

Descriptive epidemiology of physical activity among Omani adults: the Oman World Health Survey, 2008

R.M. Mabry,¹ M. Morsi,² J.A. Al-Lawati³ and N. Owen⁴

الوبائيات الوصفية للنشاط البدني لدى البالغين العمانيين: المسح الصحي العالمي لعمان في عام 2008

روث مابري، مجدي مرسى، جواد أحمد اللواتي، نيفيل أوين

الخلاصة: هناك تزايد في عبء السمنة والأمراض غير السارية المرتبطة بالسمنة في بلدان مجلس التعاون الخليجي؛ بما فيها سلطنة عمان. وقد قيّمت هذه الدراسة الوبائية الوصفية النشاط البدني لدى 2977 بالغاً عمانياً باستخدام مسح أسري سكاني في عام 2008. فكان - بالإجمال - 54.2% من الرجال و41.6% من النساء نشيطين بدنياً، وكان المعدل أعلى لدى الفئات الأصغر سناً، وشديد التباين باختلاف منطقة الإقامة. وكان النشاط البدني المرتبط بمجال المواصلات (المشي وركوب الدراجات) أعلى من النشاط الذي يبذل في مجالات الترفيه أو العمل. وكان النشاط البدني لدى الرجال غير المتزوجين ممن هم بأعمار 30-39 عاماً ضعفاً نشاط نظرائهم المتزوجين (OR = 2.25)، ولدى النساء غير المتزوجات اللواتي تجاوزن الـ 40 سنة نصف نشاط نظيراتهن المتزوجات (OR = 0.58). وكانت الشابات اللواتي لا يعملن أقل نشاطاً (OR = 0.18) من النساء العاملات. وكان هناك ارتباط كبير بين التعليم العالي وبين النشاط الترفيهي لدى الرجال الذين تزيد أعمارهم عن 30 سنة والنساء اللواتي تجاوزن الـ 40 سنة. هناك حاجة إلى مزيد من البحوث لفهم التباينات الإقليمية ولتحديد استراتيجيات ملائمة ثقافياً لتعزيز النشاط البدني.

ABSTRACT There is an increasing burden of obesity and obesity-related noncommunicable diseases in Gulf Cooperation Council countries, including Oman. This descriptive, epidemiological study assessed physical activity among 2977 Omani adults using a population-based household survey in 2008. Overall, 54.2% of men and 41.6% of women were physically active; the rate was higher in younger cohorts and varied significantly by region of residence. Physical activity related to the transportation (walking and cycling) domain was higher than in the leisure or work domains. Unmarried men aged 30–39 years were twice as likely to be physically active (OR 2.25) and unmarried women aged 40+ years were half as likely to be active (OR 0.58) than their married counterparts. Young women not working were less active (OR 0.18) than working women. Higher education was significantly associated with leisure activity for men aged 30+ years and women aged 40+ years. Further research to understand regional variations and to identify culturally appropriate strategies to promote physical activity is required.

Épidémiologie descriptive de l'activité physique chez des adultes omanais : enquête de 2008 à Oman dans le cadre de l'enquête sur la santé dans le monde

RÉSUMÉ Le fardeau de l'obésité et des maladies non transmissibles liées à l'obésité est en augmentation dans les pays du Conseil de Coopération du Golfe, notamment à Oman. La présente étude épidémiologique descriptive a évalué l'activité physique de 2977 adultes omanais à l'aide d'une enquête de population auprès des ménages en 2008. Globalement, 54,2 % des hommes et 41,6 % des femmes avaient une activité physique ; le taux était supérieur dans les cohortes plus jeunes et variait significativement en fonction de la région de résidence. L'activité physique liée aux déplacements (marche et vélo) était plus fréquente que l'activité physique professionnelle ou de loisir. Les hommes célibataires entre 30 et 39 ans étaient deux fois plus susceptibles d'être physiquement actifs (OR 2,25) alors que les femmes célibataires âgées de plus de 40 ans étaient deux fois moins actives (OR 0,58) que les femmes mariées. Les femmes jeunes sans emploi étaient moins actives physiquement (OR 0,18) que les femmes occupant un emploi. Un niveau d'études supérieur était nettement associé à une activité physique de loisir chez les hommes de plus de 30 ans et les femmes de plus de 40 ans. Des recherches plus approfondies pour comprendre les variations régionales et identifier des stratégies culturellement appropriées visant à promouvoir l'activité physique sont nécessaires.

¹World Health Organization Oman Country Office, Muscat, Oman (Correspondence to R. Mabry: rmmabry@gmail.com). ²Department of Research and Studies, Directorate General of Planning; ³Directorate General of Primary Health Care, Ministry of Health, Muscat, Oman.

⁴Behavioural Epidemiology Laboratory, Baker IDI Heart and Diabetes Institute, Melbourne, Australia.

Received: 14/06/15; accepted: 16/11/15

Introduction

There is an increasing burden of obesity and obesity-related noncommunicable diseases – diabetes, cardiovascular disease and some cancers – in Gulf Cooperation Council countries (1,2), including Oman (3–5). Calls for population-based strategies to prevent chronic disease by targeting modifiable risk factors such as tobacco use, dietary intake and physical activity have accelerated since the Political Declaration of the United Nations General Assembly on the Prevention and Control of Noncommunicable Diseases was adopted in 2011 (6). Physical inactivity (engaging in less than 150 minutes of moderate-intensity activity in a week) is one of the leading risk factors for global mortality (7). Physically inactive adults are at an increased risk of obesity, type 2 diabetes and other nutrition-related noncommunicable diseases (8). In early 2015, the World Health Organization (WHO) launched the *Global status report on noncommunicable diseases 2014* in which countries were urged to accelerate action on 9 voluntary global targets, including a 10% reduction of insufficient physical activity (7).

