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Adult physical inactivity prevalence in the Muslim world: Analysis of 38 countries

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ABSTRACT

Objective. Physical inactivity surveillance informs policy and treatment options toward meeting the World Health Organization's (WHO) goal of a 10% reduction in its prevalence by 2025. We currently do not know the aggregate prevalence for Muslim-majority countries, many of which have extremely high rates of comorbidities associated with physical inactivity.

Method. Based on data for 163, 556 persons in 38 Muslim countries that were collected by the Global Physical Activity Questionnaire and the International Physical Activity Questionnaire, unweighted and weighted physical inactivity prevalence estimates were calculated. I used two-proportion *Z* tests to determine gender and ethnic differences within the sample and between the sample and 94 non-Muslim countries and odds ratios to determine the magnitude of significant differences.

Results. Total physical inactivity prevalence was 32.3% (95% CI: 31.9, 32.7). Prevalence among males and females was 28.8% and 35.5%, respectively. Prevalence among non-Arabs and Arabs was 28.6% and 43.7%, respectively. Females and Arabs were more likely physically inactive than their respective counterparts [OR = 1.36 (1.33, 1.39) and OR = 1.94 (1.90, 1.98)]. Muslim countries were more likely physically inactive [OR = 1.23 (1.22, 1.25)] than non-Muslim ones, which was primarily due to the influence of Arabs [OR = 2.01 (1.97, 2.04)], and in particular female Arabs [OR = 2.22 (2.17, 2.27)].

Conclusion. Physical inactivity prevalence in the Muslim world is higher than non-Muslim countries and the difference is primarily due to higher rates among Arabs.

Introduction

Physical inactivity among adults threatens global public health as it is a prime behavioral risk factor associated with major non-communicable diseases such as coronary heart disease, type 2 diabetes, and breast and colon cancer (Lee et al., 2012). Its long-term impacts increasingly burden national economies (World Economic Forum, 2011). Decreasing its prevalence is paramount toward decreasing premature mortality and restoring healthy populations. In its most recent iteration of a global action plan for the prevention of non-communicable diseases, the World Health Organization (2013) established voluntary global targets to reduce physical inactivity by 10%. Contained in the report is an imperative to monitor determinants of non-communicable disease, which include physical inactivity.

The WHO maintains a global health data observatory (http://www.who.int/gho/database/en/), which emanated from its 2002–2004 conduct of the World Health Survey of 70 countries. Located in it are the risk factor prevalence values by country for physical inactivity – based on the International Physical Activity Questionnaire (IPAQ). The WHO also provides complementary data through country STEPS reports (http://www.who.int/chp/steps/reports/en/), which resulted from the uniform measurement of physical activity using the Global Physical Activity Questionnaire (GPAQ) (http://www.who.int/chp/steps/Instrument_at_a_glance.pdf?ua=1). These data have been subsequently analyzed according to various geographic permutations.

Hallal et al. (2012) performed the largest analyses to date of the WHO observatory dataset and estimated that adult (i.e., aged ≥ 15 years) physical inactivity among 122 countries is 31.1%. Analyses of data subsets have revealed physical inactivity prevalence of 17.7% among 51 countries worldwide (Guthold et al., 2008), while in 22 African countries, 20.9% did not meet WHO minimum recommendations for physical activity (i.e., 600 MET-minutes per week) (Guthold et al., 2011). The International Prevalence Study (Bauman et al., 2009) surveyed physical activity among 20 countries using the IPAQ and found that physical inactivity prevalence ranged between 6.9% (China) to 43.0% (Belgium). Results of the Special Eurobarometer Wave 58.2 of 15 European Union countries revealed that physical inactivity prevalence ranged between 19.3% (Netherlands) and 43.1% (France) (Sjöstroöm et al., 2006). Dumith et al. (2011) merged the aforementioned data sets and found physical inactivity prevalence among 76 countries of 17.4%. Ranasinghe et al. (2013) reviewed 11 research studies and 11 STEPS surveys conducted in 6 South Asian countries

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over 8 years and found that physical inactivity prevalence ranged between 5.5% (Nepal) and 58.6% (Bhutan).

