

1 **National physical activity and sedentary behaviour policies in 76 countries:**
2 **availability, comprehensiveness, implementation, and effectiveness**

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43 **Abstract**

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45 **Background:** Evidence on current, national physical activity (PA) and sedentary behaviour
46 (SB) policies is limited. We, therefore, analysed availability, comprehensiveness,
47 implementation, and effectiveness of PA and SB policies internationally.

48 **Methods:** In this cross-sectional study, Global Observatory for Physical Activity (GoPA!)
49 Country Contacts from 173 countries were asked to provide data on their national PA and
50 SB policies by completing GoPA! Policy Inventory. Data were collected for 76 countries
51 (response rate = 44%).

52 **Results:** Formal written policies for PA and SB were found in 92% (95% confidence
53 interval [CI]: 86, 98) and 62% (95% CI: 50, 75) of countries, respectively. Sixty-two percent
54 (95% CI: 51, 73) of countries have national PA guidelines, while 40% (95% CI: 29, 52)
55 have SB guidelines. Fifty-two (95% CI: 40, 64) and 11% (95% CI: 3, 19) of countries have
56 quantifiable national targets for PA and SB, respectively. The most represented
57 ministries/departments involved in the promotion of more PA and/or less SB were in the
58 sport (reported by 99% countries; 95% CI: 96, 100), health (97%; 95% CI: 94, 100),
59 education (94%; 95% CI: 88, 100), and recreation and leisure (85%; 95% CI: 71, 99)
60 sectors. The median score (0-10) for the comprehensiveness of PA and SB policies was 4
61 (95% CI: 4, 5) and 2 (95% CI: 2, 3), respectively. For PA and SB policy implementation it
62 was 6 (95% CI: 5, 6). For the effectiveness of PA and SB policies it was 4 (95% CI: 3, 5)
63 and 3 (95% CI: 2, 4), respectively. PA and SB policies were generally best developed in
64 high-income countries and countries of European and Western-Pacific regions.

65 **Conclusions:** Most of the included countries have PA policies, but their
66 comprehensiveness, implementation, and effectiveness are generally low-to-moderate. SB
67 policies are less available, comprehensive, implemented, and effective than PA policies.
68 PA and SB policies are better developed in high-income countries, compared with low- and
69 lower-middle-income countries, and in countries of European and Western-Pacific regions,
70 compared with other world regions. More investment is needed in development and
71 implementation of comprehensive and effective PA and SB policies, particularly in low- and
72 lower-middle-income countries.

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76 **Key words:** physical activity, sedentary behaviour, global, assessment, audit, policies

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Background

Insufficient physical activity (PA) and high sedentary behaviour (i.e. activities in sitting or reclining posture requiring low energy expenditure; SB) are jointly responsible for around 13% of deaths globally [1, 2]. Alongside smoking, unhealthy diet, and excessive alcohol consumption, insufficient PA and SB are key behavioural risk factors for the development of noncommunicable diseases [3, 4]. Insufficient PA is associated with a significant economic burden [5]. Its overall direct cost to worldwide healthcare systems is estimated to be around 53.8 billion international dollars [5]. Evidence on the considerable public health and economic benefits that could be achieved by increasing PA in the population has incentivised governments around the world to develop PA policies [6].

Research around PA policy is developing, and some data on PA policy are available for 168 countries [6]. SB policy research is a relatively new area [6], and for most countries evidence is lacking for the development of SB policies [6]. Research on national-level PA and SB policies may contribute to: (i) evidence-based development of new PA and SB policies; (ii) better implementation and evaluation of existing PA and SB policies; (iii) achieving sustainable reforms within the health, education, sport, and other sectors, particularly in regard to the promotion of more PA and less SB; (iv) raising awareness among policy makers and other public health stakeholders about existing challenges, gaps, and prospects in national-level PA promotion; (v) important debates between researchers and policymakers on existing and future PA and SB policies [7-16].

For the past several decades, national and subnational governments, international organisations such as the World Health Organization (WHO), public health researchers, and non-governmental organisations have worked on various initiatives to make the promotion of more PA and less SB a public health priority. In 2018, the WHO launched the *Global Action Plan on Physical Activity 2018–2030* urging countries around the world to implement policy actions that will support efforts to reduce levels of physical inactivity and SB and contribute to meeting the global target of a 15% relative reduction in the prevalence of insufficient PA by 2030 [17].

112 In 2012, the Global Observatory for Physical Activity (GoPA!) was established to monitor
113 global progress in PA surveillance, research, and policy [18, 19]. The GoPA! is a council
114 of the International Society for Physical Activity and Health [18, 19]. At the time when the
115 GoPA! was established, little data on national PA surveillance, research, and policy were
116 available that would allow for comparisons between different countries and world regions
117 [18, 19]. In 2015, the GoPA! issued PA profiles for 139 countries, the so-called “PA Country
118 Cards” [20]. The data presented in the Country Cards were a valuable starting point
119 towards a better understanding of the global progress on PA policies [6]. The first set of
120 Country Cards included information on research, surveillance and on the availability of
121 national action plans for PA [20]. Including comprehensiveness, implementation, and
122 effectiveness of PA policies as well as SB policy became one of the goals for the Second
123 set of Country Cards to be released by the end of 2020. Furthermore, national policies
124 change over time; hence, information on PA and SB policies needs to be regularly updated
125 [6]. Therefore, the aim of this study was to audit and critically assess the availability,
126 comprehensiveness, implementation, and effectiveness of current national-level PA and
127 SB policies globally.

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129 **Methods**

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131 *Data collection and study sample*

132 The data collection in this cross-sectional study took place from October 2019 to March
133 2020. GoPA! Country Contacts from 173 countries were invited to participate in the study
134 and provide information on national PA and SB policies in their countries. All GoPA!
135 Country Contacts were invited to participate in the survey, regardless of whether their
136 country had or did not have PA and SB policy. The GoPA! Country Contacts are an
137 established group that were identified by the GoPA!: (i) using PubMed search of the PA
138 literature; (ii) from the list of focal points of international networks for PA promotion; and
139 (iii) from the list of focal points of the WHO regional offices. To be selected, Country
140 Contacts needed to have established experience in the area of public health and PA as
141 researchers, members of international networks for PA promotion or members of
142 government institutions. More details about the selection of GoPA! Country Contacts can
143 be found elsewhere [18, 20]. The *GoPA! Policy Inventory version 3.0* (Additional file 1),
144 was distributed to the GoPA! Country Contacts as an online survey. Responses were
145 obtained for a total of 76 countries (response rate = 44%), of which 51% were high-income,

146 28% upper-middle-income and 21% low and lower-middle-income. The study sample
147 included countries from all six WHO regions. The most represented region was the
148 European Region (38%), followed by the Region of Americas (22%), the African Region
149 (12%), the Western Pacific Region (11%), the Eastern Mediterranean Region (11%), and
150 the South-East Asia Region (5%). In 12 of the participating countries, we obtained separate
151 responses from two Country Contacts. When their responses differed, we relied on the
152 responses from the main Country Contact listed in the GoPA! Country Cards. Participation
153 in the study was voluntary and all participants provided informed consent before
154 responding to the survey questions. The study protocol was approved by the Victoria
155 University Human Research Ethics Committee (ref: HRE19-057).

