Worldwide Surveillance, Policy, and Research on Physical Activity and Health: The Global Observatory for Physical Activity

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Background: The Global Observatory for Physical Activity (GoPA!) was launched in response to the physical inactivity pandemic. The aim of this article is to present current information about surveillance, policy, and research on physical activity (PA) and health worldwide. **Methods:** Information was collected for 217 countries. For 139 of these nations we identified a contact who confirmed information's accuracy and completeness. Associations were calculated among surveillance, policy and research categories. **Results:** Of the 139 countries, 90.6% reported having completed 1 or more PA survey, but less than one-third had 3 or more. 106 included PA on a national plan, but only one-quarter of these were PA-specific. At least 1 peer reviewed publication was identified for 63.3% of the countries. Positive associations ($P < .001$) were found between research and policy ($\rho = 0.35$), research and surveillance ($\rho = 0.41$), and surveillance and policy ($\rho = 0.31$). Countries with a standalone plan were more likely to have surveillance. Countries with more research were more likely to have a standalone plan and surveillance. **Conclusions:** Surveillance, policy, and research indicators were positively correlated, suggesting that action at multiple levels tends to stimulate progress in other areas. Efforts to expand PA-related surveillance, policy, and research in lower income countries are needed.

Keywords: public health, global health, epidemiology, methods

Physical inactivity is a global pandemic responsible for 5 million deaths per year and has become a global public health priority.[1,2] The need for country-level data, high quality locally applicable research, and monitoring to inform policy and interventions at the population level is clear.[1,3,4] A physical activity (PA) "Observatory" has been created to address this need.[1] The Observatory is a global resource and knowledge translation platform, and it encourages and supports international agencies and countries to take action to increase population levels of PA.[1]

The Global Observatory for Physical Activity[5] (GoPA!) is a Council of the International Society of Physical Activity and Health, and was established to measure global progress in the areas of surveillance, policy, and research.[5] Since 2012, GoPA! has collaborated with other institutions and governments worldwide to track progress in PA, and to achieve the World Health Organization (WHO) target of reducing the prevalence of inactivity by 10% by 2025.[6]

A description of the Observatory and information by country can be found at http://www.globalphysicalactivityobservatory.com/.[7]

In this paper, we present descriptive information on surveillance, policy and research from the first round of data collection by GoPA!, which took place from 2012–2014.[7] We also test associations among these indicators.

Methods

Identification and Classification of Countries

Starting with the World Bank (WB) list of 215 countries,[8] we divided the United Kingdom into England, Scotland, Wales, and Northern Ireland, and we combined information from China and Taiwan, as requested by the contact representatives from these countries. Our final list comprised 217 countries. For some analyses, we classified countries by income level, using the World Bank's classification.[8] We also categorized countries by region, following the World Health Organization[9] regional classification.[10]

Assembling Country-Specific Information

Identification of Country Contacts. We searched for country-level contacts or volunteers who could verify or improve information about their country. Country contacts were identified using a PubMed search of the PA literature, from the list of focal points of international networks [eg, European network for the promotion of health-enhancing physical activity (HEPA); the Americas Physical Activity Network, RAFA PANA; and the African Physical Activity Network (AFPAN)][11–13] and the list of focal points of

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WHO regional offices.[14] Recommendations from public health experts supplemented the list. Country contacts needed to have demonstrated experience in the area of PA and public health either as researchers, as members of government institutions or international networks. Country contacts were officially invited to be part of GoPA! and review their country-specific card. Approval of data by the country contact was required before publication of a country's PA-related data.