Currently, no published systematic analysis of physical inactivity prevalence among Muslim-majority countries exists. Existing literature is concentrated on Arab countries, which represent less than half of all Muslim nations. A review of adult physical activity among 5 countries of the Arabian Gulf region revealed physical inactivity prevalence as high as 61.0% and 73.7% for males and females, respectively (Mabry et al., 2009). These findings are of concern because heart disease and stroke – morbidities associated with physical inactivity – were two of the top five causes of death in Arab countries in 2010 regardless of income level (Abdul Rahim et al., 2014).

Islam considers health second in importance only to faith and holds that an individual, society, and the state share responsibilities for health promotion (Al-Khayat, 2004). This view is supported within Islamic scripture. For example, in the Tirmidhi *Hadith*, it is told that passage to heaven is partially contingent on accounting for how one safeguarded his or her health over a lifetime. Further, the Prophet Mohammed – whose behavior Muslims are to emulate – led a physically active life by engaging in running, horse racing, wrestling, archery, and swimming (Malik, n.d.). Exegeses such as these justify focusing physical activity health promotion efforts on behalf of the entire religion. To date, however, pan-Islamic physical inactivity data have not been reported. Doing so can potentially galvanize religion-specific agencies (e.g., Islamic Relief Worldwide, Organization of Islamic Cooperation) to fund efforts aimed at decreasing physical inactivity. Therefore the purpose of the current study was (a) to calculate prevalence of physical inactivity across all Muslim countries, (b) to compare prevalence by gender within and ethnicity between Muslim countries, and (c) to compare prevalence between Muslim and non-Muslim countries overall (i.e., religion), by gender, and by ethnicity.

Method

Sample

A country was considered Muslim if its Muslim population constituted ≥50% of its total 2010 population. Based on the Pew Research Religion and Public Life Project (www.pewforum.org/2011/01/27/table-muslim-population-growth-by-country), 47 countries met this criterion and included the Palestinian territories. As of August, 2014 physical inactivity prevalence data could not be located for the countries of Azerbaijan, Brunei, Djibouti, Kosovo, Kyrgyzstan, Somalia, Tajikistan, Turkmenistan, and Yemen. Thus, the final sample constituted 38 countries and was equally split between Arab (i.e., Arab League members) and non-Arab countries. A total of 94 non-Muslim countries comprised the comparative world sample (see Supplementary file for list) and included all countries for which age-standardized physical inactivity prevalence and sample sizes were reported.

Instruments

The IPAQ was piloted during 1998–1999, which resulted in multiple short (9 items) and long (27 items) versions of the questionnaire that could be administered by telephone or self-administration (Craig et al., 2003). Subsequently, a reliability and validity study was carried out in 2000 in English among 12 countries located in 6 continents (Craig et al., 2003). Results indicated that comparable data were obtained regardless of form length, administration mode, and reference periods (Craig et al., 2003). In the following years, the IPAQ (http://www.ipaq.ki.se/) was adapted for speakers of Arabic, Farsi, French, Malay, and Turkish. These languages along with English constitute official languages of 32 of the 38 countries in the study. Developers of the IPAQ "place great emphasis on developing and creating measures that have high levels of cultural equivalence so we can compare measures and results between countries" (http://www.ipaq.ki.se/cultural.htm). They recommend standardized procedures (e.g., 4 steps when translating and back-translating, 4 specific questions to ask after a person completes each item, 2 specific questions to ask at the end of the survey) in order to ensure conceptual, metric, and linguistic equivalence.

The GPAQ was conceptualized as drawing on the strengths of the IPAQ and consists of 19 questions that measure domain-specific physical activity (i.e., work, transport, leisure) (Bull et al., 2009). Measurement properties of the GPAQ were tested during 2003–2005 in 9 countries, 2 of which – Bangladesh and Indonesia – were also included in the present study (Bull et al., 2009). Pooled kappa coefficients of 0.73 and 0.68 were obtained for sedentary (i.e., physical inactivity) behavior in the work and leisure domains, respectively (Bull et al., 2009). Concurrent validity between GPAQ and IPAQ was also assessed. A correlation of 0.65 was obtained for sedentary behavior between the two instruments, which reflected the use of an identically-worded question with correlations higher for women than for men and for urban than for rural dwellers (Bull et al., 2009). Pooled kappa (0.22) for physical inactivity showed a low correlation between the two instruments although the percentage of agreement was high (85.2%) (Bull et al., 2009).