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157 *Policy variables*

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159 In the *GoPA! Policy Inventory version 3.0*, we used a broad definition of PA policy, as
160 recommended in the Comprehensive Analysis of Policy on Physical Activity (CAPPA)
161 framework [21]. PA policy was “indicated by the totality of formal written policies, unwritten
162 formal statements, written standards and guidelines, formal procedures, and informal
163 policies (or lack thereof) that may directly or indirectly affect community- or population-level
164 PA” [21]. Given the large overlap between the PA and SB policy fields, it is suggested that
165 the CAPPA framework can also be used for the analysis of SB policies [21]. Therefore, we
166 used the same broad definition from the CAPPA framework for SB policy.

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168 The *GoPA! Policy Inventory version 3.0* contains 20 questions about national PA and SB
169 policies. The questionnaire was developed based on: the Health enhancing physical
170 activity policy audit tool, version 2.0 [22]; the monitoring framework from the European
171 Union Recommendation on Health-Enhancing Physical Activity Across Sectors [23]; the
172 CAPPA framework; and a year long process of engagement of stakeholders [21]. The
173 questions on the *GoPA! Policy Inventory version 3.0* address the following elements of the
174 CAPPA framework: *availability; formal written policies; written guidelines; formal*
175 *procedures; actors; implementation; and effects* [21]. Specifically, the questions focus on:
176 the availability of national formal written PA and SB policies (e.g., policy documents,
177 legislation, strategies, action plans); national PA and SB guidelines; national targets for PA
178 and SB; health surveillance or monitoring systems that include measures of PA and SB;
179 ministries/departments involved in the promotion of more PA and less SB; and

180 comprehensiveness, implementation and effectiveness of national PA and SB policies.
181 When referring to the *availability of PA and SB policy*, we considered not only the
182 availability of formal written PA and SB policies but also the availability of written guidelines,
183 quantifiable targets, and national PA and SB surveillance or monitoring, because these are
184 indicators of a government's commitment or intention to support the promotion of more PA
185 and less SB in the population [21]. The questions on comprehensiveness, implementation,
186 and effectiveness of policies had ordinal response scales (0-10), with a higher value on the
187 scale representing a better score. Detailed definitions of comprehensiveness,
188 implementation and effectiveness of PA and SB policies are provided in Additional file 1.

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190 *Data analysis*

191 The data were analysed using IBM Statistical Package for the Social Sciences (SPSS),
192 version 23 (SPSS Inc., an IBM Company, Chicago, IL, USA). Ordinal data on
193 comprehensiveness, implementation, and effectiveness of policy were presented using
194 medians (and their 95% confidence intervals [CI]) and interquartile ranges. Categorical
195 data were presented as percentages and their 95% confidence intervals. Data were
196 analysed for the whole sample and stratified by WHO regions and country's income level
197 (GNI per capita, calculated using the Atlas method) according to the World Bank [24].
198 Differences in PA and SB policy between low-, middle, and high-income countries and
199 between the WHO regions were analysed using the Kruskal-Wallis test, for ordinal
200 variables, and chi-square test for categorical variables. The percentage of missing data
201 was relatively low (range across variables: 0% – 9.2%, mean: 3.3%). In the analyses, we
202 used pairwise deletion of missing data. We considered $p < 0.05$ as a threshold for statistical
203 significance.

204 *Categorisation of countries*

205 The list of 218 economies from June 2019 provided by the World Bank was used as the
206 list of countries/states/economies [24]. The authors are mindful of the fact that some
207 countries/states/economies on the World Bank's list cannot be termed as "countries"
208 because of unclear legal and/or political status. Nevertheless, for brevity purposes, we
209 used the term "countries" as an abbreviation for "countries/states/economies". In order to
210 be consistent with previous analyses of national PA and SB policies globally, both by
211 GoPA! [20] and other international organisations for PA promotion [25, 26], we separately

212 analysed the four United Kingdom home nations; namely, England, Northern Ireland,
213 Scotland, and Wales. The countries were divided into three groups by income level: high-
214 income; upper-middle-income; and low and lower-middle-income, in accordance with the
215 categorisation provided by the World Bank [24]. The two lowest income groups were
216 merged into one, because of a small number of low-income countries in the sample. The
217 countries were also categorised into the six WHO world regions: African Region; European
218 Region; Eastern Mediterranean Region; Region of the Americas; South-East Asia Region;
219 Western Pacific Region.

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221 **Results**

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224 *Availability of PA and SB policies*

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226 Formal written PA and SB policies

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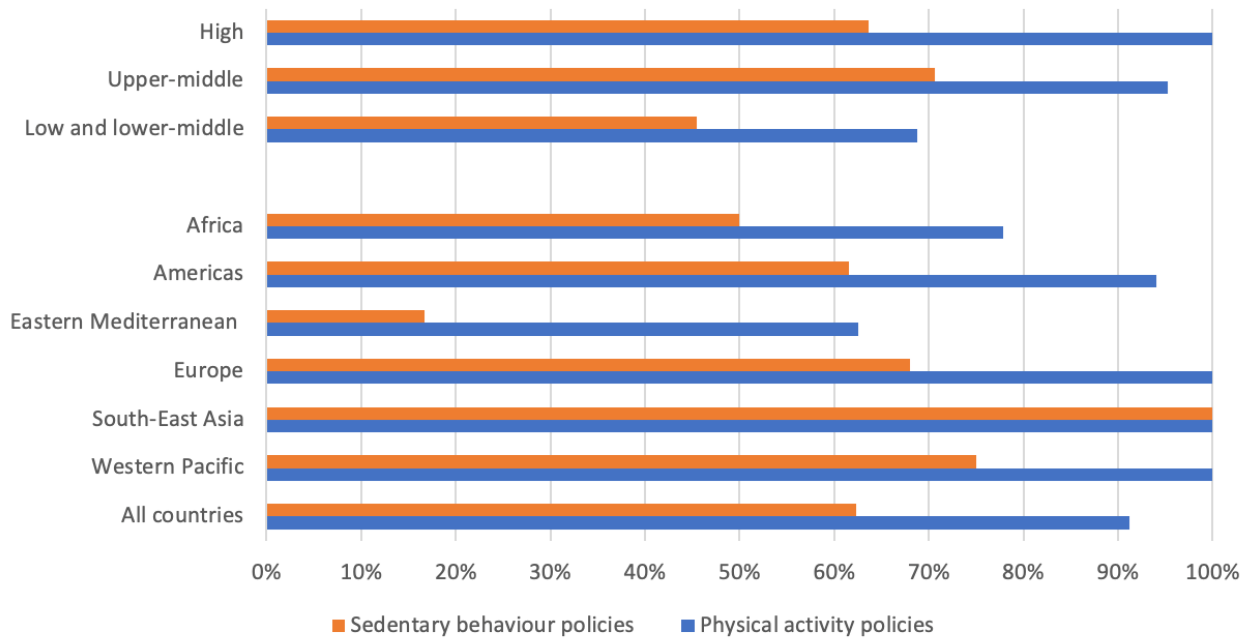
228 We found that 92% (95% CI: 86, 98) of countries have national policy documents,
229 legislation, strategies, or action plans that outline the government's intention to increase
230 PA. National policy documents, legislation, strategies or action plans that outline the
231 government's intention to tackle SB were found in 62% (95% CI: 50, 75) of countries. We
232 found a total of 251 PA and SB policies. Sixty-eight per cent of all policies were published
233 between 2015 and 2020.