Country-Specific General Information. From the World Bank we obtained information on total population, life expectancy, GINI inequality index, literacy rate, and the proportion of all deaths caused by noncommunicable diseases (NCDs).[8] From the United Nations, we obtained the Human Development Index.[15] Finally, we used the article by Lee and coworkers to show the proportion of all deaths in each country attributable to physical inactivity (defined as not meeting the international PA recommendation of at least 150 minutes of aerobic moderate-intensity PA per week).[2,9]

National Surveys of PA Prevalence. National survey was defined as a survey conducted with a national or subnational representative sample, and that included PA questions. To obtain information about country-specific PA behaviors we conducted surveys of online databases (WHO, PAHO, DHS, Google, and PubMed) using the search terms "physical activity", "national survey", "physical activity questions", and the country name as search words. With the help of the country contact we confirmed or modified the information from the online search and obtained information about the survey's periodicity (year of the first survey, year of the most recent survey, and year of the next survey planned). This information allowed us to create a variable on surveillance divided into 4 categories: 1) no national PA surveillance data, 2) 1 PA survey, 3) 2 surveys, and 4) 3 or more surveys with a clear periodicity and a specific year for the next survey.

The initial estimates of the overall and sex-specific prevalence of physical inactivity among adults (18+ years) for each country was obtained from the WHO Repository.[10] We did this to enhance comparability of estimates across countries. We replaced WHO data with a country's independent national estimate if a) the country contact suggested the change, b) prevalence was estimated using a standardized self-report instrument covering all-domains of PA (ie, leisure-time, occupation/ housework, and transport), and c) the updated WHO guidelines for PA were used to define the prevalence of physical inactivity.[9]

National PA Plans. To obtain information about national plans regarding the status and promotion of PA we conducted a survey of online databases (WHO, MiNDbank database, Google) using the search terms "physical activity", "national policy", "national plan", and the country name. We then classified the policy information into 1 of the following 3 categories: 1) no clear PA plan, 2) PA plan embedded in NCD plan, and 3) standalone PA plan.

Research in PA. To estimate the amount of PA-related research in each country, we conducted a PubMed search using the search terms "physical activity" (in title or abstract) and country name (anywhere in the title, abstract, text or affiliation). Dates of publication were restricted to 01/01/2013 to 12/31/2013. The year 2013 was selected as the first year of monitoring for GoPA! There were no study design, language, or age-of-subjects restrictions. Studies on exercise physiology and studies where PA was not an outcome were excluded. To be considered as part of the country's research production the article had to explicitly show that the research was conducted in the country. All titles and abstracts identified in the PubMed search were read by the first author (AR), and in case of doubts, the senior author (PH)[16] was consulted.

Once the PubMed search was finished a list of authors in all countries was made and duplicates were excluded. The program Matlab was used. Authors were included in the country's list if they participated in the research related to the country and not merely because of their individual affiliation with a particular country (eg, an author who is a Brazilian national who participated in a research study using UK data would NOT be counted as contributing to research for Brazil).

Country contacts reviewed the list of articles pertaining to his/her country, recommending deletions or additions based on the eligibility criteria. We identified 2173 articles that met our eligibility criteria. We divided studies into 1 of the following 5 categories: 1) PA levels, trends, and measurement; 2) determinants of PA; 3) health consequences of PA; 4) interventions in the field of PA; and 5) policy and practice in the field of PA.

The research component generated the following variables: a) country has at least 1 identifiable publication on PA and health in 2013—yes or no; b) percentage of all studies that included children and adolescents; c) number of unduplicated authors in the 2013 PubMed search; and d) the ratio of number of research articles per capita for each country, WHO region, and WB economic category. The software Matlab and Tableau were used. Finally, descriptive analyses and associations (Spearman correlation) among research, policy, and surveillance indicators were explored. We used 4 surveillance categories and 3 policy categories as previously described, and 5 research categories (none, under percentile 25, percentiles 25 to <50, percentiles 50 to <75, equal or above percentile 75). The statistical analyses were conduced in the statistical program Stata (version 12.0, StataCorp, College Station, TX).

Results

The GoPA! completed data collection for 217 countries. Collaboration with a country contact who agreed to represent the country and who fully reviewed and approved data for their country card was obtained for 139 countries (64.1%) (hereafter referred to as "active participation" or "participating countries"). Active participation in the Observatory varied among regions, ranging from 29.2% in Sub-Saharan Africa to 88.9% in East Asia and Pacific (Table 1). Participation was also directly related to country income group with only 26.5% of low-income countries participating in GoPA! compared with 82.5% of high-income countries.

