

Leisure time physical activity in Scotland: Trends 1987–1991 and the effect of question wording

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Studies from several countries have shown changes in physical activity behavior for exercise. Swiss data from several surveys showed a large increase between 1977 and 1985 in the proportion of the population engaging in a sports activity at least once a week¹; this increase was observed among all age groups and both sexes. Most of the increase in Switzerland seems to have resulted from a decrease in the sedentary proportion of the population, only a small shift could be observed in the direction of more vigorous activities. In Finland a strong increase in physical activity during leisure time was observed², however the increase was mainly explained by a shift from low effort to relatively high effort physical activities. No change was found in the proportion of the sedentary Finnish population, and the increase was particularly strong among the lower occupational groups. In the USA and Canada an increase in physical activity for exercise was found between 1972 and 1983³. This increase seems to be particularly pronounced among females and the higher age groups. It has been stressed on several occasions that, as in Finland, the increase in physical activity behavior in North America during the last decade has been mainly caused by a shift from low to high effort physical activity for exercise and that hardly any change in the sedentary proportion of the population could be observed^{1,4}.

This paper focuses on changes in the proportion of sedentary individuals in the population. Data have been collected on exercise behavior in the metropolitan areas of Edinburgh and Glasgow, for the age groups 18 to 44 years since July 1987. This data has been discussed in depth from a cross-sectional perspective for 1989, including respondents from London and respondents in the age groups 45 to 60, in Uitenbroek and McQueen⁵. This article examines the data from the perspective of reported changes in physical activity behavior between July 1987 and June 1991.

Between July 1987 and December 1988 the respondents were asked if they had engaged in physical activity for exercise, such as walking, running or swimming, in the previous month. In January 1989 this was changed to engaging in physical activity without the prompt to walking, running or swimming. In the analysis therefore both change due to real change in physical activity and change due to the change in the question have to be taken into

consideration. This is done using a logistic regression method.

The aim of this paper is twofold: 1) to account for changes in physical activity between 1987 and 1991; 2) to explore the effect of the change in the question wording. Differences between different socio-demographic groups of respondents and differences between different physical activities will be considered.

Subjects and Methods

The data analyzed are based upon daily interviews carried out by computer assisted telephone interviewing (CATI) between July 1987 and June 1991, no data were collected in July 1988 and in April 1991. The respondents were selected using a two stage procedure: 1) household telephone numbers were selected by a random digit dialing procedure, thus, unlisted telephone numbers were included in the sampling procedure; 2) once contact was established an inventory of all adults eligible for the interview was taken and a second random procedure was used to select a member of the household. The interview contains around 90 questions on health related behavior, risk factors for disease and lifestyle. Five health related factors are examined in detail, one of which is exercise, the others are drinking, smoking, diet and sexual behavior. The interview lasts around 15 minutes. In a previous article⁵ the difference between the data profile and census data was studied. There was evidence of a slight underrepresentation of respondents aged between 20 and 29 while there was an overrepresentation of respondents aged between 30 and 39. However, as this article is interested in overtime change not only the profile of the sample is important but also the stability of the sample overtime, as sample changes can influence the estimation of overtime trends. Between July 1987 and March 1988 only data of respondents between 18 and 44 years of age and of respondents living in the metropolitan areas of Glasgow and Edinburgh was collected. The analysis is therefore limited to a subset of the data containing the 13,586 respondents within these age and geographical categories. A slight increase in the average age of these respondents between 1987 and 1991 ($r = 0.0201$,

$p = 0.01$) was observed, there were no changes with regard to gender, occupation and city of residence. The number of cases per month ranged from 114 in November 1987 to 466 in May 1988, the monthly response rates according to the CASRO⁶ procedure fluctuated between 65% and 80%.

The analysis focuses on the monthly averages. Regression techniques were chosen to assess the overtime changes in exercise behavior; the behavior can be regressed on time, and a dummy variable coded "0" before and "1" after the question change was included to study the effect of the question form⁷. Using this method one assumes that the question change affects the intercept of the regression estimates, however, not the slope. There is a range of regression methods available to describe overtime change in proportional data. Linear regression weighted for the number of cases per month and logistic regression⁸, based on a logarithmic transformation of the odds ratio, are often applied. Linear regression has the advantage of parameters which are relatively easy to interpret, logistic regression takes the relative nature of change in proportions into consideration and curves between "0" and "1". We preferred to use logistic regression as the only tool of analysis primarily on the basis of our experience, which is in accordance with the literature, that it gives a better fit as compared with weighted linear regression, particularly in small proportions and both in terms of lower standard errors for the estimated parameters as, on average, a lower Chi-square difference between estimated and observed values. We further follow the practice to declare differences and changes statistically significant at a t-value higher than 2.00, which is equivalent to a parameter being twice as large as its standard error. Given the

numbers of cases utilized in this paper a t-value of 2.00 generates a p-value slightly lower than 0.05. All analysis in this paper was done using Glim.