Given the rising prevalence of noncommunicable diseases in Oman and the country's commitment to the global targets, addressing physical inactivity is urgently required. Yet little is known about the epidemiology of physical activity in Omani adults. Two studies have reported on the prevalence of physical activity. A national survey reported that 67% of men and 59% of women met physical activity guidelines (9), while another survey, among college students, reported that 56.6% of men and 42.2% of women college students met these guidelines (10). Findings from the city of Sur in the east of Oman found that women were more active in the work domain compared with men, that men were more active in the transport and leisure domains, and that physical

activity had an inverse association with the presence of metabolic syndrome (11). Here we report on the prevalence and correlates of domain-specific physical activity among Omani adults at the national level and consider the implications for the prevention of major noncommunicable diseases.

Methods

Study design and data source

This descriptive, epidemiological study involved secondary analysis of the Oman World Health Survey, a population-based household survey conducted in 2008. The objective of the WHO World Health Survey is to use a standard methodology to obtain comprehensive information on the health of a population (12). The Oman World Health Survey included the WHO STEPwise module for chronic disease risk factor surveillance (13). A multi-stage stratified cluster sampling design was used to select respondents aged 18 years and above. A total of 4717 Omani and non-Omani adults successfully completed the interview (response rate 86.3%) (14).

The Oman Ministry of Health research and ethical review committee approved the proposal for secondary analysis of the data from the Oman World Health Survey for physical activity.

Data collection

Data were collected at the household level and included the following variables: sex, age, place of residence (urban/rural; region), marital status (married/not married), educational level (illiterate, primary/preparatory, secondary, post-secondary), work status (currently working/currently not working) and wealth status (in quintiles, with quintile 1 being the lowest and quintile 5 being the wealthiest). Details of the study methodology have been published elsewhere (14).

The epidemiology of physical activity was examined according to sociodemographic variables among all Omani adults aged 20 years and above for whom complete information was available for all variables. The physical activity variables were measured using the 16-item Global Physical Activity Questionnaire (GPAQ), developed by WHO and incorporated into the STEPwise instrument, and scored as per standard protocols (13). GPAQ measures physical activity (intensity, duration and frequency) in 3 domains: work (paid and unpaid work, including household work), transportation (walking and cycling) and leisure (recreational activity).

Physical activity was estimated by calculating energy expenditure using the metabolic equivalent of task (MET), with 1 MET equivalent to sitting quietly. Total MET-min/day was calculated for each domain by first multiplying MET values by reported minutes—with moderate-intensity and transport activities assigned a value of 4 MET and vigorous-intensity activities assigned a value of 8 MET—and then adding the total MET-min of vigorous- and moderate-intensity activities performed.

Physical activity variables did not follow a normal distribution; thus, binary variables were used to define each physical activity outcome examined. Participants were identified as being physically active if they did at least 150 minutes of moderate physical activity per week (minimum total 600 MET-mins/week). A substantial portion of the respondents did no work, transport or leisure physical activity and therefore outcomes were examined as none versus any activity, since physical inactivity was of interest.

Data analysis

The data were analysed using the *Stata* statistical software package, version 11. Bivariate analysis and logistic regression using all sociodemographic

variables was carried out to examine the prevalence of physical activity in Oman and to determine the associations of independent variables with physical activity; models were weighted to the population of Oman using the 2008 population. Due to multiple sex and age interactions, regression analysis was carried out segregated by sex and age cohorts (18–29 years, 30–39 years and 40 years and older) and included only the variables found to be significant in the bivariate analyses. The results are reported as odds ratios (OR) with 95% confidence intervals (CI).

Results

Of the Omani adults surveyed, 2977 (49.9% women; response rate 89.0%) had complete information on physical activity and sociodemographic variables and were not pregnant. The age-standardized prevalence of meeting physical activity recommendations was higher in men (54.2%; 95% CI: 50.5–57.9%) than women (41.6%; 95% CI: 38.0–45.2%) and varied by region,

with the highest rate in South Batinah and the lowest in Dhofar and Al Wusta (Figure 1). The prevalence of recommended physical activity decreased with age.

When analysed by domain of physical activity, activity related to transport (walking and cycling) was the most commonly reported domain-specific activity and was higher in men compared with women and higher in the younger age groups (Figure 2). A similar trend was seen for leisure-related activity but not work-related activity; for the latter the prevalence was similar between men and women and fell slightly for the oldest age group.

Bivariate analyses by sex and age cohorts

Bivariate analysis by sex and age cohorts indicated that a higher proportion of men were physically active than were women and that younger people were more active than older cohorts; the prevalence of meeting physical activity recommendations fell from 63.1% at age 18–29 years to 41.1% at age 40+

years among men and from 49.9% at age 18–29 years to 33.4% at age 40+ years among women (Table 1). Place of residence (region only) and marital status were significantly associated with physical activity for some age cohorts for both men and women. Among men aged 30–39 years, 56.5% of married versus 74.5% of unmarried men were adequately physically active ($P = 0.004$) (Table 1).

Work status was associated with physical activity for women, but only for the youngest cohort; among women aged 18–29 years 82.0% of working women versus 47.5% of non-working women met physical activity recommendations ($P = 0.018$).

Level of education and wealth quintile were not associated with meeting physical activity recommendations in men or women in any age cohort.