The first set of 139 Country Cards and the country contacts list can be found at *The 1st Physical Activity Almanac*, available at the GoPA! website.[5]

Surveillance

Of the 139 countries participating in GoPA!, 9.4% had no representative national survey with PA questions, 39 (28.1%) had 1, 55 (39.6%) had 2, and 39 (28.1%) had completed 3 or more national surveys with PA questions (Table 2). These findings are consistent with findings reported by the WHO.[17] PA surveillance activities varied by world region and country income classification. High-income (33.3%) and middle-income (21.6%) countries were more likely to have completed 3 or more surveys and have another one scheduled. One-third (33.3%) of participating low-income countries had completed no national survey.

Table 1   Participation in GoPA! by World Region and Income Group Classification

Classification	Number of countries	Number of GoPA! countries	
	Number	Number	Percentage
World region*			
East Asia and Pacific	36	32	88.9
Europe and Central Asia	61	39	63.9
Latin America and the Caribbean	40	31	77.5
Middle East and North Africa	21	14	66.7
North America	3	3	100.0
South Asia	8	6	75.0
Sub-Saharan Africa	48	14	29.2
Income group*			
High income	80	66	82.5
Upper middle income	54	37	68.5
Lower middle income	49	27	55.1
Low income	34	9	26.5
Total	217	139	64.1

* World region and income group classifications according to the World Bank. The United Kingdom was divided in 4 countries (England, Scotland, Wales, and Northern Ireland).

Table 2   Physical Activity Surveillance Characteristics by World Region and Income Group Classification

	GoPA! countries*	No national survey	1 national survey	2 national surveys	3 national surveys
World region* (n, %)					
East Asia and Pacific	32	3 (9.4%)	14 (43.8%)	9 (28.1%)	6 (18.8%)
Europe and Central Asia	39	2 (5.1%)	6 (15.4%)	17 (43.6%)	14 (35.9%)
Latin America and the Caribbean	31	3 (9.7%)	13 (41.9%)	8 (25.8%)	7 (22.6%)
Middle East and North Africa	14	0 (0.0%)	3 (21.4%)	10 (71.4%)	1 (7.1%)
North America	3	0 (0.0%)	1 (33.3%)	0 (0.0%)	2 (66.7%)
South Asia	6	0 (0.0%)	0 (0.0%)	5 (83.3%)	1 (16.7%)
Sub-Saharan Africa	14	5 (35.7%)	2 (14.3%)	6 (42.9%)	1 (7.1%)
Income group* (n, %)					
High income	66	5 (7.6%)	15 (22.7%)	24 (36.4%)	22 (33.3%)
Upper middle income	37	3 (8.1%)	11 (29.7%)	15 (40.5%)	8 (21.6%)
Lower middle income	27	2 (7.4%)	11 (40.7%)	13 (48.2%)	1 (3.7%)
Low income	9	3 (33.3%)	2 (22.2%)	3 (33.3%)	1 (11.1%)
Total (n, %)	139	13 (9.4%)	39 (28.1%)	55 (39.6%)	32 (23.0%)

* World region and income group classifications according to the World Bank. The United Kingdom was divided in its 4 countries (England, Scotland, Wales, and Northern Ireland).

Policy

Of the 139 countries participating in GoPA!, 69 (49.6%) had a national NCD plan that included PA and 37 (26.6%) had a standalone national PA plan (Table 3). The finding that 76.3% of countries have a plan is in agreement with the estimate of 80.0% by WHO.[17] Sub-Saharan Africa is the region with the highest proportion of countries (85.7%) without a PA plan. The proportion of countries without a plan is less than 36.0% in all other world regions. Two-thirds (66.7%) of low income countries have no plan compared with less than one-third for all other income groups.