Physical inactivity definition and data sources

The WHO defines physical inactivity prevalence as the "percent of defined population attaining less than 5 × 30 min of moderate activity per week, or less than 3 × 20 min of vigorous activity per week, or equivalent" (http://apps.who.int/gho/indicatorregistry/App_Main/view_indicator.aspx?iid=2381). Age-standardized values for males, females, and total population ≥ 15 years old were extracted from the WHO Global Health Observatory Data Repository (http://apps.who.int/gho/data/node.main.A893?lang=en). These values represent self-reported and aggregated domestic, occupational, transportation, and leisure-time domains of physical activity using the IPAQ (Craig et al., 2003), GPAQ (Bull et al., 2009), or a similar instrument. When a value was not reported for a particular country, the WHO STEPS country reports were consulted for physical inactivity prevalence (http://www.who.int/chp/steps/reports/en/). For countries not listed in either source, electronic searches were conducted of population-based surveys of physical inactivity in PubMed and in a country's pertinent governmental websites. Subsequently, estimates were obtained for Afghanistan (Islam and Rasooly, 2012), Albania (Shapo et al., 2004), Morocco (Najdi et al., 2011), and Uzbekistan (Mishra et al., 2006). Data for non-Muslim countries were extracted from the same sources as well as from relevant publications (Guthold et al., 2008; Bauman et al., 2009).

Data analysis

Individual country unweighted prevalence data were entered into IBM SPSS Statistics 21. Weighted physical inactivity prevalence was calculated for the Muslim sample by the formula:

$$p = \sum_{k=1}^{38} p_k w_k \quad (1)$$

where p_k = prevalence estimate of adult physical inactivity of a country (whether that be male, female, total) multiplied by w_k, which is the quotient of N_k = adult population of the country (i.e., male, female, total) divided by N = total adult population across all 38 countries (i.e., male, female, total). Values for a country's adult male, female, and total populations (ages 15–64) represented 2014 estimates found in the World Factbook (http://www.cia.gov). Results were then added across countries to yield an overall prevalence estimate. The same procedures were used to calculate non-Muslim physical inactivity prevalence.

To construct confidence intervals, the variance of physical inactivity prevalence (p) was first determined by the formula:

$$\mathrm{Var}(p) = \sum_{k=1}^{38} w_k^2 \frac{p_k(1-p_k)}{n_k} \quad (2)$$

where n_k = the size of the adult sample drawn from a particular country. The result obtained in formula 2 was used to generate 95% confidence intervals:

$$95\%\ \mathrm{CI} = p \pm 1.96\sqrt{\mathrm{Var}(p)}. \quad (3)$$

To compare differences in weighted physical inactivity prevalence by gender, ethnicity, and religion two-tailed two-proportion Z-tests were conducted with a significance level set at $P < 0.05$. The magnitude of significant differences was assessed by calculating odds ratios.

Results

Table 1 displays the demographic characteristics of the national samples and unweighted physical inactivity prevalence values. Mean sample size and mean percent of males comprising the total sample of 163, 556 persons were 4304.1 ± 4713.4 persons and 47.6 ± 6.6%, respectively. Mean unweighted prevalence estimates of physical inactivity across Muslim countries (Table 1) were 32.8 ± 18.2%, 41.7 ± 20.5%, and 37.4 ± 19.1% for males, females, and total, respectively.

Table 2 displays weighted physical inactivity prevalence for the total Muslim population and stratified separately by gender, ethnicity, and their interaction. The prevalence of physical inactivity overall was 32.3%. Prevalence estimates significantly differed between genders and ethnicities, respectively, with females being 1.36 times more likely than males and Arabs being 1.94 times more likely than non-Arabs of being physically inactive. Prevalence estimates significantly differed within gender between ethnic groups. Specifically, Arab males and females were 1.73 and 2.15 times, respectively, more likely than their non-Arab counterparts of being physically inactive.

Table 3 displays the global physical inactivity prevalence estimates for 94 non-Muslim countries for the total population and stratified separately by gender and ethnicity, and compares prevalence estimates between non-Muslim and Muslim countries via odds ratios. The global prevalence of physical inactivity overall was 27.9% with male prevalence lower than female prevalence by 4.7%. Prevalence estimates significantly differed between non-Muslim and Muslim countries overall (i.e., religion), by gender, by ethnicity, and by ethnicity-gender interaction. In order of magnitude, Arab females, Arabs, Arab males, females, Muslim countries, males, non-Arabs, and non-Arab females were 2.22, 2.01, 1.74, 1.26, 1.23, 1.17, 1.06, and 1.03 times, respectively, more likely to be physically inactive than their counterparts in the global sample. The prevalence of physical inactivity among non-Arab Muslim males was not statistically different compared to non-Muslim males.