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235 The availability of national policies that aim to increase PA and tackle SB across different
236 groups by income level and world regions is summarised in Figure 1. We found significant
237 differences in the availability of national policies to increase population PA between country
238 groups by income level ($p < 0.001$) and between world regions ($p = 0.007$). We did not find
239 a significant difference in the availability of national policies to tackle population SB by
240 income level ($p = 0.396$) or by world region ($p = 0.135$).

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242 **Figure 1. Percentage of countries with PA and SB policies, by income level and**
243 **world region**



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245 PA: physical activity, SB: sedentary behaviour

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248 PA and SB guidelines

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250 We found that 62% (95% CI: 51, 73) of countries have national PA guidelines, while 40%

251 (95% CI: 29, 52) have guidelines for SB. The availability of national PA and SB guidelines

252 across different income levels and world regions is summarised in Figure 2. We found

253 significant differences in the availability of PA guidelines between country groups by

254 income level ($p < 0.001$) and between world regions ($p = 0.002$). We also found a significant

255 difference in the availability of SB guidelines between country groups by income level ($p =$

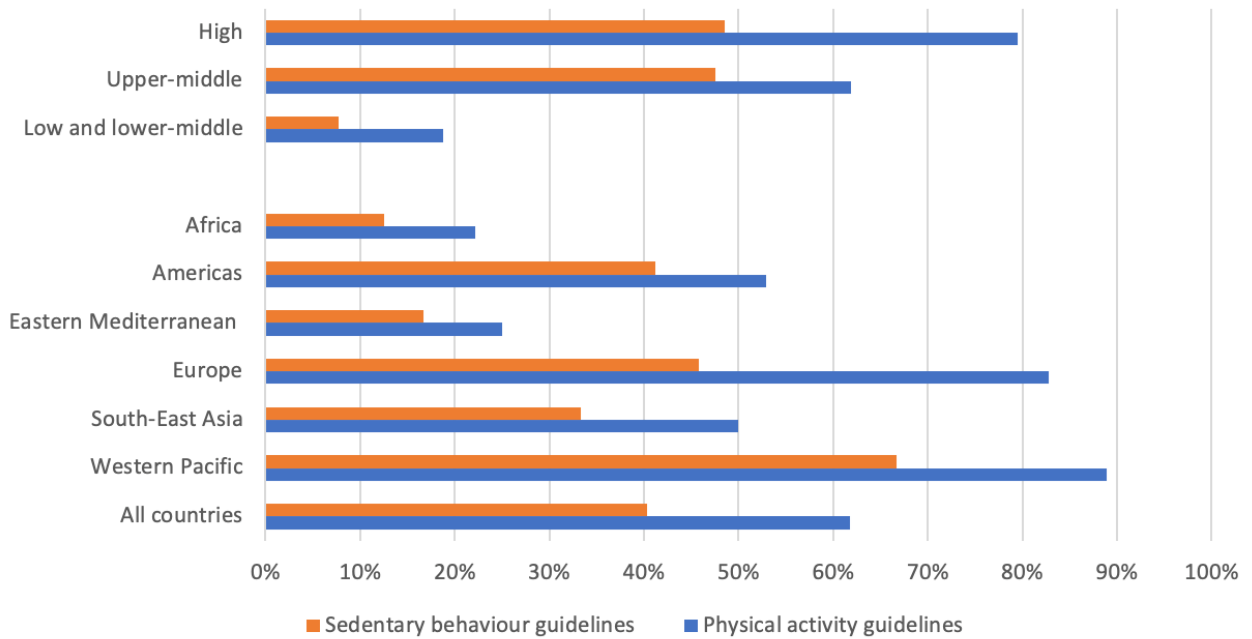
256 0.028). We did not find significant differences in the availability of SB guidelines by world

257 regions ($p = 0.226$).

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259 **Figure 2. Percentage of countries with national PA and SB guidelines, by income**

260 **level and world region**



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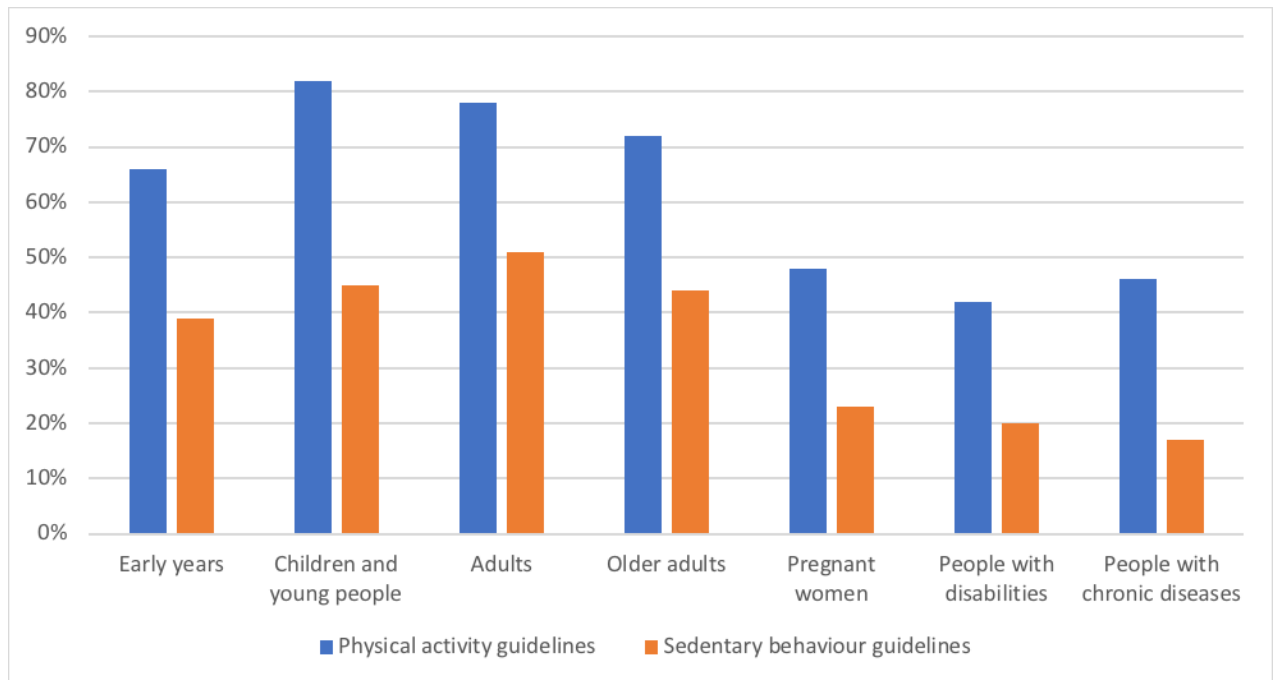
262 PA: physical activity, SB: sedentary behaviour