Logistic regression analyses

Only the variables found significant in bivariate analysis (region, marital status and work status) were used in the logistic regression analyses for age-specific

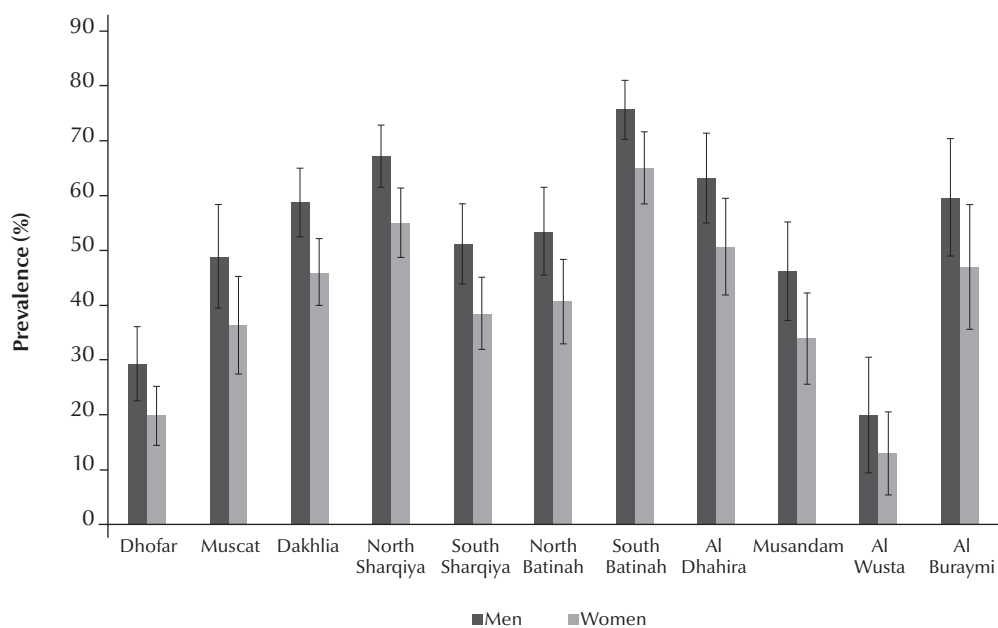


Figure 1 Estimated prevalence of physical activity of Omani men and women, by region, Oman World Health Survey, 2008 (participants were classified as meeting physical activity recommendations if they did at least 150 minutes of moderate physical activity per week; rates weighted to the 2008 Oman population; error bars denote confidence intervals)

models for men and women meeting physical activity recommendations.

Region was the only variable with significant associations across all models, consistent with the wide regional variations shown in Figure 1. The likelihood of meeting total physical activity recommendations was significantly greater for people living in most regions compared with people living in Dhofar region, the southernmost region of the country; the only common exception for all groups were people living in Al Wusta region, a sparsely populated area and a neighbour of Dhofar region. The odds ratios were at least 4 times higher for men and women in the younger age groups (18–29 years and 30–39 years) living in many of the other regions compared with Dhofar region.

Marital status was the only variable significantly associated with total physical activity by age cohorts; unmarried men aged 30–39 years were twice as likely to be active (OR 2.25; 95% CI: 1.25–4.06; $P = 0.007$) while unmarried women aged 40+ years were half as likely to be active (OR 0.58; 95% CI: 0.36–0.94; $P = 0.027$) compared with their married counterparts (Table 2).

Working status had a significant association with physical activity only for the youngest women; non-working women aged 18–29 years were less likely to meet physical activity recommendations (OR 0.18; 95% CI: 0.04–0.73, $P = 0.017$) compared with women who worked.

Regression analyses for domain-specific physical activity were also carried out for age- and sex-specific models (Tables 3 and 4). The associations with region were similar to those for meeting overall physical activity recommendations. Other associations of interest were education and marital status. Better educational attainment was associated with leisure activity for men aged 30–39 years (P for trend = 0.001), men aged 40+ years (P for trend = 0.001); the highest odds ratio was seen in better educated men aged 30–39 years compared with their least educated counterparts (OR 21.69; 95% CI: 3.62–129.83; $P < 0.001$). Being unmarried was associated with no work activity for men less than 30 years and women aged 40+ years ($P = 0.002$, 0.037 respectively), and with no leisure activity for men aged 30–39 years and women

in the youngest and oldest cohorts ($P = 0.004$, 0.001, 0.032 respectively).

Discussion

This study is the first to examine the epidemiology of physical activity in a national sample of Omani adults. It shows that 5 out of 10 men and 4 out of 10 women in 2008 were engaging in recommended levels of physical activity, with higher rates among the younger age groups. The prevalence of meeting physical activity guidelines observed in this study is in the mid-range for other countries in the Gulf Cooperation Council area, where prevalence ranges from 47.9% to 73% for men and 32.3% to 60.6% for women (7), but higher than in the Eastern Mediterranean Region as a whole (15). The sex differences, although much wider than in some developed countries (16,17), are similar to neighbouring countries (18). The physical and social environment of Oman – with its high dependency on cars, inadequate infrastructure, hot arid climate, employment of domestic workers and cultural norms placing a low value on physical activity – inhibits

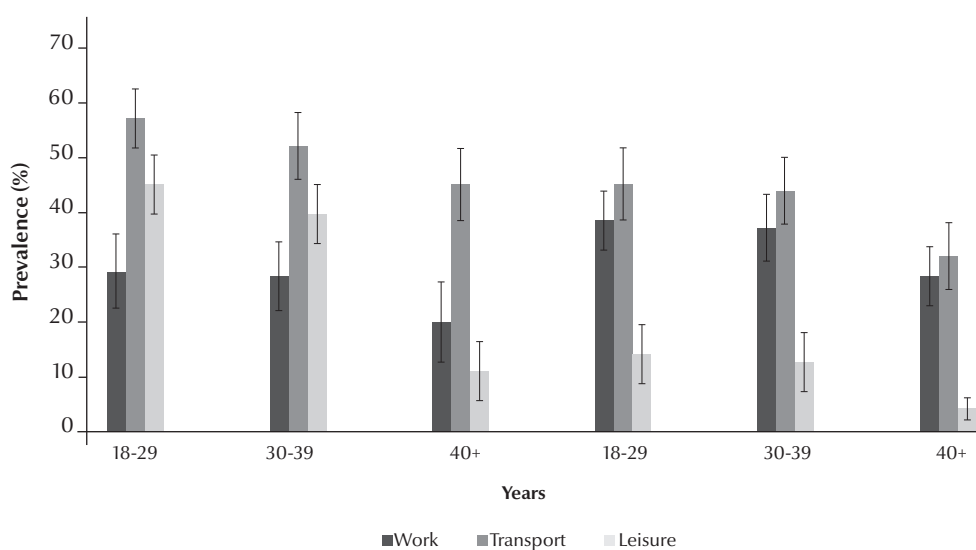


Figure 2 Estimated prevalence of any physical activity in the work, transport and leisure domains among Omani men and women by age, Oman World Health Survey, 2008 (rates weighted to the 2008 Oman population; error bars denote confidence intervals)

