school age children living in orphanages in north Lebanon	2017	n = 153 institutionalized children
40. Mouhanna et al	Student support for reproductive health education in middle schools: findings from Lebanon	2017	Global School-Based Student Health Survey (2011). n = 2286 students from 44 schools in grades 7, 8, and 9
41. Youssef et al	Overweight and obesity related factors among Lebanese adolescents: an explanation for gender and socioeconomic differences	2017	n = 1000 Lebanese adolescents aged 14–18 y from 9 schools (3 public and 6 private)