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264 A large majority of countries have specific PA guidelines for *early years* (66%; 95% CI: 53,
 265 79), *children and young people* (82%; 95% CI: 71, 92), *adults* (78%; 95% CI: 67, 89), and
 266 *older adults* (72%; 95% CI: 60, 84). About half of the countries have specific SB guidelines
 267 for *early years* (39%; 95% CI: 24, 54), *children and young people* (45%; 95% CI: 30, 60),
 268 *adults* (51%; 95% CI: 36, 67), and *older adults* (44%; 95% CI: 29, 59; Figure 3). Specific
 269 national PA and SB guidelines for pregnant women, people with disabilities, and people
 270 with chronic disease were less well represented.

271

272 **Figure 3. Percentage of countries with specific national PA and SB guidelines for**
 273 **different target groups**



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275 PA: physical activity, SB: sedentary behaviour

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278 National targets for PA and SB

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280 The availability of quantifiable national targets for PA and SB across countries with different
 281 income levels and world regions is presented in Additional file 2. Overall, 52% (95% CI:
 282 40, 64) and 11% (95% CI: 3, 19) of countries reported having quantifiable national targets
 283 for PA and SB, respectively. We found significant differences in the availability of
 284 quantifiable national targets for PA between country groups by income level ($p = 0.049$)
 285 and between world regions ($p = 0.027$). We did not find significant difference in the
 286 availability of quantifiable national targets for SB by income level ($p = 0.262$) or by world
 287 region ($p = 0.206$).

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290 National PA and SB surveillance/monitoring

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292 The percentages of countries with national health surveillance or monitoring system that
 293 include measures of PA and SB, by income level and world regions, are presented in
 294 Additional file 3. Overall, 71% (95% CI: 60, 81) of countries have a national health
 295 surveillance or monitoring system that includes measures of PA, and 51% (95% CI: 39,
 296 63) of countries have a national health surveillance or monitoring system with measures of
 297 SB. We did not find significant differences in the availability of national health

298 surveillance/monitoring systems that include measures of PA and SB between countries
299 with different income levels or between world regions.

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301 *Ministries/departments involved in the promotion of more PA and less SB*

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303 The most represented ministries or departments with an active role in the promotion of
304 more PA and/or less SB were in the sectors of: *sport* (reported by 99% of countries; 95%
305 CI: 96, 100); *health* (97%; 95% CI: 94, 100); *education* (94%; 95% CI: 88, 100); *recreation*
306 *and leisure* (85%; 95% CI: 71, 99); and *research* (68% 95% CI: 26, 12). This was followed
307 by the ministries or departments of *transport* (60%; 95% CI: 56, 74), *urban/rural planning*
308 *and design* (60%; 95% CI: 45, 75), *tourism* (46%; 95% CI: 30, 62), *culture* (44%; 95% CI:
309 29, 59), *environment* (43%; 95% CI: 27, 58), *work and employment* (39%; 95% CI: 24, 54),
310 and *public finance* (28%; 95% CI: 13, 42). The percentage of national ministries or
311 departments involved in promotion of more PA and/or less SB are presented in Additional
312 file 4.

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314 *Comprehensiveness of PA and SB policies*

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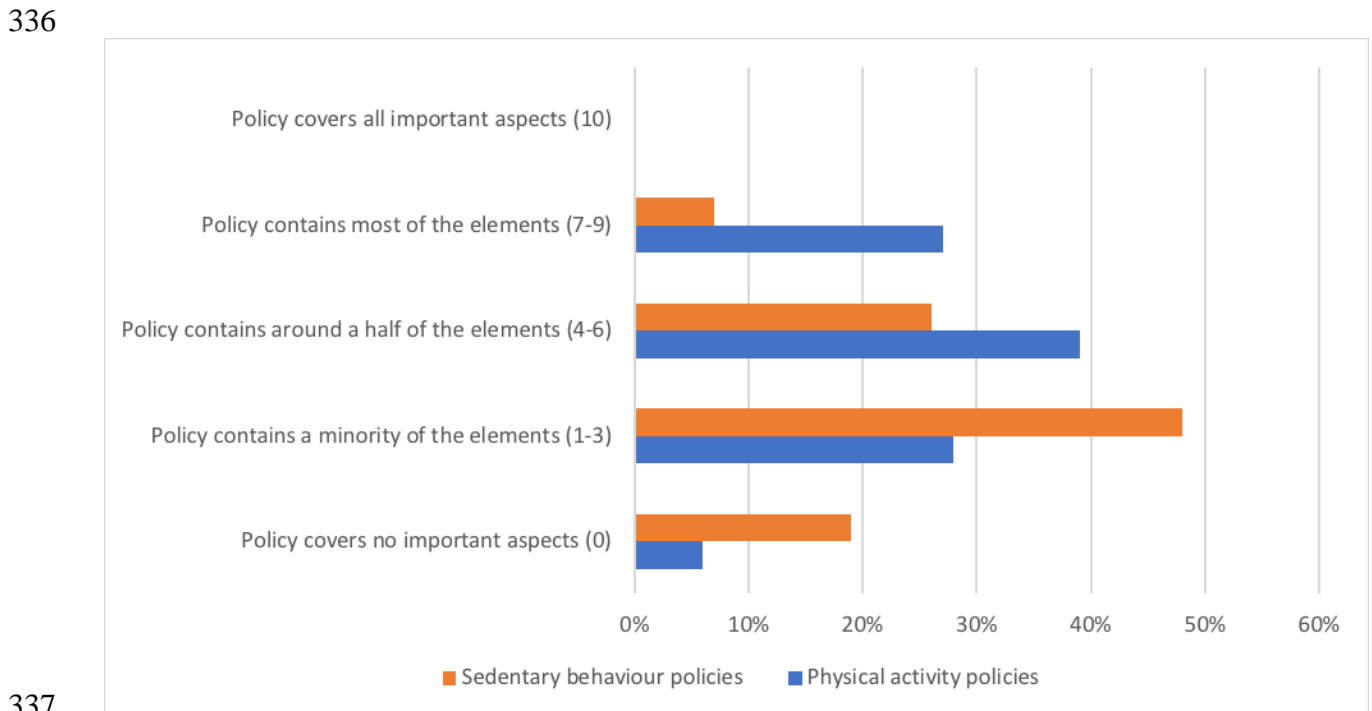
316 The distribution of national PA and SB policies according to their level of
317 comprehensiveness is presented in Figure 4. We found that PA policy in 39% (95% CI: 28,
318 51) of countries includes only around half of the important elements of a comprehensive
319 approach (the list of elements can be found in Additional file 1), while in 27% (95% CI: 17,
320 37) of countries PA policy contains most of the important elements. A low level of
321 comprehensiveness was found for PA policy in 28% (95% CI: 18, 39) of countries, while in
322 6% (95% CI: 0.3, 11) of countries PA policy covers no important elements. No countries
323 reported having PA policy that includes all important elements. The median score for the
324 comprehensiveness of PA policy was 4 (95% CI: 4, 5).