Table 1 Percentage of Omani men and women meeting physical activity recommendations by age cohorts and demographic characteristics, Oman World Health Survey, 2008

Sex/demographic variable	18–29 years			30–39 years			40+ years		
	No. ^a	% active ^b	P-value ^c	No. ^a	% ^b	P-value ^c	No. ^a	% active ^b	P-value ^c
Men									
<i>Residence</i>									
Rural	173	66.4	0.540	311	61.4	0.845	318	46.8	0.693
Urban	226	62.3		429	60.3		419	44.9	
<i>Region</i>									
Dhofar (Ref.)	37	28.5	0.002	72	29.9	0.003	72	30.3	0.423
Muscat	28	34.4		83	58.3		81	50.8	
Dakhliya	31	68.0		46	68.3		76	39.5	
North Sharqiyah	52	72.0		95	59.6		67	59.5	
South Sharqiyah	28	73.4		44	49.9		65	37.9	
North Batinah	37	69.0		46	76.7		56	31.2	
South Batinah	50	83.5		51	75.2		51	74.0	
Al-Dhahira	17	70.9		54	64.7		41	46.1	
Musandam	39	79.2		79	59.7		81	46.0	
Al Wusta	63	16.1		102	43.4		105	20.6	
Al Buraymi	17	81.9		68	74.5		42	55.7	
<i>Marital status</i>									
Married	20	66.6	0.871	543	57.2	0.039	644	46.7	0.056
Not married	379	63.3		197	70.2		93	33.0	
<i>Educational level</i>									
Illiterate	2	95.8	0.853	30	47.2	0.866	314	43.4	0.646
< Preparatory	133	63.6		258	63.8		255	45.9	
Secondary+	264	63.4		452	59.8		168	46.6	
<i>Wealth quintile:</i>									
1 (lowest, Ref.)	86	53.2	0.655	245	56.9	0.550	285	46.3	0.585
2	117	64.7		186	60.2		156	47.5	
3	87	71.9		119	73.4		126	43.0	
4	61	72.0		100	70.0		100	49.8	
5	48	49.2		90	46.2		70	39.6	
<i>Work status</i>									
Working	113	58.3	0.387	626	59.1	0.134	413	48.8	0.105
Not working	286	65.1		114	69.7		324	40.1	
Total	399	63.4		740	60.6		737	45.3	
Women									
<i>Residence</i>									
Rural	170	55.5	0.235	285	46.5	0.405	254	31.0	0.518
Urban	202	47.1		414	42.2		348	34.0	
<i>Region</i>									
Dhofar (Ref.)	32	11.5	0.466	88	19.4	0.001	73	24.8	0.775
Muscat	35	54.6		84	36.0		55	32.8	
Dakhliya	31	71.7		76	52.3		83	39.7	
North Sharqiyah	48	63.7		68	51.1		57	53.3	
South Sharqiyah	34	33.3		61	55.3		80	30.1	
North Batinah	29	38.4		57	45.7		64	24.8	
South Batinah	41	73.4		41	70.5		48	47.9	
Al-Dhahira	14	62.2		50	59.1		30	41.7	

Table 1 Percentage of Omani men and women meeting physical activity recommendations by age cohorts and demographic characteristics, Oman World Health Survey, 2008 (concluded)

Sex/demographic variable	18–29 years			30–39 years			40+ years		
	No. ^a	% active ^b	P-value ^c	No. ^a	% ^b	P-value ^c	No. ^a	% active ^b	P-value ^c
Musandam	31	41.0		61	27.9		39	17.5	
Al Wusta	68	11.4		87	12.9		59	6.0	
Al Buraymi	9	41.4		26	48.9		14	36.1	
Marital status									
Married	109	47.2	0.763	580	42.5	0.585	359	37.1	0.058
Not married	263	50.0		119	46.4		243	27.4	
Educational level									
Illiterate	13	71.9	0.458	105	48.4	0.510	425	31.6	0.417
< Preparatory	132	41.8		282	44.1		131	35.1	
Secondary+	227	51.6		312	41.9		46	38.2	
Wealth quintile:									
1 (lowest, Ref.)	108	46.6	0.671	157	35.5	0.584	180	29.0	0.927
2	93	43.7		198	48.9		149	37.2	
3	86	60.6		139	41.4		103	33.9	
4	58	51.4		117	54.2		111	39.4	
5	27	33.8		88	32.4		59	24.6	
Work status									
Working	25	78.0	0.018	126	36.6	0.229	32	41.6	0.435
Not working	347	46.7		573	45.2		570	32.7	
Total	372	49.4		699	43.1		602	33.3	

^aNumber in sample (unweighted); ^bPercentages meeting physical activity recommendations, weighted to the Omani population 2008; ^cUsing weighted logistic regression.

Ref. = reference category.

Table 2 Demographic correlates for Omani men and women meeting physical activity recommendations, Oman World Health Survey 2008 (n = 2977)

Sex/demographic variable	18–29 years			30–39 years			40+ years		
	No. ^a	OR ^b	95% CI	No. ^a	OR ^b	95% CI	No. ^a	OR ^b	95% CI
Men									
Marital status									
Married	19	Ref.		395	Ref.		482	Ref.	
Not married	367	0.95	0.17–5.33	138	2.25	1.25–4.06*	89	0.80	0.43–1.49
Work status									
Working	101	Ref.		425	Ref.		256	Ref.	
Not working	285	1.86	0.92–3.77	108	1.18	0.65–2.16	315	0.78	0.47–1.27
Women									
Marital status									
Married	100	Ref.		481	Ref.		209	Ref.	
Not married	253	1.15	0.53–2.48	110	1.35	0.73–2.50	234	0.58	0.36–0.94*
Work status									
Working	18	Ref.		81	Ref.		13	Ref.	
Not working	335	0.18	0.04–0.73*	510	1.07	0.53–2.15	530	0.65	0.18–2.36

Participants were classified as meeting physical activity recommendations if they did at least 150 minutes of moderate physical activity per week. Data were controlled for geographical region.

