Limitations on the Use of a Single Screening Question to Measure Sedentary Behavior

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Tracking health behaviors is an important component of chronic disease surveillance programs. Among applicable health behaviors, physical activity has been associated with lower mortality and morbidity, whereas physical inactivity or sedentary behavior has been associated with increased mortality and morbidity. Thus, the prevalence of participation in physical activity in a community population provides important information for public health action.

Questionnaires are the most commonly used tool for assessing the prevalence of health behaviors in population-based surveillance systems. Because of the cost of large surveys, questionnaires usually are designed to classify a behavior with the fewest number of questions possible. Although a shorter survey is desirable for reducing costs, it could limit the ability to draw inferences about specific outcomes of interest. For example, to examine fitness-related outcomes, a single question has reasonable validity in some, but not all, studies. However, to determine health-related outcomes associated with moderate-intensity physical activity, the intensity, frequency, and duration of the activity must be determined. Because of the difficulty in characterizing the various components of physical activity, surveillance efforts focused on physical inactivity may be more efficient than trying to identify physically active individuals.

This study assessed the limitations associated with use of the physical activity screening question from the state-based Behavioral Risk Factor Surveillance System (BRFSS) to identify sedentary behavior and the applicability of this screening question to designing and tracking community interventions.

METHODS

Data were collected by telephone between November 1999 and May 2000 in a protocol adapted from the BRFSS. The study sample for this investigation was obtained by national random-digit dialing of households with telephones in the 48 contiguous states. A screening procedure was used to exclude group homes and businesses. To ensure accurate prevalence estimates, a 95% confidence level with a 5% error margin was used to guide the sampling requirements.

For each sampled telephone number, interviewers determined household eligibility and identified the person within the household who would be available to complete the interview. Up to 5 attempts were made to complete the interview with the selected household member. In all cases, attempts to contact households were rotated through weekday daytime, weekday evening, and weekend hours. Interviewers asked the first available eligible person 18 years or older in each household to complete the survey after providing informed consent. All prevalence estimates were age adjusted to the year 2000 standard population.

Between 1997 and 1999, the Physical Activity and Health Branch at the Centers for Disease Control and Prevention developed a telephone-administered questionnaire to measure physical activity. The validation process was complex and ongoing. Initial versions of the questions, validated with Spearman rank correlations with activity logs and accelerometers, were found to have reasonable validity in assessing total physical activity. However, the questions did not perform well in distinguishing moderate from vigorous activities. On the basis of these results and those of the cognitive testing conducted by the National Center for Health Statistics, questions were modified for clarity, and additional examples of appropriate activities for moderate or vigorous categories were included. Finally, 4 states piloted these questions as part of the 1999 BRFSS and provided important data on the practicality of using the questions in a telephone survey.

The final version of the questionnaire was administered to a national sample, along with a second physical activity questionnaire (used in the 2000 BRFSS) and basic demographic items (age, sex, education). The entire interview lasted approximately 4 minutes.

Data from the national telephone survey (n=7529) were used to compare responses to a screening question (used in the 2000 BRFSS) with responses to a new set of leisure-time physical activity questions (to be used in future BRFSS surveys). The screening question asked, "In the past month, other than your regular job, did you do any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Typically, persons answering no to this question were considered sedentary (defined as not active in leisure time) and were not asked any further questions about physical activity.
In this study, regardless of the response to the screening question, respondents were asked specifically about leisure-time moderate and vigorous activities. Answers to questions about moderate and vigorous activity during leisure time were used to assess compliance with health-related recommendations. The criteria for meeting recommendations for moderate-intensity activities are participation on 5 or more days per week for 30 or more minutes per day; for vigorous-intensity activity, the criteria are participation on 3 or more days per week for 20 or more minutes per day. Respondents who met the criteria for either moderate or vigorous activities (or both) were classified as meeting recommended health-related levels of physical activity. The criteria for determining compliance with health-related physical activity guidelines were adopted from Physical Activity and Health: A Report of the Surgeon General.5

RESULTS

The sample included 3001 men and 4528 women. The distribution of age and educational level for men and women in the sample is shown in Table 1.

On the basis of the screening question, 25% of the respondents would have been classified as sedentary (i.e., did not do any leisure-time physical activities during the past month). However, when responses to specific questions about moderate and vigorous activities were considered, only 15% reported no participation in leisure-time activities in the past week.