Research

The automated search strategy retrieved 6539 articles of which 2173 met the inclusion criteria. Of the 217 countries, 105 (48.4%) had

Table 3 Physical Activity Policy Characteristics by World Region and Income Group Classification

	GoPA! countries*	No physical activity plan	NCDs plan including physical activity	A standalone physical activity plan
World region* (n, %)				
East Asia and Pacific	32	6 (18.7%)	19 (59.4%)	7 (21.9%)
Europe and Central Asia	39	3 (7.7%)	18 (46.1%)	18 (46.2%)
Latin America and the Caribbean	31	4 (12.9%)	17 (54.8%)	10 (32.3%)
Middle East and North Africa	14	5 (35.7%)	9 (64.3%)	0 (0.0%)
North America	3	1 (33.3%)	0 (0.0%)	2 (66.7%)
South Asia	6	2 (33.3%)	4 (66.7%)	0 (0.0%)
Sub-Saharan Africa	14	12 (85.7%)	2 (14.3%)	0 (0.0%)
Income group* (n, %)				
High income	66	9 (13.6%)	32 (48.5%)	25 (37.9%)
Upper middle income	37	10 (27.0%)	15 (40.5%)	12 (32.4%)
Lower middle income	27	8 (29.6%)	19 (70.4%)	0 (0.0%)
Low income	9	6 (66.7%)	3 (33.3%)	0 (0.0%)
Total (n, %)	139	33 (23.7%)	69 (49.6%)	37 (26.6%)

* World region and income group classifications according to the World Bank. United Kingdom was divided in its 4 countries (England, Scotland, Wales, and Northern Ireland).

Abbreviations: NCDs, Noncommunicable diseases.

Table 4 Physical Activity Research Characteristics by World Region and Income Group Classification

	Number of countries*	Countries with publications in PubMed in 2013 (# and %)	Number of articles meeting inclusion criteria	Articles per 100 million population
World region** (n, %)				
East Asia and Pacific	36	15 (41.6%)	441	20
Europe and Central Asia***	61	47 (77.0%)	882	98
Latin America and the Caribbean	40	12 (30.0%)	149	24
Middle East and North Africa	21	12 (57.1%)	31	8
North America	3	2 (67.0%)	612	174
South Asia	8	6 (75.0%)	28	2
Sub-Saharan Africa	48	11 (23.0%)	30	3
Income group** (n, %)				
High income	80	53 (66.3%)	1817	139
Upper middle income	54	28 (51.9%)	297	12
Lower middle income	49	16 (32.7%)	46	2
Low income	34	8 (23.5%)	13	2
Total (n, %)	217	105 (48.4%)	2173	31

* PubMed search was conducted for the 217 world countries GoPA! list.

** Population, world region, and income group classifications according to the World Bank in 2013. The United Kingdom was divided in its 4 countries (England, Scotland, Wales, and Northern Ireland).

*** PubMed search showed the same results for Denmark and Faeroe Islands. Therefore results were counted only once.

1 or more publications (Table 4). Among the 139 GoPA! participating countries, 90 (64.7%) had at least 1 publication compared with only 15 (19.2%) of the 78 nonparticipating countries. The country-specific number of research publications and number of publications per 100 million population per GoPA! participating country varied widely (Webtable 1). Among the 90 participating countries with 1 or more articles, the number per country ranged from 1 to 445 with a median of 4.