^aUnweighted number of participants meeting physical activity recommendations; ^bFrom logistic regression models, adjusted for all other variables in the table, weighted to the 2008 Oman population.

OR = odds ratio; CI = confidence interval; Ref. = reference category.

*P < 0.05.

Table 3 Demographic correlates for Omani men for physical activity in the work, transport and leisure domains by age cohorts, Oman World Health Survey, 2008

Type of activity/demographic variable	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value
			18-29 years				30-39 years				40+ years	
Work-related physical activity												
Residence												
Rural	-	-	-	-	-	-	-	-	-	-	-	-
Urban	-	-	-	-	-	-	-	-	-	-	-	-
Region												
Dhofar	36	Ref.	-	-	58	Ref.	-	-	-	-	-	-
Muscat	27	0.51	0.10 - 2.66	0.423	61	1.67	0.40 - 6.93	0.477	-	-	-	-
Dakhliya	31	6.92	1.58 - 30.29	0.010	40	4.27	1.27 - 14.43	0.019	-	-	-	-
North Sharqiya	51	6.08	1.48 - 25.00	0.012	69	6.28	2.05 - 19.23	0.001	-	-	-	-
South Sharqiya	28	5.22	1.10 - 24.67	0.037	36	0.77	0.17 - 3.52	0.734	-	-	-	-
North Batinah	37	5.29	1.20 - 23.29	0.028	40	7.65	2.11 - 27.77	0.002	-	-	-	-
South Batinah	49	10.23	2.54 - 41.32	0.001	48	6.15	1.93 - 19.65	0.002	-	-	-	-
Al Dhahira	17	5.19	0.98 - 27.57	0.053	40	7.26	2.19 - 24.07	0.001	-	-	-	-
Musandam	36	3.65	0.80 - 16.74	0.096	40	4.05	0.95 - 17.25	0.058	-	-	-	-
Al Wusta	62	0.36	0.05 - 2.74	0.323	75	1.07	0.18 - 6.35	0.944	-	-	-	-
Al Buraymi	12	2.56	0.35 - 18.59	0.353	26	4.31	1.16 - 15.96	0.029	-	-	-	-
(P-value for trend)	-	-	-	< 0.001	-	-	-	< 0.001	-	-	-	-
Marital status												
Married	19	Ref.	-	-	-	-	-	-	-	-	-	-
Not married	367	0.08	0.01-0.38	0.002	-	-	-	-	-	-	-	-
Transport-related physical activity												
Residence												
Rural	-	-	-	-	252	Ref.	-	-	-	-	-	-
Urban	-	-	-	-	281	0.582	0.37-0.93	0.022	-	-	-	-
Region												
Dhofar	36	Ref.	-	-	-	-	-	-	-	-	-	-
Muscat	27	1.21	0.25-5.84	0.811	-	-	-	-	-	-	-	-
Dakhliya	31	8.50	2.58-27.98	<0.001	-	-	-	-	-	-	-	-
North Sharqiya	51	4.71	1.71-12.98	0.003	-	-	-	-	-	-	-	-
South Sharqiya	28	11.45	3.13-41.89	<0.001	-	-	-	-	-	-	-	-

Table 3 Demographic correlates for Omani men for physical activity in the work, transport and leisure domains by age cohorts, Oman World Health Survey, 2008 (continued)

Type of activity/demographic variable	18-29 years			30-39 years			40+ years					
	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value
North Batinah	37	2.10	0.69-6.38	0.189	-	-	-	-	-	-	-	-
South Batinah	49	11.90	3.86-36.66	<0.001	-	-	-	-	-	-	-	-
Al Dhahira	17	14.81	3.29-66.65	<0.001	-	-	-	-	-	-	-	-
Musandam	36	7.90	2.39-26.11	0.001	-	-	-	-	-	-	-	-
Al Wusta	62	0.42	0.10-1.73	0.230	-	-	-	-	-	-	-	-
Al Buraymi	12	3.75	0.91-15.43	0.067	-	-	-	-	-	-	-	-
(P-value for trend)	-	-	-	< 0.001	-	-	-	-	-	-	-	-
Educational level												
Illiterate	-	-	-	-	98	Ref.	-	-	-	-	-	-
< Preparatory	-	-	-	-	258	1.38	0.35-5.49	0.651	-	-	-	-
Secondary+	-	-	-	-	235	0.77	0.20-2.93	0.706	-	-	-	-
(P-value for trend)	-	-	-	-	-	-	-	0.158	-	-	-	-
Leisure-related physical activity												
Residence												
Rural	-	-	-	-	252	Ref.	-	-	-	-	-	-
Urban	-	-	-	-	281	1.30	0.79-2.16	0.302	-	-	-	-
Region												
Dhofar	36	Ref.	-	-	-	-	-	-	-	-	-	-
Muscat	27	3.59	0.53-24.28	0.189	-	-	-	-	-	-	-	-
Dakhliya	31	14.58	3.66-58.03	<0.001	-	-	-	-	-	-	-	-
North Sharqiya	51	9.11	2.47-33.65	0.001	-	-	-	-	-	-	-	-
South Sharqiya	28	10.19	2.43-42.65	0.001	-	-	-	-	-	-	-	-
North Batinah	37	10.57	2.61-42.75	0.001	-	-	-	-	-	-	-	-
South Batinah	49	16.35	4.41-60.66	<0.001	-	-	-	-	-	-	-	-
Al Dhahira	17	16.85	3.60-78.87	<0.001	-	-	-	-	-	-	-	-
Musandam	36	14.17	3.53-56.86	<0.001	-	-	-	-	-	-	-	-
Al Wusta	62	1.03	0.19-5.67	0.969	-	-	-	-	-	-	-	-
Al Buraymi	12	22.73	4.22-122.34	<0.001	-	-	-	-	-	-	-	-
(P-value for trend)	-	-	-	<0.001	-	-	-	-	-	-	-	-