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326 In most of the included countries, SB policy was assessed as having low
327 comprehensiveness (48%; 95% CI: 35, 62) or as covering no important aspects (19%; 95%
328 CI: 8, 29). Twenty-six per cent (95% CI: 14, 38) of countries reported having SB policy that
329 includes only around half of important elements, while in 7% (95% CI: 0.4, 14) of countries
330 SB policy contains most of the important elements. No countries reported having SB policy
331 that includes all important elements. The median score for the comprehensiveness of SB
332 policy was 2 (95% CI: 2, 3).

333

334 **Figure 4. Distribution of national PA and SB policies according to their level of**
 335 **comprehensiveness**



338 PA: physical activity, SB: sedentary behaviour

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 340 The level of comprehensiveness of PA and SB policies across countries with different
 341 income levels and world regions is presented in Table 1. We found significant differences
 342 in the comprehensiveness of PA policy between country groups by income level ($p = 0.030$)
 343 and between world regions ($p = 0.049$). We did not find significant differences in the
 344 comprehensiveness of SB policy by income level ($p = 0.157$) or by world region ($p = 0.412$).
 345 The level of comprehensiveness of PA and SB policies across different income levels and
 346 world regions is presented in Table 1.

347

348 **Table 1. Level of comprehensiveness of national PA and SB policies, by income**
 349 **level and world region**

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Category	Physical activity policy			Sedentary behaviour policy		
	Median (IQR)	95% CI	p	Median (IQR)	95% CI	p
Income						
High	5 (3)	4, 7	0.030	2 (3.5)	1, 3.5	0.157
Upper-middle	4 (3)	3, 5		2.5 (3.25)	2, 4.5	

Low and lower-middle	2 (3.25)	1, 4		2 (2)	1, 3	
Region						
Africa	2.5 (3.75)	1, 5		2 (2)	1, 3	
Americas	4 (3.75)	2, 5		2 (3.5)	1, 4	
Eastern Mediterranean	3 (5)	0, 5		1 (3.5)	0, 3.6	
Europe	5 (3)	4, 7	0.049	3 (3)	1, 4	0.412
South-East Asia	6.5 (4.75)	2.7, 10		6 (4)	n/a	
Western Pacific	6 (5)	1, 8		2.5 (4.25)	0.2, 4.8	
All countries	4 (4)	4, 5	/	2 (3)	2, 3	/

352 PA: physical activity, SB: sedentary behaviour, IQR: interquartile range, CI: confidence interval for median,
353 *p*: *p*-value for the difference between groups from Kruskal-Wallis test, n/a: number of countries too small to
354 calculate CI

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357 *Implementation of PA and SB policies*

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359 The level of implementation was assessed for a total of 150 national PA and SB policies.

360 The percentage of PA and SB policies according to their level of implementation is

361 presented in Figure 5. For 39% (95% CI: 27, 52) of policies, we found that only around a

362 half of the statements were implemented, while for 28% (95% CI: 17, 39) of policies most

363 statements were implemented. A low level of implementation was found for 18% (95% CI:

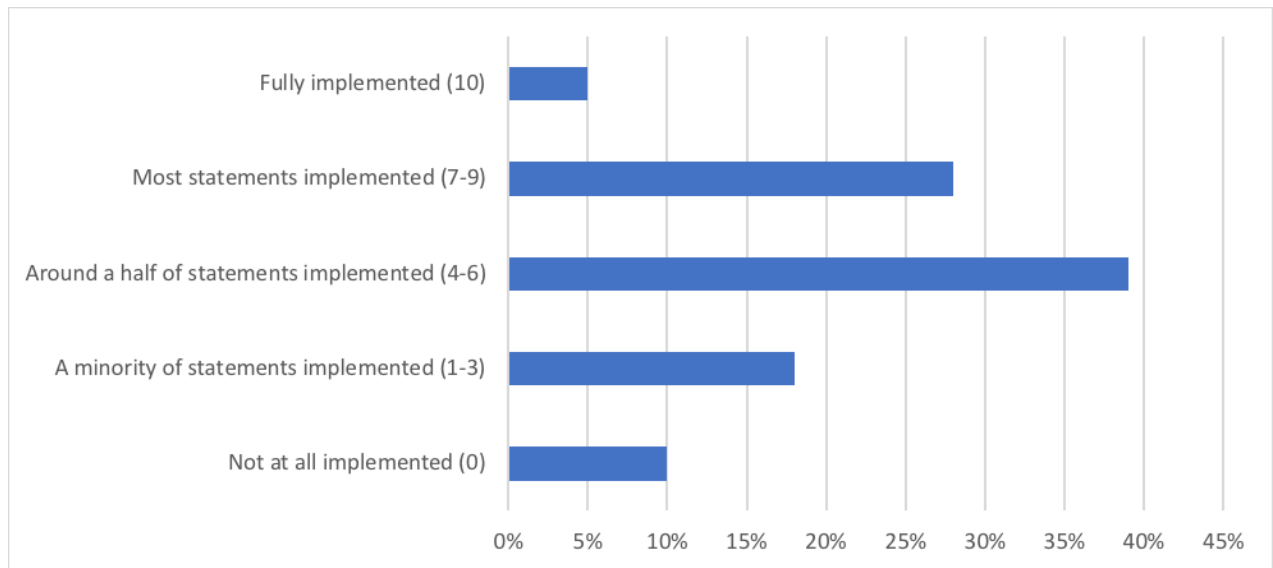
364 8, 28), while 10% (95% CI: 2, 17) of policies were not implemented at all. Only a few policies

365 (5%; 95% CI: 0, 10) were fully implemented. The median score for PA and SB policy

366 implementation was 6 (95% CI: 5, 6).

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368 **Figure 5. Distribution of PA and SB policies according to their level of**
369 **implementation**



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371 PA: physical activity, SB: sedentary behaviour

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The level of implementation of PA and SB policies across countries with different income levels and world regions is presented in Table 2. We did not find a significant difference between the level of PA and SB policy implementation by income level ($p = 0.059$) or by world region ($p = 0.166$).