Europe and Central Asia (40.6%), North America (28.2%), and East Asia and the Pacific (20.3%) accounted for 89.0% of
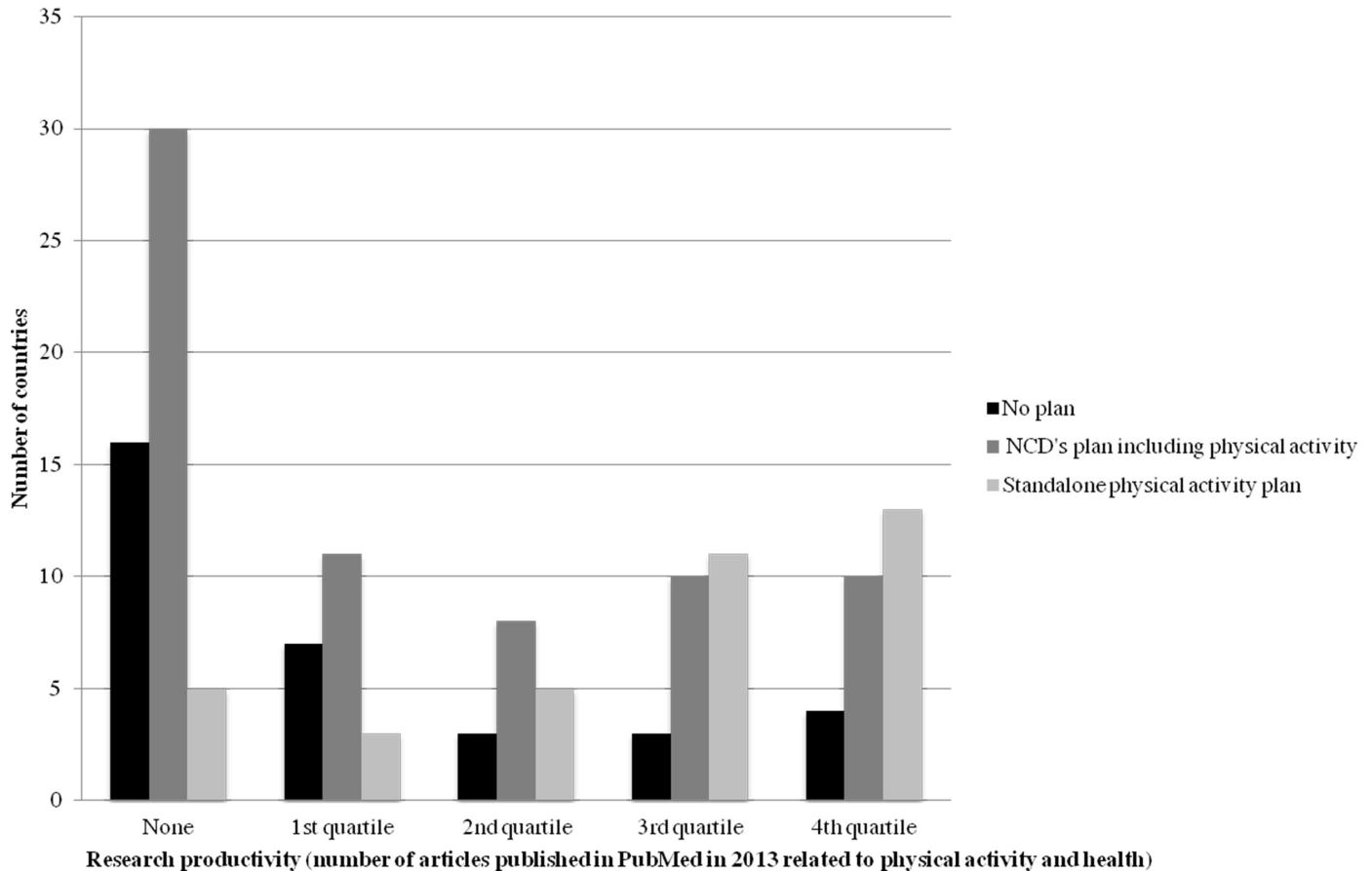
Figure 1 — Physical activity policy characteristics and research productivity in 2013 by country.

publications (Table 4). Among income groups, high-income countries produced 83.6% of publications.

Among participating countries with ≥500,000 population, the highest rates were found for Australia and several European countries (more than 200 articles per 100 million people). The median number of publications for this group was 19. Thirty-nine GoPA! countries (28.1%) accounting for 44 million inhabitants did not have a research publication in 2013. Figure 1 displays the number of PA and health publications in each country around the world.