Table 1
Unweighted prevalence of physical inactivity by country (n = 38).

Country	Source		Sample % males (n)	Female %	Male %	Total %
Afghanistan	Islam and Rasooly, (2012)	1169	33.5	59.9	57.9	59.2
Albania	Shapo et al. (2004)	896	44.6	42.9	34.5	39.0
Algeria	STEPS, 2003	4102	50.6	45.8	32.5	40.7
Bahrain	STEPS, 2007	1769	48.8	72.4	63.1	67.8
Bangladesh	WHS	5166	51.8	6.6	2.7	4.7
Burkina Faso	WHS	4341	47.5	16.3	14.6	15.5
Chad	WHS	3604	48.8	26.2	22.8	24.5
Comoros	WHS	1492	49.5	10.6	6.1	8.3
Egypt	STEPS, 2011–2012	5300	51.1	42.0	23.3	32.1
Gambia	STEPS, 2010	4111	50.9	26.5	18.3	22.6
Guinea	STEPS, 2009	2491	50.0	19.3	9.2	14.2
Indonesia	STEPS, 2003	1885	45.7	12.3	19.5	15.9
Iran	STEPS, 2009	30, 000	50.0	49.9	28.3	39.0
Iraq	STEPS, 2006	4503	43.2	52.7	61.8	56.7
Jordan	STEPS, 2007	3654	53.1	4.5	5.8	5.2
Kazakhstan	WHS	4263	48.8	31.0	32.0	31.5
Kuwait	STEPS, 2006	2280	40.3	63.2	47.8	55.4
Lebanon	STEPS, 2008	1982	45.1	40.3	52.4	45.8
Libya	STEPS, 2009	3579	50.1	51.7	36.0	43.9
Malaysia	WHS	5563	50.7	65.6	57.3	61.4
Maldives	STEPS, 2011	1780	37.3	52.4	39.1	45.9
Mali	WHS	1478	51.0	23.8	17.9	20.9
Mauritania	WHS	2726	47.8	47.6	40.0	43.8
Morocco	Najdi et al. (2011)	2610	51.8	24.2	9.4	16.5
Niger	STEPS, 2007	2780	52.7	31.5	25.1	28.2
Oman	STEPS, 2006	1700	47.0	33.4	26.1	30.1
Pakistan	WHS	5610	50.3	48.1	32.7	40.4
Palestine	STEPS, 2010–2011	6957	50.8	59.2	33.8	46.5
Qatar	STEPS, 2012	2496	42.2	54.2	37.4	45.9
Saudi Arabia	STEPS, 2005	3679	51.4	73.7	61.0	67.6
Senegal	WHS	1610	48.6	25.8	20.4	23.1
Sierra Leone	STEPS, 2009	4997	45.7	18.9	13.8	16.4
Sudan	STEPS, 2005	1573	41.4	94.8	75.9	86.8
Syria	STEPS, 2003	9105	40.2	40.8	21.3	32.9
Tunisia	WHS	4332	49.6	40.3	31.5	35.9
Turkey	WHS	9073	51.0	62.5	49.5	56.0
UAE	WHS	1104	72.1	68.9	56.1	62.5
Uzbekistan	Mishra et al. (2006)	7796	29.9	44.3	29.5	39.9

Note. STEPS = STEPS Noncommunicable Disease Risk Factors Survey; WHS = World Health Survey (2002–2003). Total weighted response rate = 92.8%.

Discussion

This study represents the first compendium of physical inactivity prevalence data specifically aggregated for Muslim countries. It is incomplete at present because data are not currently available for 9 countries: 4 former Soviet republics, 2 war-torn countries (Kosovo, Somalia), Yemen and oddly, Brunei, which is ranked the 4th richest by 2014 GDP per capita. It is important that these countries – perhaps under the aegis of international Islamic NGOs – soon conduct and disseminate the results of physical inactivity surveillance.

Ethnic, gender, and ethnicity-gender interaction disparities were noted for physical inactivity prevalence between subgroups. Arabs were almost twice more likely physically inactive than non-Arabs and this difference was even higher between Arab and non-Arab females.

