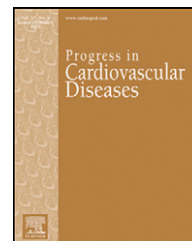


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Inadequate Physical Activity and Health Care Expenditures in the United States



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ABSTRACT

This study estimates the percentage of health care expenditures in the non-institutionalized United States (U.S.) adult population associated with levels of physical activity inadequate to meet current guidelines. Leisure-time physical activity data from the National Health Interview Survey (2004–2010) were merged with health care expenditure data from the Medical Expenditure Panel Survey (2006–2011). Health care expenditures for inactive (i.e., no physical activity) and insufficiently active adults (i.e., some physical activity but not enough to meet guidelines) were compared with active adults (i.e., ≥ 150 minutes/week moderate-intensity equivalent activity) using an econometric model. Overall, 11.1% (95% CI: 7.3, 14.9) of aggregate health care expenditures were associated with inadequate physical activity (i.e., inactive and insufficiently active levels). When adults with any reported difficulty walking due to a health problem were excluded, 8.7% (95% CI: 5.2, 12.3) of aggregate health care expenditures were associated with inadequate physical activity. Increasing adults' physical activity to meet guidelines may reduce U.S. health care expenditures.

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Regular physical activity is associated with important health benefits, including reduced risk for premature death, cardiovascular disease, ischemic stroke, type 2 diabetes, colon and breast cancers, and depression.¹ Current national guidelines for aerobic physical activity recommend for substantial health benefits, adults should participate weekly in at least 150 minutes of moderate-intensity aerobic activity, at least 75 minutes of vigorous-intensity aerobic activity, or an equivalent combination.² Despite the health benefits, fewer than half of United States (U.S.) adults met the minimal guidelines for aerobic activity and almost one-third of adults were physically inactive in 2011.³

Population levels of physical activity inadequate to meet current guidelines can place a health burden on the U.S.

population that results in higher health care expenditures. Many studies quantify this burden by estimating the percentage of health care costs associated with physical inactivity using a population-attributable fraction approach.^{4–9} This approach combines risk, prevalence, and aggregate cost estimates from unlinked sources.^{4–9} Costs calculated from unlinked sources can be biased if the characteristics of the source populations differ or if measures of physical inactivity differ across sources.

Studies using individual physical activity data linked to health care expenditure data overcome many of the limitations associated with estimates calculated using a population-attributable fraction approach.^{10–18} Studies using linked data show that an individual's physical activity level is associated

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Abbreviations and Acronyms

BMI = Body Mass Index

MEPS = Medical Expenditure Panel Survey

NHIS = National Health Interview Survey

U.S. = United States

with health care expenditures, but these studies have limitations, such as selected study populations,^{11–17} lack of adequate control for confounding characteristics,^{10,13,18} and measures of physical activity that do not match current guidelines.^{10–12,14–18} In addition,

while these studies compare estimates of per person costs associated with different levels of physical activity, they do not provide estimates of the population level burden associated with inadequate physical activity. To our knowledge, no study uses linked individual data to estimate the percentage of health care expenditures associated with inadequate levels of aerobic physical activity defined using current guidelines criteria.

Studies have consistently shown that obese persons have higher health care expenditures than normal weight persons.^{11,13,19–21} One pathway by which physical activity may influence health care expenditures is through its role in weight management.¹ Given this potential pathway, adjusting estimates of the association between physical activity and health care expenditures for an individual's obesity status may be overly conservative. Therefore, it is important to examine estimates of the percentage of health care expenditures associated with inadequate levels of physical activity with and without adjustment for obesity status.

Using linked individual data, this study examines the association of leisure-time aerobic physical activity (defined using current guidelines) and health care expenditures in a nationally representative sample of non-institutionalized U.S. adults with and without adjusting for obesity status. These results are then applied to estimate the percentage of overall health care expenditures associated with levels of physical activity inadequate to meet current guidelines.

Methods

Data

Data from the National Health Interview Survey (NHIS) (2004–2010) and the Medical Expenditure Panel Survey (MEPS) (2006–2011) were merged at the individual level. The NHIS is a multistage probability sample survey of U.S. households conducted annually. Data on physical activity are collected during the sample adult interview. The MEPS uses the same sampling frame as the NHIS. Respondents from the previous 2 years of NHIS are included in each MEPS year. MEPS response rates for study years range from 53.5% (2010) to 59.3% (2008). Additional information about the design of the NHIS and the MEPS are described elsewhere.^{22,23}

There were 57 987 MEPS records for adults age 21 years or older with a linkable NHIS sample adult record. Adults missing data on covariates or physical activity were excluded

($n = 3627$). Adults who were pregnant during the MEPS year or at the NHIS interview (2141) or who reported being unable to do physical activity (1054) were excluded from all analyses.

Measures

Physical activity level

In the NHIS, adults were asked how often and, if applicable, the duration during leisure-time they participated for at least 10 minutes at a time, in 1) vigorous-intensity activities (i.e., heavy sweating or large increases in breathing or heart rate) and 2) light- or moderate-intensity activities (i.e., light sweating or slight to moderate increases in breathing or heart rate). To classify adults into levels of physical activity, minutes of moderate-intensity equivalent physical activity were calculated by counting 1 minute of vigorous-intensity activity as 2 minutes of light- or moderate-intensity activity.² Respondents were then classified into three activity levels using current guidelines: 1) active, reporting at least 150 minutes/week of moderate-intensity equivalent physical activity; 2) insufficiently active, reporting some moderate-intensity equivalent physical activity but not enough to meet active definition; 3) inactive, reporting no moderate-intensity equivalent physical activity that lasted at least 10 minutes.²

Health care expenditures

A continuous variable of yearly total direct health care expenditures was calculated (includes expenditures for all services: inpatient, outpatient, emergency room, office-based, dental, vision, home health, prescription drug, and other). The Personal Health Care Expenditure Price Index was used to adjust all expenditures to 2012 dollars.²⁴

Covariates

Covariate data from the MEPS dataset included: sex, age (in years: 21–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80 and older), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other), marital status (married, widowed, divorced/separated, never married), census region (Northeast, Midwest, South, West), metropolitan statistical area (MSA, non-MSA), poverty level (household income as a percentage of federal poverty level: less than 100%, 100–199%, 200–399%, 400% or more), health insurance status (coverage for the year: any private coverage, Medicare and Medicaid, Medicare only, Medicaid only, uninsured), and MEPS year. Covariate data from the NHIS dataset included: education level (less than high school graduate, high school graduate, some college, college graduate), smoking status (current, former, never), and body mass index (BMI) category. BMI was calculated using self-reported weight and height and was categorized as underweight ($<18.5 \text{ kg/m}^2$), normal weight ($18.5\text{--}25 \text{ kg/m}^2$), overweight ($25\text{--}30 \text{ kg/m}^2$), and obese ($\geq 30 \text{ kg/m}^2$).²⁵

Statistical analysis

To capture the skewed nature of health care expenditure data, a four-part econometric model was used.^{20,26} In this four-part model, two probit models predicted the probability of having a positive health care expenditure and, among those with a

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