Of the 2173 articles, more than 60% were categorized 'prevalence, measurement, and trends' or 'correlates and determinants'. Only 5.3% were classified in the 'policy' category (Table 5). Thirty-one percent of all studies focused on children and adolescents. A total of 7814 authors were identified.

Association Between PA and Health Research, Policy, and Surveillance. Using the information from the 139 countries participating in GoPA!, we explored the associations among research, policy and surveillance categories. Overall, positive and significant Spearman correlations ($P < .001$) that were moderate in size were found between research and policy (rho = 0.35); research and surveillance (rho = 0.41) and surveillance and policy (rho = 0.31).

After stratifying by income level group, in high income countries (n = 66) positive and significant Spearman correlations that were weak to moderate in size were found between research and

policy ($\rho = 0.27$; $P = .03$); research and surveillance ($\rho = 0.39$; $P < .001$) and surveillance and policy ($\rho = 0.25$; $P = .04$). In upper middle income countries (n = 37), 1 positive and significant weak to moderate correlation was found: research and surveillance ($\rho = 0.52$; $P < .001$); research and policy ($\rho = 0.23$; $P = .17$); and surveillance and policy ($\rho = 0.24$; $P = .15$). There were no statistically significant associations in lower middle (n = 27) and low (n = 9) income countries (data not presented). Although, the positive correlation between research and policy remained consistent in both groups (lower middle income $\rho = 0.18$ and low income $\rho = 0.19$).

Figure 1 shows the relationship between research and policy characteristics. It was seen that in those countries with no research (no publication in PubMed in 2013) the proportion of countries with no PA plan was the highest (48.5%). In contrast, in the countries in the 4th quartile of research, the number of countries with no PA plan was the lowest (12.1%), and the number of countries with a standalone PA plan was the highest (35.1%). In Figure 2, the association between surveillance and research is presented. Countries in the lowest research quartile were less likely to have 3 or more surveys (9.1%), whereas those in the highest research quartile were more likely to have 3 or more national surveys (51.5%). Finally, of the 37 countries with a standalone PA plan, only 1 had no surveillance. Of the 33 countries with 3 or more surveys, 18 (54.6%) had a standalone PA plan, versus a global proportion of only 26.6% (data not presented in tables or figures).

Table 5   Topic of Physical Activity Research Publications by World Regions and Income Group Classification

	Number of articles meeting the inclusion criteria (n = 2173)	Study type classification					Contribution to the total (%)
		Prevalence, measurement, & trends	Correlates & determinants	Health consequences	Interventions	Policy	
World region** (n, %)							
East Asia and Pacific	441	151 (34.2%)	128 (29.0%)	64 (14.5%)	91 (20.6%)	7 (1.6%)	17.2%
Europe and Central Asia***	882	273 (30.9%)	259 (29.3%)	166 (18.8%)	134 (15.2%)	50 (5.7%)	41.4%
Latin America and the Caribbean	149	58 (38.9%)	40 (26.8%)	22 (14.8%)	27 (18.1%)	2 (1.3%)	5.3%
Middle East and North Africa	31	6 (19.3%)	18 (58.0%)	4 (12.9%)	3 (9.7%)	0 (0.0%)	1.6%
North America	612	183 (29.9%)	157 (25.6%)	106 (17.3%)	114 (18.6%)	52 (8.5%)	32.4%
South Asia	28	13 (46.4%)	8 (28.6%)	1 (3.6%)	5 (17.9%)	1 (3.6%)	1.6%
Sub-Saharan Africa	30	13 (43.3%)	10 (33.3%)	2 (6.7%)	2 (6.7%)	3 (10.0%)	1.0%
Income group** (n, %)							
High Income	1817	578 (31.8%)	503 (27.7%)	305 (16.8%)	326 (17.9%)	105 (5.8%)	87.6%
Upper middle income	297	94 (31.6%)	95 (32.0%)	57 (19.2%)	44 (14.8%)	7 (2.4%)	10.4%
Lower middle income	46	19 (41.3%)	17 (36.9%)	2 (4.3%)	6 (13.0%)	2 (4.3%)	2.1%
Low income	13	6 (46.2%)	5 (38.5%)	1 (7.7%)	0 (0.0%)	1 (7.7%)	0.4%
Total (n, %)	2173	697 (32.1%)	620 (28.5%)	365 (16.8%)	376 (17.3%)	115 (5.3%)	100%

* PubMed search was conducted for the 217 world countries GoPA! list.