Results

The stars in Figure 1 show the monthly proportions of respondents answering yes to the question on whether they engaged in any physical activity for exercise in the previous month. The top continuous line shows the estimated trend using logistic regression. The "jump" in this line between December 1988 and January 1989 is the effect of the question change. If there had been no question change (dotted line) an estimated decrease in the proportion of sedentary individuals of 9.7% would have been observed for the period July 1987 to June 1991 ($t = 3.8, p < 0.05$). The difference between the dotted line and the trend line gives the effect of the removal of the examples given by the interviewer (walking, swimming and running) in asking the question; a drop in the estimated proportion of physically active respondents of 13.8% ($t = 9.1, p < 0.05$) was observed.

Table 1 summarizes the changes for a number of subgroups. As can be seen among all subgroups a decrease in the proportion of sedentary individuals can be observed. The change seems to be particularly concentrated among males, respondents living in Glasgow, the non-manual occupational categories and younger respondents, however, the differences in trends between the subgroups were not statistically significant. There are only small differences between the socio-demographic groups with regard to a question wording effect, with the exception of age; the question change primarily affected the responses of older respondents ($t = 8.4, p < 0.05$).

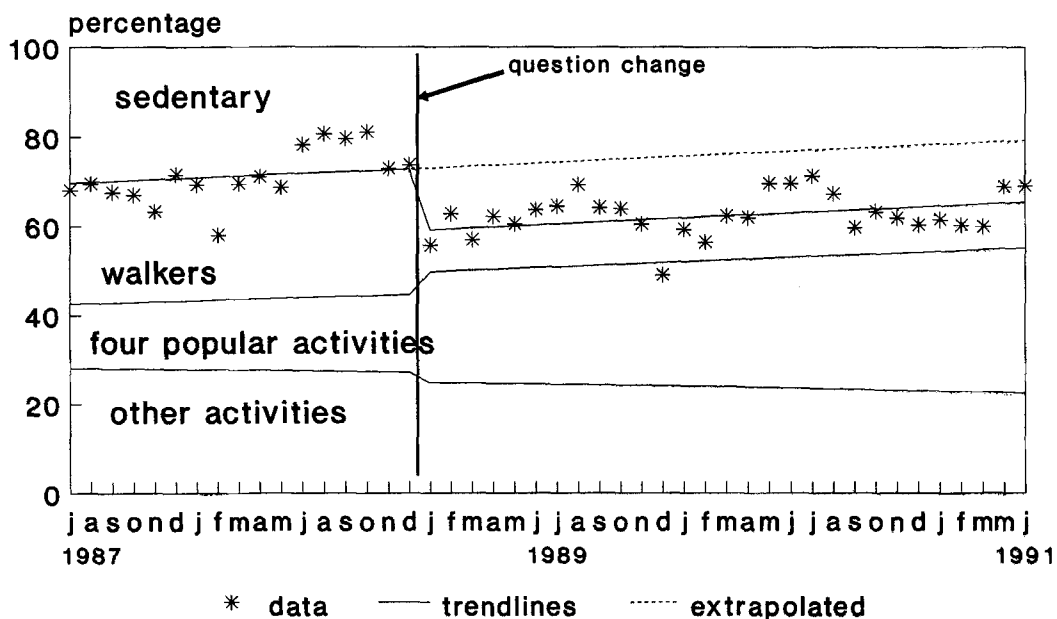


Fig. 1. Physical activity for exercise Edinburgh and Glasgow 1987–1991

Table 1. Decrease in the proportion of sedentary individuals and question change effect among several socio-demographic groups between July 1987 and June 1991, respondents aged 18–44, percentages.