Table 3 Demographic correlates for Omani men for physical activity in the work, transport and leisure domains by age cohorts, Oman World Health Survey, 2008 (concluded)

Type of activity/demographic variable	18-29 years			30-39 years			40+ years		
	No. ^a	OR ^b	P-value	No. ^a	OR ^b	P-value	No. ^a	OR ^b	P-value
Marital status									
Married	-	-	-	395	Ref.	-	-	-	-
Not married	-	-	-	138	2.22	0.004	-	-	-
Educational level									
Illiterate	-	-	-	98	Ref.	-	417	Ref.	-
< Preparatory	-	-	-	258	10.90	0.010	117	5.11	0.001
Secondary+	-	-	-	235	21.69	0.001	9	5.87	0.002
(P-value for trend)	-	-	-	-	-	<0.001	-	-	<0.001
Wealth quintile									
1 (lowest)	-	-	-	111	Ref.	-	-	-	-
2	-	-	-	151	0.90	0.810	-	-	-
3	-	-	-	102	2.17	0.095	-	-	-
4	-	-	-	88	2.30	0.085	-	-	-
5	-	-	-	81	1.27	0.620	-	-	-
(P-value for trend)	-	-	-	-	-	0.082	-	-	-

^aNumber in sample (unweighted); ^bWeighted to the Omani population 2008.
OR = odds ratio; CI = confidence interval; Ref. = reference category.

engagement in physical activity, particularly for women and older adults (1,3,19,20).

The findings about regional variations are perhaps the most striking finding, since health-related studies in Oman are usually limited to the national context. It is unclear, however, how the geographical variations that we found affected physical activity. For example, people in coastal regions were not more active than those in land-locked regions, nor were people in mountainous areas more active compared with those in regions that are largely desert. These regional variations could therefore be attributed to a combination of differences in socioeconomic development, geography, economy and sociocultural context; however, any conclusions made at this point would be speculative given the limited evidence and potential complexity of the factors that may be influential. Thus, research examining regional variations in disease incidence and mortality and their relationship with physical activity and other factors is needed to guide local planning and evaluations of relevant initiatives. Experience from the community-based initiatives in Nizwa and Sur cities could be used to identify potential research foci (21,22).

Interestingly, unmarried men aged 30-39 years were twice as likely to be active, while unmarried women aged 40+ years were half as likely to be active, compared with their married counterparts. A study in Sur, Oman, found a similar association among men of all ages for the leisure domain only, but not among women (11). Similarly, young unmarried women in Saudi Arabia have been found to be less active than married women (23). Two key reviews noted that people who are married were less active than those who were not married (24,25); however, these reflect trends from developed countries. Further research would be useful to better understand the effect that key life events, such as marriage, having children and

Table 4 Demographic correlates for Omani women for physical activity in the work, transport and leisure domains by age cohorts, Oman World Health Survey, 2008 (continued)

Type of activity/ demographic variable	18-29 years						Age cohorts					
	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value
Work-related physical activity												
Region												
Dhofar	-	-	-	-	75	Ref.	-	-	-	-	-	-
Muscat	-	-	-	-	49	0.72	0.17-3.09	0.660	-	-	-	-
Dakhliya	-	-	-	-	73	4.09	1.68-9.91	0.002	-	-	-	-
North Sharqiya	-	-	-	-	59	2.88	1.16-7.19	0.023	-	-	-	-
South Sharqiya	-	-	-	-	59	1.89	0.71-5.06	0.206	-	-	-	-
North Batinah	-	-	-	-	52	2.93	1.06-8.14	0.039	-	-	-	-
South Batinah	-	-	-	-	39	8.69	3.15-23.95	<0.001	-	-	-	-
Al Dhahira	-	-	-	-	46	7.29	2.55-20.85	<0.001	-	-	-	-
Musandam	-	-	-	-	52	2.20	0.82-5.89	0.117	-	-	-	-
Al Wusta	-	-	-	-	72	0.05	0.01-0.27	<0.001	-	-	-	-
Al Buraymi	-	-	-	-	15	7.50	1.80-31.25	0.006	-	-	-	-
(P-value for trend)	-	-	-	-	-	-	-	<0.001	-	-	-	-
Marital status												
Married	-	-	-	-	-	-	-	-	309	Ref.	-	-
Not married	-	-	-	-	-	-	-	-	234	0.59	0.35-0.97	0.037
Wealth quintile												
1 (lowest)	-	-	-	-	169	Ref.	-	-	-	-	-	-
2	-	-	-	-	139	0.63	0.26-1.49	0.292	-	-	-	-
3	-	-	-	-	93	0.60	0.26-1.39	0.235	-	-	-	-
4	-	-	-	-	96	0.37	0.16-0.88	0.025	-	-	-	-
5	-	-	-	-	46	0.55	0.19-1.64	0.285	-	-	-	-
(P-value for trend)	-	-	-	-	-	-	-	0.247	-	-	-	-

Table 4 Demographic correlates for Omani women for physical activity in the work, transport and leisure domains by age cohorts, Oman World Health Survey, 2008 (concluded)