** Population, world region, and income group classifications according to the World Bank in 2013. United Kingdom was divided in its 4 countries (England, Scotland, Wales, and Northern Ireland).

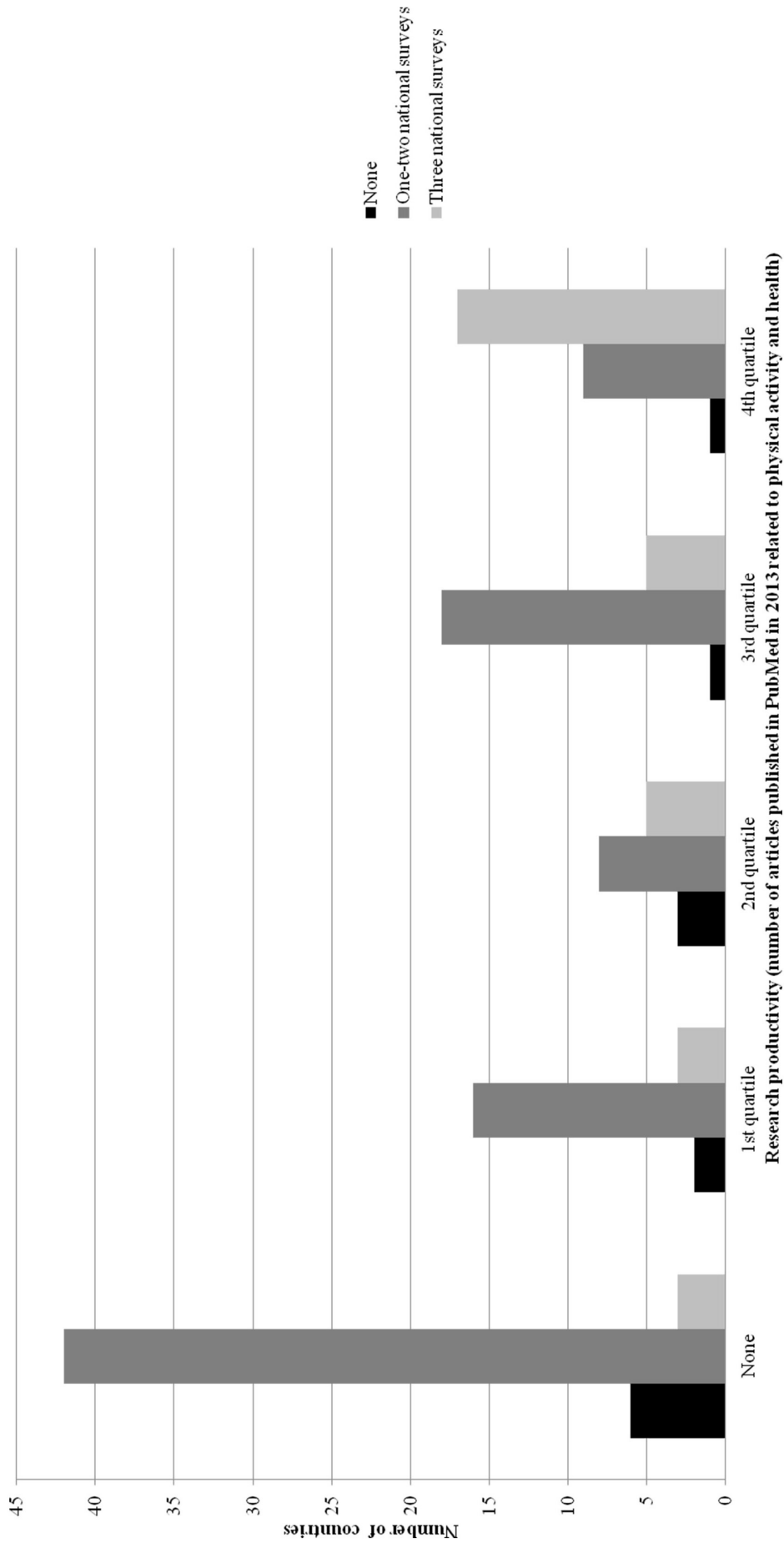*** PubMed search showed the same results for Denmark and Faeroe Islands. Therefore results were counted only once.