	Change % (t) Jul. 87–Mar. 91	Question change % (t)	Valid N-of-cases
All respondents	9.6 (3.8)	–13.8 (9.1)	13,586
Females	8.6 (2.5)	–14.8 (7.0)	7,429
Males	10.7 (2.9)	–12.6 (5.8)	6,091
Glasgow	9.5 (3.4)	–13.6 (7.0)	9,401
Edinburgh	8.7 (2.0)	–13.8 (5.7)	4,185
Non-manual occupations	10.2 (1.6)	–12.8 (4.8)	8,197
Manual occupations	8.1 (3.3)	–14.7 (6.8)	3,791
Age 18 to 30	11.5 (3.2)	–9.7 (4.4)	6,380
Age 31 to 44	8.5 (2.5)	–17.7 (8.4) ¹	7,206

¹ T-value of the difference in question wording effect between age groups equals 2.36. Further no t-values between groups larger than 2.00.

Table 2. Change in a number of physical activities for exercise between July 1987 and June 1991, respondents aged between 18 and 44. Question change effect. Percentage of respondents engaging in these activities after the question change.

	Change % (t) Jul. 87–Mar. 91	Question change % (t)	Percent
All activities	9.6 (3.8)	–13.8 (9.1)	62.4
Swimming	3.6 (2.5)	2.3 (2.8)	10.1
Walking	2.1 (1.0)	–18.9 (–13.7)	9.9
Team sports	3.0 (2.4)	1.1 (–1.5)	7.2
Keep fit exercise	0.7 (0.6)	2.3 (3.7)	5.8
Aerobics	3.3 (3.2)	1.8 (3.2)	5.7
Jogging	1.5 (1.3)	–0.6 (–0.9)	4.5
Tennis	0.6 (0.7)	0.4 (–0.9)	2.9
Cycling	–0.9 (–1.2)	1.8 (4.0)	2.7
Gardening	–0.8 (–0.7)	–6.2 (9.9)	0.2
Remaining activities	–3.8 (2.1)	2.7 (2.5)	13.5

The space between the top line and the second line in Figure 1 estimates the proportion of walkers in the sample. As can be seen, the second line runs almost parallel to the top line, this can be interpreted as an indication of little change in the proportion of walkers overtime. This was confirmed in a regression analysis which estimated a non-significant increase in the proportion of walkers among all respondents of 2.1% ($t = -1.0$, $p > 0.05$), after correction for the question change. The second line also shows only a small jump between December 1988 and January 1989. This indicates that the decrease in the proportion of physically active respondents, following the removal of the prompt in the question, is for a large part explained by a decrease in the proportion of respondents who reported walking for exercise. Regression analysis estimates this decrease to be 18.9%. Before the question change approximately 28% of the respondents reported walking for exercise, after the question change this percentage decreased to 10%. Figure 1 also shows the proportions of respondents on a number of popular physical activities: team sports, swimming, keep fit exercise and aerobics. As can be seen there is a shift between December 1988 and January 1989 for a number of activities besides

walking, thus also affected by the question change. Further it can be seen that a divergence develops between the overall trend in physically active respondents, indicated in the top line, and the line indicating the proportions of respondents engaging in the four popular activities.

To study these phenomena in more detail Table 2 shows the changes estimated by logistic regression analysis for the period July 1987 to June 1991. The table shows all physical activities which were reported by at least 2.5% of the respondents after the question change. Gardening was included because it concerns one of the behaviors explicitly mentioned before the question change. There are many activities in which a statistically significant increased proportion of the respondents are involved. Only a few activities decrease in importance and these are primarily the less popular activities contained in the remaining category. The question change affects a number of activities but particularly two of the behaviors initially mentioned in asking the question, walking and gardening, go down very considerably in importance after the prompt to walking, swimming and gardening is removed. It is notable that more respondents report swimming for exercise when asked the unprompted question.

Discussion

The first, and most important, conclusion is that during the period of measurement a downward trend in the proportion of sedentary individuals is observed. Caution should be observed in attaching too much value to any precise estimate of the decrease as it is dependent on the regression procedure utilized and may be influenced by chance fluctuation and seasonal effects. However, the strength of the evidence for a decrease in the proportion of sedentary individuals is such that, *ceteris paribus*, we conclude that a real change towards a higher proportion of the population engaging in physical activity is taking place.