Table 2. Level of implementation of PA and SB policies, by income level and world region

Category	Median (IQR)	95% CI	p
Income			
High	6 (3)	5, 7	0.059
Upper-middle	6 (4)	3, 7	
Low and lower-middle	4 (5)	0, 5	
Region			
Africa	5 (6)	0, 6	0.166
Americas	6 (4.5)	3, 7.5	
Eastern Mediterranean	2 (6)	0, 6.2	
Europe	6 (2.75)	5, 7	
South-East Asia	6 (2)	n/a	

Western Pacific	6 (4)	3, 9	
All countries	6 (4)	5, 6	/

383 PA: physical activity, SB: sedentary behaviour, IQR: interquartile range, CI: confidence interval for median,
384 *p*: *p*-value for the difference between groups from Kruskal-Wallis test, n/a: number of countries too small to
385 calculate CI

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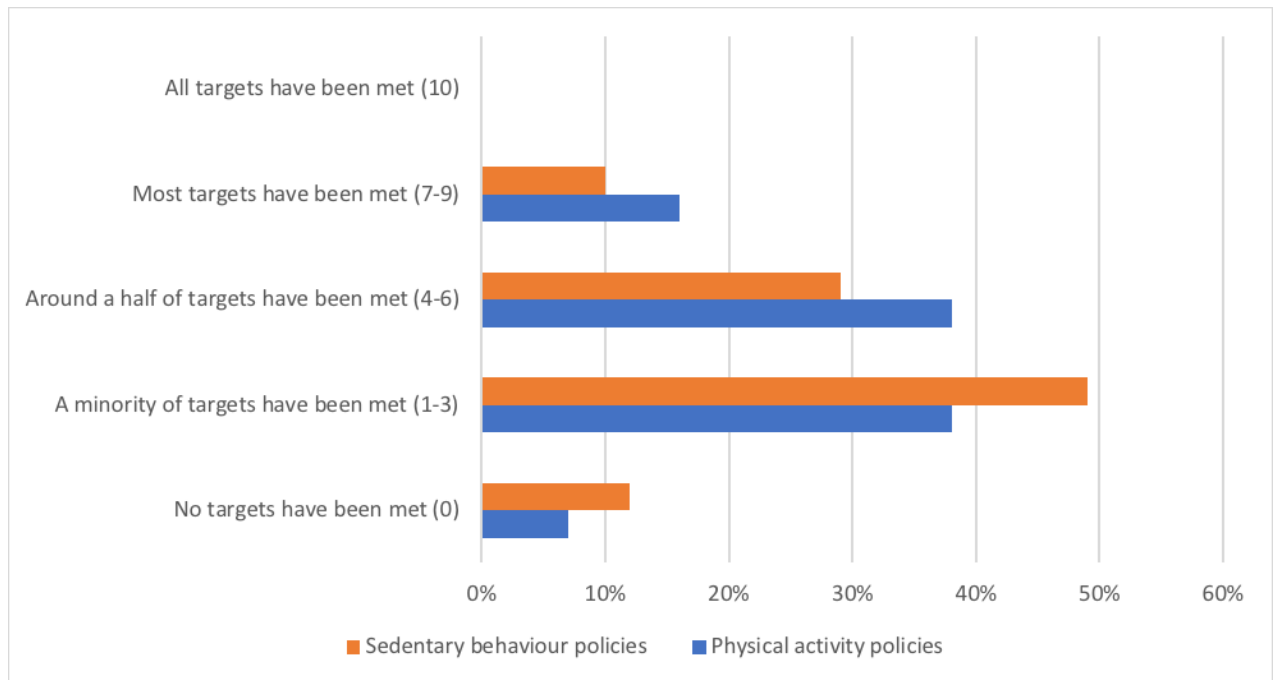
388 *Effectiveness of PA and SB policies*

389 The distribution of national PA and SB policies according to their level of effectiveness is
390 presented in Figure 6. We found that PA policy in 16% (95% CI: 7, 26) of countries was
391 highly effective (i.e. most targets have been met), while in 38% (95% CI: 25, 51) of
392 countries PA policy was moderately effective (i.e. around half of the targets have been
393 met). A low level of effectiveness (i.e. a minority of targets have been met) was found for
394 PA policy in 38% (95% CI: 25, 51) of countries, while in 7% (95% CI: 0.4, 14) of countries
395 PA policy was not effective at all (i.e. no targets have been met). No countries reported
396 having PA policy that was fully effective (i.e. all targets have been met). The median score
397 for the effectiveness of PA policy was 4 (95% CI: 3, 5).

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399 We found that SB policy in 10% (95% CI: 0.7, 19) of countries was highly effective (i.e.
400 most targets have been met), while in 29% (95% CI: 15, 43) of countries SB policy was
401 moderately effective (i.e. around half of the targets have been met). A low level of
402 effectiveness (i.e. a minority of targets have been met) was found for SB policy in 49%
403 (95% CI: 34, 64) of countries, while in 12% (95% CI: 2, 22) of countries SB policy was not
404 effective at all (i.e. no targets have been met). No countries reported having SB policy that
405 was fully effective (i.e. all targets have been met). The median score for the effectiveness
406 of SB policy was 3 (95% CI: 2, 4).

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409 **Figure 6. Distribution of PA and SB policies according to their level of** 410 **effectiveness**



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412 PA: physical activity, SB: sedentary behaviour

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Table 3. Level of effectiveness of PA and SB policies, by income level and world region

Category	Physical activity policy			Sedentary behaviour policy		
	Median (IQR)	95% CI	<i>p</i>	Median (IQR)	95% CI	<i>p</i>
Income						
High	5 (3)	3, 5		3.5 (2.75)	3, 5	
Upper-middle	5 (3)	3.5, 6	0.004	3 (3.25)	2, 5	0.202
Low and lower-middle	3 (3.5)	0.5, 4		2 (3)	0, 3	
Region						

Africa	2 (4.25)	1, 6		2 (3)	1, 4	
Americas	4 (3)	2, 5		3 (3)	1, 4	
Eastern Mediterranean	3 (3.5)	0.4, 5.6		2 (2)	n/a	
Europe	5 (4)	4, 6		5 (3)	3, 5	
South-East Asia	5 (2)	n/a	0.175	5 (2)	n/a	0.265
Western Pacific	3 (4)	0, 6.2		3 (2)	n/a	
All countries	4 (2)	3, 5	/	3 (3.5)	2, 4	/

426 PA: physical activity, SB: sedentary behaviour, IQR: interquartile range, CI: confidence interval for median,
 427 *p*: *p*-value for the difference between groups from Kruskal-Wallis test, n/a: number of countries too small to
 428 calculate CI

429

430 Discussion

431 In this international study conducted in 76 countries, we found that most of the included
 432 countries have formal written PA policies, guidelines for PA, health surveillance or
 433 monitoring systems that include measures of PA, and quantifiable national targets for PA.
 434 However, the levels of comprehensiveness, implementation and effectiveness of PA
 435 policies were generally found to be low-to-moderate. Compared with PA policies, national
 436 SB policies were generally less available and comprehensive. They were also less
 437 implemented and effective. PA and SB policies were generally more developed in high-
 438 income countries and countries of European and Western-Pacific regions.

439

440 *Availability of PA and SB policies*

441 Formal written PA and SB policies

442 We found that formal written PA policies are available in most of the included countries,
 443 which is consistent with findings of previous studies [27, 28]. This is significant progress
 444 from the mid 2000s, when only around 29% of countries had PA policies [27]. However,
 445 our findings showed significant differences in the availability of national PA policies
 446 between country groups by income level and by world regions. The prevalence of
 447 insufficient physical activity is higher in high-income countries than in middle-income and
 448 low-income countries [29], which may partly explain why the governments in high-income
 449 countries are more likely to prioritise investing in the development of PA policies.
 450 Furthermore, in many low- and middle-income countries there is still a lack of country and

451 context specific research on PA and health [30], which could be the reason for lower
452 interest of policymakers to support the promotion of PA.