Figure 2 — Physical activity surveillance characteristics and research productivity in 2013 by country.

Discussion and Conclusions

GoPA! is the first observatory exclusively dedicated to monitoring and reporting on surveillance, policy, and research indicators related to PA worldwide and has completed data collection for 217 countries in it's first 2 years of operation.[7,18] The data collected by GoPA! is already being used to inform policy.[19]

In the context of health observatories worldwide, the WHO Global Health Observatory, is the largest observatory monitoring risk factors for NCDs. Its data has helped to inform health policy and priorities for tobacco, cardiovascular disease, cancer, diabetes, and air pollution.[20] Tobacco control is an example for which monitoring, has successfully contributed to improved global health.[20] Global prevalence of tobacco use has declined over the last 13 years; among the reasons are a strong tobacco control policy framework, global and multisectorial advocacy efforts, and effective use of global data bases. Important lessons from the tobacco control case relevant for PA include 1) acknowledging physical inactivity as a standalone health threat; 2) disseminating existing policy frameworks including the Toronto Charter for Physical Activity and the WHO Global Action Plan for the Prevention and Control of NCDs, 2013 to 2020; and 3) using existing data to inform policy.

Results must be interpreted acknowledging some limitations:

1. Information about 78 countries is not included. For 37 countries PA prevalence data exist but could not be confirmed by a country representative, and for 41 countries no data could be found. (Webtable 2 shows the comparison of general country characteristics between GoPA! and non-GoPA! members)

2. Policy included only the presence of a plan but not implementation

3. The publication search was restricted to PubMed which may have left out publications from other indices and in other languages

4. Complexity of defining and determining methods for measuring research productivity

5. The cross sectional design provides no information about trends or causal associations

6. Caution is needed when comparing national estimates of PA prevalence due to differences in the sampling frames and data sources.

Our findings indicate that PA surveillance systems, national plans and policies, and research efforts vary substantially by geographic area and by income group. Surveillance data gaps remain concentrated in Sub-Saharan Africa and low income countries as previously reported in the 2012 Lancet series.[21] There is more than a 50-fold difference in publications per 100 million population between high and low income countries, with less than 5% of the world's population living in the countries with the highest research productivity.

An encouraging finding is that PA surveillance, policy and research are positively and significantly correlated. When stratified by income group, associations were no longer significant in lower middle and low income countries, possibly due to the resulting small number of countries per group. The positive association between research and policy remained consistent in all groups.

Although further analyses to study the potential role of national income as an effect modifier of the associations between surveillance, policy and research are warranted, these results are an indication that enhancing any one of them may lead to improvements across the other dimensions. This suggests that action at multiple levels might be more efficient for national PA promotion and advocacy. One of the main strategies may be investing in capacity building for PA research for developing a strong public health response to the global pandemic of inactivity.[17,22,23] These findings are supported by recent literature showing that although complex there is an interplay between research and policy.[24,25]

In conclusion, GoPA! has responded to the global call to tackle the pandemic of physical inactivity by being exclusively dedicated to monitoring and reporting on indicators related to PA. GoPA! is not only a global open access repository, but also a knowledge translation platform that may stimulate progress from information to action. It has a great potential to guide public health and advocacy efforts to increase population levels of PA. Periodic reporting on country-level progress is expected to assist countries develop and implement programs to foster and facilitate PA and thereby, can be an important contributor to global health.

Acknowledgments

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