Table 2
Weighted estimated prevalence (%) of physical inactivity in Muslim countries and comparisons by ethnicity and gender.

Variable	Sample n	Population N	Prevalence (95% CI)	$\|Z\|$	OR (95% CI)
Total	163, 556	841, 212, 189	32.3 (31.9–32.7)		
Gender					
Male	77,997	424,362,461	28.8 (28.1–29.4)		
Female	85,559	416,849,728	35.5 (34.9–36.1)	28.9***	1.36 (1.33–1.39)
Ethnicity					
Non-Arab	98,613	632,219,706	28.6 (28.2–29.0)		
Arab	64,943	208, 992, 483	43.7 (43.5–43.8)	62.8***	1.94 (1.90–1.98)
Ethnicity × gender					
Non-Arab male	47,043	316,097,792	25.8 (25.1–26.4)		
Arab male	30,961	108,264,669	37.6 (37.4–37.8)	35.0***	1.73 (1.68–1.78)
Non-Arab female	51,570	316,121,914	31.1 (30.6–31.6)		
Arab female	33,982	100,727,814	49.2 (49.1–49.4)	53.3***	2.15 (2.09–2.21)

Note. $|Z|$ represents results of two-tailed two-proportion Z-tests. OR = odds ratio.
*** $P < 0.001$.

Table 3
Comparisons between weighted estimated prevalence (%) of physical inactivity in non-Muslim countries ($n = 94$) and Muslim countries ($n = 38$) by ethnicity and gender.

Variable	Sample *n*	Population *N*	Prevalence (95% CI)
Non-Muslim countries			
Total	296, 417	3, 445, 547, 954	27.9 (27.4–28.4)
Gender			
Male	132,917	1, 750,162,940	25.7 (25.0–26.4)
Female	155, 406	1,691,008,887	30.4 (29.7–31.1)
Comparisons to non-Muslim countries		|Z|	OR (95% CI)
Religion		31.3***	1.23 (1.22–1.25)
Male		15.5***	1.17 (1.15–1.19)
Female		25.6***	1.26 (1.24–1.28)
Arab		78.3***	2.01 (1.97–2.04)
Non-Arab		7.7***	1.06 (1.05–1.08)
Arab males		41.7***	1.74 (1.70–1.79)
Non-Arab males		0.7	1.00 (0.98–1.03)
Arab females		65.4***	2.22 (2.17–2.27)
Non-Arab females		3.0**	1.03 (1.01–1.06)

Note. Sum of Sample *n* and Population *N* for male and female do not equal Total sums because data for physical inactivity prevalence stratified by gender was not available for 4 countries (Barbados, Dominica, Papua New Guinea, Samoa). |*Z*| represents results of two-tailed two-proportion *Z*-tests. OR = odds ratio.
** $P < 0.01$.
*** $P < 0.001$.

Observed differences are most likely even greater because Jordan's very low prevalence estimates are likely in error (Table 1); they were the lowest among all Arab countries despite prevalence of adult overweight and obesity in excess of 70% (Ng et al., 2014). High prevalence among Arabs of co-morbidities considered potential determinants of physical activity (Bauman et al., 2012) may partly explain the observed ethnic gap. Specifically, analysis of extracted comparative diabetes prevalence 2013 data from the International Diabetes Federation's atlas (http://www.idf.org/atlasmap/atlasmap) reveals a significant ($P < 0.001$) difference in unweighted prevalence between the Arab ($13.3 \pm 6.0\%$) and non-Arab ($5.9 \pm 3.2\%$) countries included in the present study. Additionally, analysis of extracted overweight and obesity prevalence data from the Global Burden of Disease Study 2013 (Ng et al., 2014) reveals significant differences ($P < 0.001$) in unweighted prevalence between Arab ($59.3 \pm 16.8\%$) and non-Arab ($34.2 \pm 15.4\%$) males and between Arab ($66.9 \pm 12.2\%$) and non-Arab ($40.0 \pm 15.2\%$) females from countries included in the present study. Additional factors cited as barriers to physical inactivity among Arabs include: inhospitable climate, changes in traditional lifestyles and occupations to more sedentary ones, increases in screen time, decreased physical labor associated with domestic chores, lack of active transport, and limited governmental policy and intercession efforts (Abdul Rahim et al., 2014; Benjamin and Donnelly, 2013; Badran and Laher, 2011; Lachat et al., 2011; Musaiger et al., 2011). Future research should identify which factors are most associated with physical inactivity among Muslims overall and within and between subgroups.