Type of activity/ demographic variable	18-29 years			Age cohorts 30-39 years			40+ years					
	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value	No. ^a	OR ^b	95% CI	P-value
Transport-related physical activity												
Residence												
Rural	167	Ref.	-	-	-	-	-	-	-	-	-	-
Urban	186	0.52	0.29-0.91	0.022	-	-	-	-	-	-	-	-
Region												
Dhofar	-	-	-	-	75	Ref.	-	-	64	Ref.	-	-
Muscat	-	-	-	-	49	1.17	0.35-3.87	0.798	37	1.84	0.52-6.45	0.342
Dakhliya	-	-	-	-	73	2.69	1.19-6.05	0.017	82	4.71	1.81-12.24	0.001
North Sharqiya	-	-	-	-	59	5.29	2.26-12.42	<0.001	51	7.29	2.63-20.24	<0.001
South Sharqiya	-	-	-	-	59	4.12	1.72-9.91	0.002	77	3.21	1.20-8.61	0.020
North Batinah	-	-	-	-	52	4.07	1.56-10.58	0.004	63	1.39	0.47-4.05	0.551
South Batinah	-	-	-	-	39	7.53	2.90-19.51	<0.001	42	11.46	3.94-33.29	<0.001
Al Dhahira	-	-	-	-	46	4.21	1.63-10.87	0.003	29	6.84	2.21-21.16	0.001
Musandam	-	-	-	-	52	1.52	0.61-3.81	0.374	35	3.70	1.18-11.54	0.024
Al Wusta	-	-	-	-	72	0.72	0.26-1.95	0.514	54	0.61	0.18-2.12	0.441
Al Buraymi	-	-	-	-	15	2.84	0.80-10.09	0.105	9	2.61	0.48-14.13	0.266
(P-value for trend)	-	-	-	-	-	-	-	< 0.001	-	-	-	< 0.001
Educational level												
Illiterate	-	-	-	-	-	Ref.	-	-	-	-	-	-
< Preparatory	-	-	-	-	-	0.93	0.45-1.91	0.837	-	-	-	-
Secondary+	-	-	-	-	-	0.71	0.33-1.49	0.362	-	-	-	-
(P-value for trend)	-	-	-	-	-	-	-	0.517	-	-	-	-
Leisure-related physical activity												
Marital status												
Married	100	Ref.	-	-	-	-	-	-	309	Ref.	-	-
Not married	253	0.05	0.01-0.31	0.001	-	-	-	-	234	5.92	1.16-30.08	0.032

^aNumber in sample (unweighted); ^bWeighted to the Omani population 2008.
OR = odds ratio; CI = confidence interval; Ref. = reference category.

retirement, have on physical activity in Oman (26).

The Omani adult population was found to be least active in the leisure domain compared with the transport and work domains, a similar pattern seen in other developing countries (27,28). In the coming years it is likely that work activity will decrease and may not be replaced with active transport and leisure, a trend seen in both developed and developing countries (29). Evidence indicates that geography and the built environment influence activity in developed countries (30). Establishing mass public transportation and shaping the urban environment to encourage active living are among the 7 best investments for physical activity (31). The evaluation of the Nizwa Healthy Lifestyle Initiative in Oman suggested that provision of gender-segregated walkways could increase levels of physical activity for both men and women (21). However, further research is required to identify strategies to encourage transport and leisure activities that are gender-relevant and appropriate for the hot arid climate.

WHO encourages implementing mass campaigns for physical activity as one of the most cost-effective interventions ("best buys") to address physical inactivity (7). The evidence from our study suggests that physical activity campaigns need to target women, men and younger and older age cohorts

differently according to the domain of activity. Targeting campaigns to the younger age groups is a particular priority since the Omani population is very young (66% are under the age of 30 years) (32). Although this study found a higher prevalence of physical activity among the youngest cohorts, it is likely that this will decrease unless efforts are made to promote physical activity, since the prevalence of physical activity is already low in adolescents (22.0%), especially among girls (15.4%) (33). Evidence indicates that campaigns need to be designed not only to raise awareness about the benefits of physical activity and provide examples of how to overcome common barriers (i.e. limited time, lack of social support) but also to address cultural norms that place a low value on physical activity and restrict women's and girls' participation in physical activity (19). Further research would be useful to identify the best strategies.

Our study had some limitations. First, sampling was designed for national representation, not regions; thus, further research is required to confirm the regional variations observed in this study. Second, although the GPAQ has been used in several Arab countries, it has not been validated for Arab populations (34). Third, it is possible that some people were misclassified and thus prevalence could be over- or underestimated. Fourth, the dataset used for this

analysis was collected 7 years ago and it is likely that the situation has changed; fortunately, plans are underway to conduct a national survey by early 2016 which will be key for monitoring trends in physical activity.

In conclusion, the evidence from this study indicates that physical activity initiatives in Oman need to target women, men and age groups differently according to the physical activity domain. Raising broader public awareness through conducting mass communication campaigns and mobilizing support for addressing the built environment, and especially targeting younger people, is needed so that Oman can meet the voluntary global targets for physical activity sufficient for health benefits. Further research is required to understand regional variations and to identify culturally appropriate strategies.

Acknowledgements

Funding: The authors acknowledge the support provided by the Ministry of Health, Oman for providing the raw data. N. Owen's contributions were supported by the National Health and Medical Research Council of Australia Program Grant [#566940] and Senior Principal Research Fellowship [# 1003960].

Competing interests: None declared.

References

- Rahim HF, Sibai A, Khader Y, Hwalla N, Fadhil I, Alsiyabi H, et al. Non-communicable diseases in the Arab world. *Lancet*. 2014 Jan 25;383(9914):356-67. PMID:24452044
- Ng SW, Zaghoul S, Ali HI, Harrison G, Popkin BM. The prevalence and trends of overweight, obesity and nutrition-related non-communicable diseases in the Arabian Gulf States. *Obes Rev*. 2011 Jan;12(1):1-13. PMID:20546144
- Al-Lawati JA, Mabry R, Mohammed AJ. Addressing the threat of chronic diseases in Oman. *Prev Chronic Dis*. 2008 Jul;5(3):A99. PMID:18558048
- Al Riyami AA, Afifi MM. Hypertension in Oman: distribution and correlates. *J Egypt Public Health Assoc*. 2002;77(3-4):383-407. PMID:17216969
- Al Riyami A, Elaty MA, Morsi M, Al Kharusi H, Al Shukaily W, Jaju S. Oman world health survey: part I-methodology, sociodemographic profile and epidemiology of non-communicable diseases in Oman. *Oman Med J*. 2012 Sep;27(5):425-43. PMID:23074559
- Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. Resolution submitted by the President of the General Assembly at the Sixty-sixth session of the General Assembly of the United Nations, Agenda item 117. New York: United Nations; 2011 (A/RES/66/2) (http://www.who.int/nmh/events/un_ncd_summit2011/political_declaration_en.pdf?ua=1, accessed 5 December 2015).
- Global status report on noncommunicable diseases 2014. Geneva: World Health Organization; 2014.
- Physical Activity Guidelines Advisory Committee report. Washington (DC): US Department of Health and Human Services; 2008.

