Non-participation modestly increased with distance to the examination clinic among adults in Finnish health examination surveys

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Abstract

Aims: Health examination surveys (HES) provide important information about population health and health related factors, but declining participation rates threaten the representativeness of collected data. It is hard to conduct national HESs so that examination clinics would be near to every sampled individual. Thus, it is interesting to look into the possible association between the distance from home to the examination clinic and non-participation, and whether there is a certain distance after which the participation activity decreases considerably.

Methods: Data from two national HESs conducted in Finland in 2011 and 2012 were used and a logistic regression model was fitted to investigate how distance was related to non-participation.

Results: We found out that non-participation modestly increased with distance to the examination clinic. An additional analysis indicated that a possibility to have an examination at home may decrease the effect of distance to participation.

Conclusions: Long distances from home to the examination clinic are one reason for low participation activity. Possible bias caused by these differences in participation could be decreased by providing a possibility for home examination.

Key Words: *Non-participation*, *distance*, *health examination survey*

Word count: 1126

Introduction

Health examination surveys (HES) provide information about population health and health related factors, but declining participation rates threaten the representativeness of collected data. When regional comparisons of health indicators are conducted to investigate possible regional health differences in the study population, it is important that the used data are equally representative in all regions.

Field work in HESs is expensive, so it is hard to conduct national HESs so that examination clinics would be near to every sampled individual. Especially, this is true in Finland, which is a sparsely populated but geographically relatively large country. Thus, it is interesting to look into associations between the distance from home to the examination clinic and non-participation, and whether there is a certain distance after which the participation activity decreases considerably. These findings have relevance when interpreting regional differences in HES results and planning future surveys.

There is no previous literature about the association between distance and non-participation in HESs. It has been reported that women with long distances to mammography screening centers have higher non-participation than those who live close to the centers [1-3].

Methods

In these analyses data from two national HESs conducted in Finland were used. The Health 2011 study was conducted among adult population (29+ years) living in the mainland Finland [4]. It was a follow-up study for the Health 2000 study conducted 11 years earlier. The national FINRISK 2012 study among adult population aged 25-74 years was conducted in five large geographical areas [5]. FINRISK 2012 belongs to a series of cross-sectional FINRISK studies conducted between five years from 1972. Data collection of the

Health 2011 and FINRISK 2012 surveys was based on questionnaires and a health examination including physical measures and biological samples.

We restricted the data sets to the common age range 29-74. Individuals who had participated in a different examination clinic where he/she had been invited were removed from the data (6 individuals). This resulted in the sample sizes of 6816 and 9109 of which 55% and 59% participated the health examination at examination clinics in the Health 2011 study and the FINRISK 2012 study, respectively. In Health 2011, 4% of invited individuals had the examination at home, because it was not possible for them to participate at the examination clinic.

In both surveys, a sample was drawn from the National Population Register. The sample data included information about sex, age and geocodes for home.

Logistic regression models were used to model non-participation. Explanatory variables were distance from home to the examination clinic, age, sex, information whether the individual belonged to the Health 2011 or FINRISK 2012 sample and information whether an individual has participated in an earlier HES. Distance and age were used as continuous variables. Restricted cubic splines [6] were used in logistic models to take possible non-linear associations into account. The selection of covariates and their possible non-linearities modeled by splines and first-order interactions was based on Bayesian information criterion (BIC) [7]. The best model included, in addition to the main effects of the above-mentioned variables, interactions of age with sex, study and earlier participation and an interaction of study with earlier participation. Analyses were carried out using the R statistical software version 3.1.2 [8]. Distances between homes and examination sites were calculated as the shortest routes along the road network using the Digiroad database of the Finnish Transport Agency (see http://www.liikennevirasto.fi/web/en/open-data/digiroad). Dijkstra's algorithm [9] and ArcGIS software [10] were used in the calculation of the distances.

Results

The sample sizes and participation rates are presented in Table 1. The participation was usually higher among those living close to the examination clinics than among those with long distances. Women had higher participation rates than men, older individuals participated more actively than younger and participation was clearly higher among those who had participated already in an earlier HESs than among those who had not.

Table 1 Sample sizes (N) and rates for participation at an examination clinic (%) in Health 2011 and FINRISK 2012 studies. Ages restricted to 29 – 74.