453
454 Low availability of formal written PA policies and PA guidelines may be especially
455 problematic for the Eastern Mediterranean region. In addition to a high prevalence of
456 noncommunicable diseases [31], this region has one of the highest physical inactivity and
457 obesity rates in the world [32]. The call to focus more on developing national PA policies
458 and implementation plans in the Eastern Mediterranean region from several years ago [33],
459 is still justified.

460 The availability of SB policies was generally lower than the availability of PA policies. This
461 finding is not surprising because public awareness of the potential adverse health
462 outcomes of SB started to be systematically addressed no more than 20 years ago [6, 21].
463 Most evidence on SB policies and other determinants of SB comes from research
464 conducted in high-income countries [6, 34]. Due to differences in socio-cultural, political,
465 environmental, and legal factors, there is a need for context-specific research on SB
466 policies [34]. More research on SB and associated policies is warranted, because such
467 research may facilitate the development of national SB policies.

468

469 PA and SB guidelines

470 Availability of national PA guidelines is a good indicator of national PA and SB policy, as it
471 shows the government's intention to support the promotion of more PA and less SB. More
472 effort needs to be put in the development of national SB guidelines, as they were less
473 represented than PA guidelines. The low availability of SB guidelines might be because
474 there is still an ongoing discussion within the research community on whether there is
475 sufficient epidemiological evidence on the dose-response relationship between SB and
476 health outcomes [35, 36]. Furthermore, we found that the difference between high-income
477 and low- and lower-middle-income countries is particularly large in the availability of PA
478 and SB guidelines. The fact that a large majority of low- and lower-middle-income countries
479 do not have national PA and SB guidelines is concerning from a public health perspective.
480 Greater investment is needed in the development or adoption of PA and SB guidelines in
481 low- and lower-middle-income countries, to support their promotion of more PA and less
482 SB in the population.

483

484 Most of the included countries have specific PA guidelines for early years, children and
485 young people, adults, and older adults, in accordance with the target groups in the WHO
486 PA recommendations [37, 38]. We found that national guidelines for other, specific target
487 groups were much less represented. The guiding principle for the implementation of the
488 *Global Action Plan on Physical Activity 2018–2030* is proportional universality, which states
489 that greatest efforts should be directed towards target populations that are the least active
490 [17]. Countries should consider adopting the proportional universality principle in the
491 development and implementation of their national PA guidelines. In accordance with this
492 principle, specific PA and SB guidelines should be developed for pregnant women, people
493 with disabilities, and people with chronic disease, as these population groups tend to be
494 less active and more sedentary than the rest of the population [39-41]. These will likely
495 feature in the updated WHO guidelines, which might facilitate their adoption in countries
496 [42]. It should be acknowledged that the development of specific recommendations for
497 people with disabilities and chronic diseases may be challenging, due to a large variety of
498 different disabilities and diseases and the fact that the guidelines may need to be
499 disability/disease-specific. The research base supporting the development of specific
500 recommendations for people with disabilities and chronic diseases is also less well
501 developed.

502

503 National targets for PA and SB

504 Health policy experts agree that for successful national PA and SB policies it is essential
505 to set quantifiable, comparable national targets [22, 43-45]. However, we found that such
506 targets for PA are still not available in nearly half of countries, while only a few countries
507 have such targets for SB. The WHO's "global" target of "a 15% relative reduction in the
508 global prevalence of physical inactivity in adults and in adolescents by 2030" can only be
509 achieved through the joint effort of all countries contributing to this common goal [17]. This
510 target could be used as a basis for setting a national target for PA in a country that still
511 does not have one, but it should be adapted to the country-specific context. Setting
512 quantifiable targets for SB may be more challenging, because evidence on prevalence of
513 SB and its trends is less developed.

514

515 National PA and SB surveillance/monitoring

516 Health surveillance and monitoring have a key role in assessing the progress towards
517 meeting PA and SB targets [46, 47]. There are still a large number of countries that do not

518 have PA surveillance, particularly in the Eastern Mediterranean region. We also found that
519 national surveillance of SB is less common than PA surveillance. This suggests that many
520 national governments are still not committed to systematically tracking PA and SB in the
521 population, which means that they may not be able to assess their progress in relation to
522 the WHO targets for 2030.

523
524 Previous studies have suggested that comprehensive PA and SB surveillance systems are
525 needed to provide a good evidence base for public health interventions and strategies [46,
526 47]. Our study provided data only on availability of national PA and SB surveillance. Future
527 studies should explore the comprehensiveness of PA and SB surveillance systems, and
528 how they conform to the principles of optimal PA and SB surveillance [47].

529

530 *Ministries/departments involved in the promotion of more PA and less SB*

531 An approach that integrates policies across settings and sectors is crucial for successful
532 PA promotion at the national level [21, 44, 48-51]. We found that in most of the included
533 countries ministries/departments in several sectors are, at least notionally, involved in the
534 promotion of more PA and less SB, which suggests that, in this regard, national
535 approaches to PA and SB policy are heading in the right direction. A PA policy audit
536 conducted in several European countries suggested that the sport, health, and education
537 sectors were key drivers of PA policy, and that more opportunities for PA promotion should
538 be created in other sectors [14]. In addition to the ministries/departments of sport, health,
539 and education, in most of the included countries we also found that ministries/departments
540 of recreation and leisure, research, transport, and urban/rural planning and design are
541 engaged in the promotion of more PA and less SB. Despite these encouraging findings,
542 facilitating engagement of ministries/departments across different sectors in PA promotion
543 remains an important task for national governments. There is still ample space for
544 improvement, particularly in the tourism, culture, environment, work and employment, and
545 public finance sectors. Ideally, whole-of-system [17] and structural approaches [52] would
546 be applied, to engage all relevant sectors and utilise knowledge from public health and
547 social sciences. As outlined in the *Global Action Plan on Physical Activity 2018–2030*, a
548 whole-of-system approach may be necessary to enable adequate policy investments in
549 PA [17].

550

551 *Comprehensiveness of PA and SB policies*

552 Comprehensiveness is often regarded as a key determinant of successful policies on PA
553 [49, 51, 53, 54]. Our findings suggest that in most of the included countries PA and SB
554 policies are still not sufficiently comprehensive.