As to the structure of the change in the proportion of sedentary individuals, increases in a large number of physical activities can be observed while only a small number of physical activities decreased in importance. Therefore it does not seem that a particular "fashion" can explain our findings. From an international perspective the pattern of change among subgroups of the sample is rather unique. As opposed to Finland, the changes in Scotland are concentrated in the higher, non-manual, occupational categories. As opposed to North America the changes are concentrated among the younger respondents and males. Diffusion theories are a valuable instrument in explaining such differences⁹. According to such theories one should not expect to find all socio-demographic groups changing at similar rates during a limited period of observation, even if there is a development which affects the population at large. The social groups which are changing might be the leaders in changing exercise behavior. Thus, international differences might be explained by different segments of the population being at different stages of a general development in their various countries.

The change in the question from physical activity for exercise with prompts to a question without prompts had observable effects. These effects seem to affect the behaviors initially mentioned in asking the question, walking and gardening, in particular. However, that the matter is complicated becomes clear from the fact that more respondents reported swimming when not prompted for this behavior. Although there is an extensive body of literature on questionnaire construction, in general there is no rule to decide what is the "right" way to ask a question¹⁰. In the case of the question which is not "cued" or prompted, many people will be missed who walk considerable distances on a regular basis but do not regard this activity as exercise. This is particularly problematic because a relatively high proportion of older respondents, among whom walking may constitute an important daily activity, are then mis-classified.

Summary

In this article data collected between 1987 and 1991 is analyzed to identify changes in the proportion of sedentary individuals in Edinburgh and Glasgow. In the primary question, which asked the respondents about physical activity for exercise such as walking, running and swimming, a wording change deleting the prompt to specific activities is taken into consideration. The data were collected by telephone on 13,586 respondents. A considerable decrease in the proportion of sedentary individuals in both cities was observed between 1987 and 1991. This decrease could not be related to changes in specific sporting activities. The change to an unprompted question led to a 14% lower estimate of physical activity. This was almost fully explained by a change in the estimate of the proportion of walkers. Older respondents in particular were affected by the question change.

Résumé

Activité physique durant les loisirs en Ecosse: évolution entre 1987 et 1991 et influence de la formulation du questionnaire sur les réponses

Dans cet article, les données collectées entre 1987 et 1991 des villes de Edinburgh et Glasgow sont analysées pour mettre en évidence un changement dans la proportion des individus sédentaires, attribuable à la formulation du questionnaire. La question principale, concernant les activités physiques des répondants comme la marche, la course à pied ou la nage, et un changement de formulation concernant une liste explicite d'activités spécifiques sont analysés. Les données ont été collectées par téléphone auprès de 13 586 enquêtés. Une diminution considérable de la proportion des individus sédentaires dans les deux villes a été observée entre 1987 et 1991. Cette diminution ne peut pas être attribuée à un changement d'activité sportive spécifique. L'apparition d'une question non fermée aboutit à une estimation de l'activité physique qui est de 14% inférieure à la précédente. Cela est presque entièrement attribuable à la différence de l'estimation de la proportion de marcheurs. Les enquêtés les plus âgés sont particulièrement touchés par ce changement de question.

Zusammenfassung

Körperliche Freizeitaktivität in Schottland: Entwicklung 1987–1991 unter Berücksichtigung des Interviewfragenwortlauts

Die vorliegende Analyse beschreibt auf Grund von Interviewdaten Änderungen des körperlich inaktiven Bevölkerungsanteils zwischen 1987 und 1991 in Edinburgh und Glasgow, Schottland. Besonders berücksichtigt wird dabei der Einfluss der Änderung der Schlüsselfrage nach körperlich-sportlicher Freizeitaktivität, bei der während der Studienperiode auf die Nennung von expliziten Beispielen (Gehen, Laufen, Schwimmen) verzichtet wurde. Telefoninterviewdaten von 13 586 Personen wurden ausgewertet. Zwischen 1987 und 1991 ging der Anteil körperlich inaktiver Personen in beiden Städten merklich zurück, wobei dieser Trend nicht durch eine grössere Popularität einzelner, spezifischer Sportarten bedingt war. Die genannte Änderung des Fragenwortlauts führte zu einer Reduktion des geschätzten Anteils physisch aktiver Personen um 14%, wobei dies praktisch ganz auf die seltenere Nennung von Gehen zurückzuführen war. Damit waren vor allem ältere Personen von der Änderung des Fragenwortlauts betroffen.

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