9. World Health Survey, Oman, 2008. Muscat, Oman: Director of Health Information and Statistics, Directorate General of Planning, Ministry of Health; 2012.
10. Helmi S, El Sayed M, Oman H. A KAP survey on lifestyle among students in universities, colleges and other high educational institutes. Muscat, Oman: Ministry of Health; 2008.
11. Mabry RM, Winkler EA, Reeves MM, Eakin EG, Owen N. Correlates of Omani adults' physical inactivity and sitting time. *Public Health Nutr.* 2013 Jan;16(1):65-72. PMID:22626450
12. World Health Survey. Geneva: World Health Organization; 2013 (<http://apps.who.int/healthinfo/systems/surveydata/index.php/catalog/whs/about>, accessed 5 December 2015).
13. WHO STEPS surveillance manual: the WHO STEPwise approach to chronic disease risk factor surveillance. Geneva: World Health Organization; 2005.
14. Al Riyami A, Elaty MA, Morsi M, Al Kharusi H, Al Shukaily W, Jaju S. Oman world health survey: part 1-methodology, sociodemographic profile and epidemiology of non-communicable diseases in Oman. *Oman Med J.* 2012 Sep;27(5):425-43. PMID:23074559
15. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U; Lancet Physical Activity Series Working Group. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet.* 2012 Jul 21;380(9838):247-57. PMID:22818937
16. Prevalence of regular physical activity among adults-United States, 2001 and 2005. *MMWR Morb Mortal Wkly Rep.* 2007 Nov 23;56(46):1209-12. PMID:18030281
17. Physical activity patterns of Australian adults. Canberra: Australian Institute of Health and Welfare; 2000.
18. Mabry RM, Reeves MM, Eakin EG, Owen N. Evidence of physical activity participation among men and women in the countries of the Gulf Cooperation Council: a review. *Obes Rev.* 2010 Jun;11(6):457-64. PMID:19793376
19. Mabry RM, Al-Busaidi ZQ, Reeves MM, Owen N, Eakin EG. Addressing physical inactivity in Omani adults: perceptions of public health managers. *Public Health Nutr.* 2014 Mar;17(3):674-81. PMID:23347388
20. Ali HI, Baynouna LM, Bernsen RM. Barriers and facilitators of weight management: perspectives of Arab women at risk for type 2 diabetes. *Health Soc Care Community.* 2010 Mar;18(2):219-28. PMID:20059569
21. Nizwa healthy lifestyle evaluation report. Muscat, Oman: Ministry of Health; 2012.
22. Healthy lifestyle study. Assessment of lifestyle risk factors among Sur city population. Muscat, Oman: Ministry of Health; 2006
23. Khalaf A, Ekblom Ö, Kowalski J, Berggren V, Westergren A, Al-Hazzaa H. Female university students' physical activity levels and associated factors—a cross-sectional study in southwestern Saudi Arabia. *Int J Environ Res Public Health.* 2013 Aug;10(8):3502-17. PMID:23939387
24. Bauman AE, Sallis JF, Dzewaltowski DA, Owen N. Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *Am J Prev Med.* 2002 Aug;23(2) Suppl:5-14. PMID:12133733
25. Trost SG, Owen N, Bauman AE, Sallis JF, Brown W. Correlates of adults' participation in physical activity: review and update. *Med Sci Sports Exerc.* 2002 Dec;34(12):1996-2001. PMID:12471307
26. Brown WJ, Trost SG. Life transitions and changing physical activity patterns in young women. *Am J Prev Med.* 2003 Aug;25(2):140-3. PMID:12880882
27. Guthold R, Louazani SA, Riley LM, Cowan MJ, Bovet P, Damasceno A, et al. Physical activity in 22 African countries: results from the World Health Organization STEPwise approach to chronic disease risk factor surveillance. *Am J Prev Med.* 2011 Jul;41(1):52-60. PMID:21665063
28. Ng N, Hakimi M, Van Minh H, Juvekar S, Razzaque A, Ashraf A, et al. Prevalence of physical inactivity in nine rural INDEPTH Health and Demographic Surveillance Systems in five Asian countries. *Glob Health Action.* 2009;2:2. PMID:20027261
29. Ng SW, Popkin BM. Time use and physical activity: a shift away from movement across the globe. *Obes Rev.* 2012 Aug;13(8):659-80. PMID:22694051
30. Durand CP, Andalib M, Dunton GF, Wolch J, Pentz MA. A systematic review of built environment factors related to physical activity and obesity risk: implications for smart growth urban planning. *Obes Rev.* 2011 May;12(5):e173-82. PMID:21348918
31. The Toronto Charter for Physical Activity: a global call to action. Global Advocacy for Physical Activity/International Society for Physical Activity and Health; 2010.
32. Annual health report, 2013. Muscat, Oman: Director of Health Information and Statistics, Directorate General of Planning, Ministry of Health; 2014.
33. Oman global school-based student health survey, 2010. Muscat, Oman: Ministry of Health Oman; 2012.
34. Bull FC, Maslin TS, Armstrong T. Global physical activity questionnaire (GPAQ): nine country reliability and validity study. *J Phys Act Health.* 2009 Nov;6(6):790-804. PMID:20101923