When recommended levels of activity were calculated, 20% of the 1878 who were identified as sedentary by the screening question actually met health-related recommendations based on leisure-time activity (5% of the whole sample). This means that of the 41% who met the health-related recommendations based on the new battery of questions, 5% would have been misclassified as sedentary based on the screening question alone. Figure 1 illustrates the percentages of activity that were missed by the screening question for different categories, including recommended activity, moderate activity, and vigorous activity.

DISCUSSION

The findings from this study highlight the difficulty of measuring a complicated construct such as “no leisure-time physical activity” or “sedentary behavior” with 1 screening question in a telephone survey format. In this study, we assessed additional activities among all respondents, regardless of their response to the screening question, and found that many who responded negatively to the screening question actually had engaged in various types of physical activity.

One reason for this misclassification of sedentary behavior may be the lack of understanding by respondents of the broad range of activities that could be included as physical activity or exercise. Without examples or
physiologic descriptors, activities such as yard work and some household tasks may not be interpreted as "leisure-time physical activity or exercise" by the respondent, leading to a negative response to the screening question. This problem is complicated by the leisure-time terminology and the unclear role of transportation and household activity as they contribute to overall health-related physical activity. However, recent evidence suggests that everyday activities can play a role in health-related fitness. Classifying individuals who engage in lifestyle activities, but not sports-related activities, as sedentary may cause researchers to miss an important aspect of physical activity. From a public health perspective, important differences exist between adults who participate in some activity and those who are completely inactive.

On the positive side, only 5% of the population was misclassified when moderate and vigorous activities were combined to reflect a "recommended" leisure-time physical activity level; therefore, the estimated percentage of adults who engage in the recommended level of physical activity would not be greatly affected if only those who responded positively to the screening question were queried about the intensity, frequency, and duration of their activities. Unfortunately, it is often not possible to obtain information on additional activities, so the sedentary label is applied to those who respond negatively to the screening question without further examination of activity patterns. Many of the 1878 who were classified as sedentary reported engaging in moderate or vigorous activity at least once a week. These results show that the prevalence of sedentary behavior would be 15% instead of 25% (based on the screening question) if physical activity were more broadly defined to include common moderate- and vigorous-intensity activities and if all respondents were given an opportunity to report these activities.

In summary, many people who were classified as sedentary based on the screening question actually may be participating in some amount of activity. Having detailed information is important, because findings from surveillance programs often serve to inform, direct, and evaluate public health action. Community-based interventions to increase physical activity levels can be more effective if the goal is to move individuals to the next stage rather than to the optimal stage. The intervention messages for motivating people who perform different levels of physical activity will necessarily differ; completely sedentary individuals will need specific messages to encourage them to engage in at least a low level of physical activity, whereas those who already participate in low levels of activity will need a different message to prompt them to increase their activities enough to meet health-related recommendations.

Use of a single screening question to identify a target group for public health messages has the effect of combining those who do nothing with those who do some activity, thus complicating the public health message. In evaluating the effect of public health programs to increase physical activity, it may be reasonable to assess what proportion of the population has moved from the completely sedentary category to the next category, even if these persons are not yet at the recommended levels of physical activity. Relying on this 1 screening question for surveillance purposes over time might miss important changes in physical activity behaviors that are occurring at the population level.

The BRFSS physical activity questions were significantly changed for the 2001 survey year, and the screening question used here is being considered as a way to monitor long-term trends in physical activity (this question has been used since 1984 in the BRFSS). The prevalence of sedentary behavior found in the current study (25%) is generally the same as that found by BRFSS data in previous years. Use of this screening question may be appropriate for examining long-term trends, but it is less useful for developing or evaluating public health programs in which the goal is to increase physical activity along a continuum, because subtle changes in the type or intensity of activity may not be well measured.

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Contributors
C.A. Macera and S.A. Ham planned the overall study and wrote the first draft. C.A. Macera, D.A. Jones, and C.D. Kinney developed the questionnaire. B.E. Ainsworth and L.J. Neff validated the questionnaire and supervised data collection. S.A. Ham analyzed and interpreted the data. All authors contributed to the writing and revising of the paper.

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