	Health 2011				FINRISK 2012			
	Men		Women		Men		Women	
	N	Partic. %	N	Partic. %	N	Partic. %	N	Partic. %
Total	3333	51	3483	60	4558	57	4551	62
Distance (km)								
< 2	377	57	430	64	811	57	854	65
2 – 5	758	49	784	62	1262	57	1332	63
5 – 10	713	52	810	61	1225	55	1244	61
10 – 20	838	51	854	58	866	58	755	61
≥ 20	647	48	605	56	394	57	366	57

The odds ratio (OR) of distance per 10 km for non-participation was 1.08 (95% confidence interval (CI): 1.05, 1.11). Thus, non-participation was greater for those living far from the examination clinics than for those living close to them. Non-linear associations between distance and participation were not found, so there does not seem to be a certain distance after which the participation activity would change notably. Distance was not found to be associated differently with participation among different sexes or in different studies. Figure 1 illustrates the predicted participation probabilities for distances from 0 to 30km. For a 10km change in distance, absolute changes in probabilities are slightly less than 2 percentage points.

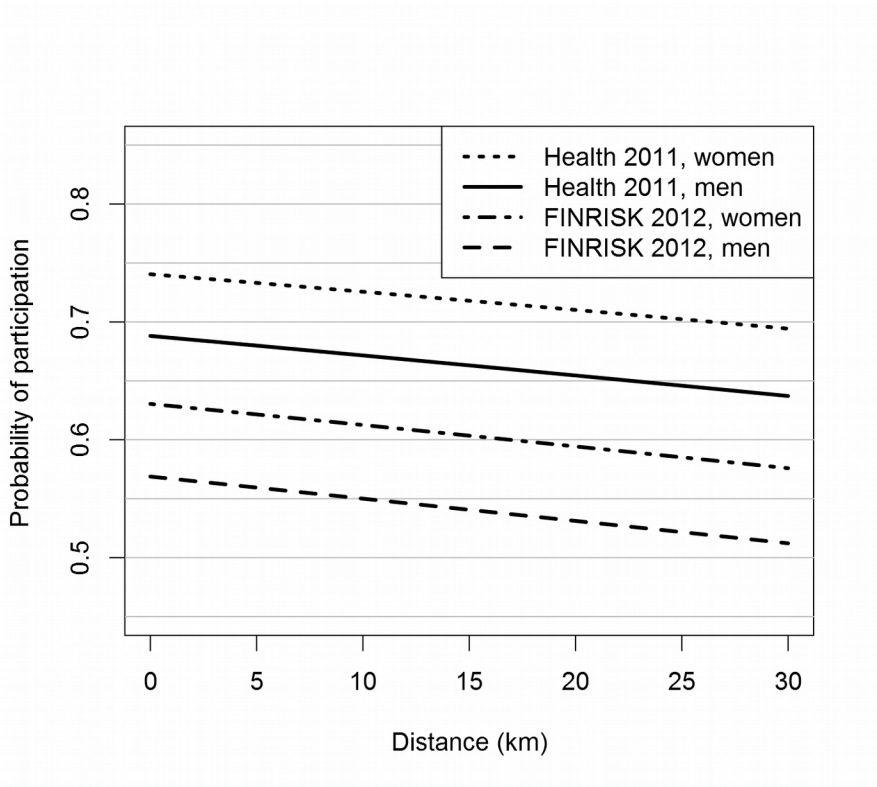

Figure 1 Predicted participation probabilities by sex and study for distances from 0 to 30km. For Health 2011, predictions are for those who have participated in an earlier HES and for FINRISK 2012, for those who have not. Age is fixed to 50.

We also estimated how participation activity would have changed if the distances would have been in maximum of 10 km for all individuals invited to the survey. The distances over 10 km were set to 10 km and participation probabilities were predicted using the same model as above. The effect would not have been substantial as the predicted participation rates would have increased from 55% to 56% in Health 2011 and from 59% to 60% in FINRISK 2012.

To analyze how the possibility to have the examination at home affected the association between distance and participation, we fitted two further models for the Health 2011 data, similarly as for combined data. When the response was participation at the examination clinic, the OR of distance per 10 km for non-participation was 1.09 (95% CI: 1.05, 1.12) in Health 2011. When participation to home examination was also counted as participation, the OR of distance declined to 1.05 (95% CI: 1.02, 1.08). This can be

interpreted as an indication that providing the possibility for home examination could decrease the effect of distance to participation.

Discussion

This study showed that the distance between home and examination clinic along the road network modestly predicted non-participation among adults in Finnish HESs. It is not clear if making the network of examination clinics denser would be a cost-efficient way to reduce non-participation. This cannot, however, be interpreted so that increasing the distances in these kinds of studies would not cause considerable decrease in participation rates. People who have long distances to examination sites are likely to live in areas where they are used to travel long distances from home to work places and services. A limitation of this study is that we could not take into account the means of transportation or topographic characteristics which may substantially affect travel time. Time spent for travelling might be even more important predictor of participation than the distance. The lack of information about the means of transportation could also be the reason no non-linear associations were found. Our study also gave an indication that a possibility to have an examination at home may decrease the effect of distance to participation and thus decrease the possible bias caused by regional differences in participation.

Conflict of interests

None declared.

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