Females were more likely physically inactive than males and this difference was more pronounced among Arabs (difference = 11.6%) compared to non-Arabs (difference = 5.3%). According to the WHO's Global Health Observatory, generally, women are more physically inactive than men by approximately 6%, which in this study was nearly the difference found among non-Arabs. The much greater gender difference found among Arabs is concerning. Benjamin and Donnelly (Benjamin and Donnelly, 2013) identified multiple correlates of physical inactivity among Arab women: (a) fatigue and tiredness; (b) lack of social support, and culturally-restrictive sex role and behavioral expectations for women; (c) lack of allocation of funding for women's sport; and (d) lack of suitable exercise facilities. As this list of correlates spans intrapersonal, interpersonal, environmental, and policy domains a social-ecological model (Sallis and Owen, 2008) should be used to clarify their unique contribution and interaction for explaining physical inactivity. Application of the model to physical inactivity for people living in Muslim majority countries has not been published. There are, however, examples in the scientific literature for people living in non-Muslim countries (Kahan, 2011; Shuval et al., 2009). Future research should determine if these or other correlates of physical inactivity are associated with a gender gap among non-Arab Muslims.

In this study, weighted physical inactivity prevalence for Muslim countries was significantly higher than for the 94 non-Muslim countries (32.7% vs. 27.9%) that were simultaneously analyzed. It was higher than estimates reported in other studies (Guthold et al., 2008, 2011; Bauman et al., 2009; Sjöstroöm et al., 2006; Dumith et al., 2011; Ranasinghe et al., 2013), lower than that reported for Arabian Gulf countries (Mabry et al., 2009), and nearly equal to the value reported by Hallal et al. (2012). Interpretation of odds ratios suggests that the difference in physical inactivity prevalence between Muslim and non-Muslim countries reflects the influence of the sub-samples of Arab countries. In fact, the prevalence estimate for non-Arab males was not significantly different than for non-Muslim males and the difference between non-Arab and non-Muslim females was nominal (i.e., OR = 1.03). Globally, the prevalence of physical inactivity rises with country income level with prevalence in the high-income level more than twice that found in the low-income level (World Health Organization, 2011). Increased occupational- and transport-related physical activity is thought to explain the gap (World Health Organization, 2011). The World Bank classifies 17 of 19 Arab countries in the sample as middle- or high-income economies. Additional correlates of physical inactivity – especially sociocultural ones – may also explain the prevalence gap between Arab countries and non-Muslim countries.

The GPAQ and IPAQ instruments, which were used to collect data reported by the WHO and others (Bauman et al., 2009; Sjöstroöm et al., 2006) typically overestimate moderate-to-vigorous physical activity (Bull et al., 2009; Herrmann et al., 2013). Thus, the prevalence estimates presented in the study should be cautiously interpreted; physical inactivity prevalence may be higher. The data collection period across countries spanned 10 years (see Table 1). Changes in physical inactivity over such an extended time period are inevitable. For example, among Mexican adults, physical inactivity prevalence increased by 6.0% from 2006 to 2012 (Medina et al., 2013). Correction of this limitation would require complex forecasting models of physical inactivity trends. Ideally, all countries should conduct national surveillance studies at predetermined common intervals with funding assistance provided to those countries without adequate economic resources. With such a heterogeneous mix of countries, sampling procedures and survey administration protocol were not conducted uniformly, which affected the accuracy of the aggregated prevalence estimates (World Health Organization Regional Office for Europe, 2010). Researchers have previously acknowledged factors such as differential interpretation of questions and understanding of physical activity intensity as a limitation when making comparisons across countries (Guthold et al., 2008). Weighted response rates, however, were similar between Arab (92.2%) and non-Arab (93.5%) Muslim countries and prevalence estimates for Muslim countries as a whole and for subgroups seem plausible juxtaposed to the extant literature. In conclusion, non-Arab Muslim countries were found to be about as physically inactive as non-Muslim countries and both were more active than Arab countries. Arab women, in particular, were identified as a vulnerable subgroup. Arab countries should prioritize the formulation of national policies and invest in the creation of active living environments that allow female citizens to be more physically active and still conform to sociocultural mores and religious doctrine.

Conflict of interest statement

The authors declare that there are no conflicts of interests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.pmedr.2014.12.007.

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