Osong Public Health Res Perspect 2014 5(1), 20–27
http://dx.doi.org/10.1016/j.phrp.2013.12.002
pISSN 2210-9099 eISSN 2233-6052

ORIGINAL ARTICLE

The Determinants of Participation in Physical Activity in Malaysia

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Received: December 2, 2013
Revised: December 19, 2013
Accepted: December 26, 2013

KEYWORDS:
demography,
health,
Malaysia,
participation,
physical activity

Abstract
Objectives: In light of the importance of physical activity, the aim of the present study is to examine the factors affecting participation in physical activity among adults in Malaysia.
Methods: A logistic regression model and the Third National Health and Morbidity Survey consisting of 30,992 respondents were used.
Results: Age, income, gender, education, marital status, region, house locality, job characteristics, and medical conditions are significantly associated with participation in physical activity. In particular, old individuals, high income earners, females, the well-educated, widowed or divorced individuals, East Malaysians, urban dwellers, the unemployed, and individuals who are not diagnosed with hypercholesterolemia are less likely to be physically active than others.
Conclusion: Because sociodemographic and health factors play an important role in determining physical activity, the government should take them into account when formulating policy.

1. Introduction

Physical inactivity is a leading risk factor of mortality and morbidity worldwide. Each year, about 3 million deaths and 32 million disability-adjusted life years are associated with physical inactivity [1]. Physical inactivity increases the risks of noncommunicable diseases such as diabetes, stroke, cancer, and cardiovascular diseases [1–3]. Nicklett et al [4] found physically active adults to be 40–50% less likely to die prematurely than physically inactive adults. Helmrich et al [5] and LaMonte et al [6] found that frequent participation in physical activity could reduce the likelihood of acquiring diabetes by up to 45%. In Malaysia, 36% of adults did not adopt a physically active lifestyle [7]. Using the Malaysian Adults Nutrition Survey and a

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Penang (Malaysia) sample, Poh et al [8] and Cheah [9], respectively, found alarming evidence that only 11−15% of adults in Malaysia were physically active.

Because physical activity plays an important role in preventing diseases, there is a growing number of studies examining the factors affecting participation in physical activity in well-developed countries [3,10−15]. The studies found that sociodemographic and health factors such as income, age, gender, education, marital status, ethnicity, and self-perceived health status could affect an individual's decision to participate in physical activity. Although a better understanding of the factors associated with participation in physical activity is important, there is only one nationwide study focusing on this topic in Malaysia [8]. However, the study did not explore the likelihood of participating in physical activity among the respondents, and also did not consider the influence of health on participation in physical activity. The aim of the present study is to fill this research gap.

Briefly, the contributions of the present study to the literature and society are four fold. First, in addition to sociodemographic variables, the present study includes several important health variables such as being diagnosed with hypertension, hypercholesterolemia, or diabetes. Second, a nationally representative data consisting of a large sample size and detailed information on an individual's sociodemographic, lifestyle, and health profiles is used for a robust analysis. Third, the focus of the present study is on a multiethnic developing country, Malaysia, where physically inactive adults are highly prevalent and only a few studies exist. Fourth, the findings of the present study can provide the government with baseline information for policy development.

2. Materials and methods

2.1. Data

This study used data from the Third National Health and Morbidity Survey, which was a nationally representative cross-sectional population-based survey conducted by the Ministry of Health Malaysia over the period from April 2006 to January 2007. The survey covered all urban and rural areas in the 13 states of Malaysia, as well as the Federal Territory of Kuala Lumpur, Malaysia. Following the sampling frame designed by the Department of Statistics Malaysia, a two-stage stratified sampling approach proportionate to the size of the population in Malaysia was used to collect the data. The first stage sampling unit was based on geographically contiguous areas of the country [enumeration blocks (EB)]. The second stage sampling unit was based on the Living Quarters (LQ) in each EB, and all the households and individuals that resided in the selected LQ participated. In particular, each EB consisted of 80-120 LQ with a population of about 600. The EB were based on the population of gazetted and built-up areas [i.e., urban (population $\geq$ 10,000) and rural (population $<$ 10,000)].

The inclusion criteria of the survey were: (1) all adults aged 18 years and above; (2) both sexes; (3) all ethnic groups; and (4) Malaysian citizens. The target sample size was calculated based on three criteria: (1) 95% confidence interval; (2) the prevalence and response rate of the Second National Health and Morbidity Survey; and (3) the calculated margin of error and design effect. More detailed information about this calculation was published previously [16]. The calculated target sample size was 34,539 respondents, which represented 12,923,504 Malaysian adults. The targeted household member was classified as "no response" after three consecutive unsuccessful visits. The overall response rate was about 98.20% (33,933 respondents).

The piloted bilingual (*Bahasa Malaysia* and English) questionnaires were used by the trained health professionals to interview face-to-face the respondents. During the interview, the respondents were asked to report their sociodemographic, lifestyle, and health profiles. Meanwhile, if the respondents reported that they did not have hypertension or hypercholesterolemia, their blood pressure and blood cholesterol were examined by the health professionals using Omron Digital Automatic Blood Pressure Monitor Model HEM-907 and Accutrend GC—Roche Diagnostic's battery-operated gluco-photometer. The respondents were classified as having hypertension if their systolic blood pressure was $\geq$140 mmHg and diastolic blood pressure was $\geq$90 mmHg, and were classified as having hypercholesterolemia if their blood cholesterol was $\geq$5.2 mM. If the respondents reported that they were not diabetics, their blood glucose was tested using Accutrend GC. If the respondents' blood glucose was $\geq$6.1 mM (after 8 hours of fasting), they were referred to the nearest clinics or hospitals for further examination.

2.2. Dependent variable

Physical activity was defined as "any bodily movement produced by the skeletal muscles resulting in energy consumption" [17]. Following the guideline of Ministry of Health Malaysia, the respondents who spent at least 150 minutes/week in moderate or 60 minutes/week in vigorous physical activities (including work, travel, and leisure) were considered as physically active, otherwise they were considered as physically inactive. The details of this measurement were published previously [16].

2.3. Independent variables

Based on the previous studies examining the factors affecting participation in physical activity [3,10,11,15,18−21] the following sociodemographic and health variables were hypothesized to have significant impacts on individuals' likelihood of being

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