555 In 2013, a review of PA-related policies advocated for an urgent response to the
556 noncommunicable disease burden in low- and middle-income countries by developing
557 comprehensive policies to increase PA [55]. The results of our study show that the level of
558 comprehensiveness of PA policies is higher in countries with higher income level. In our
559 sample, the level of comprehensiveness of PA policies was the lowest in the African and
560 Eastern Mediterranean regions. It may be challenging to develop all necessary
561 components of PA and SB policy within the available budget, particularly in low- and lower-
562 middle-income countries, where government's spending on the prevention of non-
563 communicable diseases is generally low, and where the prevention of infectious diseases
564 is a competing priority [56, 57]. Limited funding should therefore be carefully distributed, to
565 cover all the essential components of PA and SB policy. Low- and lower-middle-income
566 countries and countries in the African and Eastern Mediterranean regions might benefit
567 from greater support by international experts and organisations in the process of
568 developing and refining their national PA and SB policies. Another option for some
569 countries would be to consider implementing the WHO *Global Action Plan on Physical*
570 *Activity 2018–2030* [17] and adapting their current PA policies accordingly. Governments,
571 non-governmental organisations, academia, and other stakeholders involved in PA
572 promotion are invited to align their efforts towards achieving the targets outlined in the plan
573 [17].

574

575 *Implementation of PA and SB policies*

576 A recent study found that most countries implemented less than a half of the
577 noncommunicable disease policies recommended by the WHO [58]. The study also found
578 that the number of countries that adopted PA policies is relatively large, but that it dropped
579 between 2015 and 2017. We found that in most of the included countries half or more of
580 the statements from key national PA and SB policies have not been implemented. Policies
581 can be effective only if they are implemented; hence national governments should invest
582 in mechanisms that would ensure better implementation of their PA and SB policies.

583
584 Several previous studies from high-income countries reported a lack of: (i) PA policy
585 implementation; (ii) monitoring/evaluation of policy implementation; and (iii) allocated
586 resources for PA policy implementation [25, 44, 49, 59]. From our data, it seems that the
587 situation in low- and lower-middle-income countries is even more challenging, probably
588 because they have fewer available resources for implementation of PA and SB policies.
589 Highly complex policy designs without clear, specific, feasible, timely, and budgeted, and
590 trackable action/implementation plans may be a recipe for failure of policy implementation
591 [60, 61]. Therefore, national governments should rely on evidence from implementation
592 science and aim to establish more efficient systems for implementation of PA and SB
593 policies. National governments should also invest in rigorous evaluation of different types
594 of interventions, sharing lessons learnt, and scaling-up the successful ones [62]. For some
595 national governments, especially in low and lower-middle-income countries, PA promotion
596 may not be a priority at the national level, so developing and piloting smaller-scale
597 interventions at the local level could be a way to start building context-specific evidence.

598
599 *Effectiveness of PA and SB policies*
600 Effective PA and SB policies are necessary to increase PA and reduce SB in the
601 population. Previous studies reported a lack of evidence on the effectiveness of PA policy
602 [25, 63]. Our findings indicate that the effectiveness of national PA and SB policies in most
603 of the included countries is low to moderate. Timely modification of PA and SB policies is
604 of utmost importance, if they prove to be ineffective. Although this may be a challenging
605 task, countries should invest in establishing efficient and sustainable systems to evaluate
606 national PA and SB policies, and use the gathered data to continuously improve the
607 effectiveness of the policies.

608
609 **Strengths and limitations of the study**
610 Strengths of this study include: (i) a large sample of countries from all world regions; (ii)
611 separate analyses of PA and SB policies; and (iii) analyses of availability,
612 comprehensiveness, implementation, and effectiveness of the policies.

613
614 This study was also subject to some limitations. First, not all the elements of a
615 comprehensive analysis of PA and SB policy could be asked about, because we did not

616 want to overburden our Country Contacts. For the same reason, we could not collect
617 detailed data on all of the analysed policy elements. Second, the way policies are designed
618 and implemented may vary depending on the political system, culture, and institutional
619 settings in a given country [64]. Despite detailed explanations that we provided in our
620 survey, it might be that some questions were not equally applicable to all country contexts.
621 Third, the data were provided by GoPA! Country Contacts. It may be that some of them did
622 not have access to all relevant data on PA and SB policies in their countries. Fourth, not
623 all invited Country Contacts responded to the survey, which may have led to selection bias
624 and reduced generalisability of the results. Finally, in the African and South-East Asian
625 regions we had relatively small sample sizes, compared with other regions. This was
626 mainly due to a lack of internationally visible PA and public health experts in some countries
627 who we could recruit as Country Contacts.

628

629 **Conclusion**

630

631 This study found that most of the included countries have formal written PA policies,
632 guidelines for PA, quantifiable national targets for PA, and a health surveillance or
633 monitoring system that includes measures of PA. However, the levels of
634 comprehensiveness, implementation and effectiveness of these policies are generally low-
635 to-moderate. Compared with PA policies, national SB policies are less available,
636 comprehensive, implemented, and effective. Both PA and SB policies are more developed
637 in high-income countries, compared with low- and lower-middle-income countries, and in
638 countries of the European and Western-Pacific regions, compared with other world
639 regions.

640

641 Future studies should aim to include more countries from the African and Eastern
642 Mediterranean regions, and analyse elements of a comprehensive analysis of PA and SB
643 policy [21] that were not covered in this study, such as country-specific policy contexts,
644 political will, unwritten formal statements, and informal policies. The area would also benefit
645 from a detailed analysis of all stages of the policy cycle and policies in specific sectors.

646

647 To conclude, the findings of this study indicate that more investment is needed in the
648 development and implementation of comprehensive and effective PA and SB policies,
649 particularly in low- and lower-middle-income countries.

650

651 **Additional files**

652 Additional file 1 - *GoPA! Policy Inventory, version 3.0*

653 Additional file 2 - Percentage of countries with targets for PA and SB, by income level and
654 world regions

655 Additional file 3 - Percentage of countries conducting PA and SB

656 surveillance/monitoring, by income level and world region

657 Additional file 4 - Percentage of national ministries or departments involved in promotion
658 of more PA and/or less SB

659

660 **Abbreviations:**

661

662 CAPPA: Comprehensive Analysis of Policy on Physical Activity; CI: Confidence Intervals; GoPA!:

663 Global Observatory for Physical Activity; PA: Physical activity; SB: Sedentary behaviour; WHO:

664 World Health Organization

665

666 **Declarations**

667

668 **Ethics approval and consent to participate**

669 The ethics approval was obtained from the Victoria University Human

670 Research Ethics Committee (ref: HRE19-057). Participation in the study was voluntary, and all

671 participants provided informed consent before responding to survey questions.

672

673 **Consent for publication**

674 Not applicable

675

676 **Availability of data and materials**

677 Summary results are available in Figures, Tables and Additional files. Raw data can be obtained
678 from the corresponding author upon a reasonable request.

679

680 **Competing interests**

681 The authors declare that they have no competing interests.

682

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684 Not applicable

685

686 **Authors' contributions**

687 BKP, ZP, ARV, and MP conceived the idea for the study. BKP, ARV, and ZP contacted Country

688 Contacts for data collection. BKP conducted data analysis. ZP provided support in conducting data

689 analysis. BKP drafted the initial manuscript. ZP, ARV, MP, KM, AB, and SJHB contributed to writing

690 the manuscript. All authors read and approved the final manuscript.

691

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696

697

698

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700

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