

# The Oslo Health Study

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## Objectives

The main objectives of the population-based Oslo Health Study (HUBRO)<sup>1</sup> were to:

- identify health needs within the community and determine the priorities in the health sector
- monitor the developments and trends of diseases and their associated risks
- estimate the prevalence and later the incidence of chronic diseases
- identify social and geographical differences in health and associated risk factors for disease
- initiate research in order to further investigate the aetiology of major health problems.

The Oslo Health Study was conducted in joint collaboration with the Oslo City Council, the University of Oslo and the National Health Screening Service, Oslo (now Norwegian Institute of Public Health), the latter responsible largely for actually conducting the survey. A steering committee comprising of two members from each of the collaborating partners were responsible for co-ordination and overall direction of the study.

## Material and methods

HUBRO was carried out in the City of Oslo from May 2000 to September 2001. An invitation for participation in the health survey was sent to all men and women born in the following years: 1924, 1925, 1940, 1941, 1955, 1960 and 1970 who had been residing in Oslo on December 31, 1999. Those moving into Oslo between this date and 03.03.2000 were invited during the reminding process (more information in Appendix 1). At the end of the study period, two additional cohorts (born in 1954 and 1969), were also invited to participate in the survey. No reminder was sent to these cohorts (more information in Appendix 2). They are not included in the presentation below.

In addition to the adult cohorts, all the 15- and 16-year olds in Oslo filled out two questionnaires at school and of these 7343 responded (88.3%). The adolescents did not

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<sup>1</sup> Acronym for the Norwegian title of the Oslo Health Study – HUBRO=eagle owl

undergo a physical examination. A separate description of the material and methods of this study will be made.

In 2002-2003, the same co-operating partners carried out a separate immigrant study, inviting inhabitants in Oslo born in Pakistan, Iran, Vietnam, Sri Lanka and Turkey (born 1942-71 - except those age groups previously invited to HUBRO). Of these the age-group 31-60 years got one reminder, whereas the others got no reminder (Hovik et al., 2004). The main questionnaire and parts of the first supplementary HUBRO-questionnaires were also used in the immigrant study. Data from this separate study is not included in the present description.

### ***Invitation and procedure***

The Oslo Health Study consists of a central core and around 70 supplementary projects. The data collection for the core part was undertaken following the standard procedure elaborated below:

A letter of invitation was mailed two weeks prior to the screening appointment containing:

- Invitation to participate with time and place of appointment
- A three-page questionnaire
- Instructions about how to fill out the questionnaire and a letter of consent, to be handed in personally at the screening station
- Information brochure containing the aims of the study, content, procedures, etc
- Map showing the exact location of the screening station

The letter of invitation informed the participants that they could avail of the information brochure and the questionnaires (main questionnaire and first supplementary questionnaire) in 11 languages other than Norwegian if they should require translations.

In October 2000 we carried out an experiment with an alternative two-step invitation, based on previous experience (Japac L et al., 1997). The two-step invitation did not differ from the standard invitation procedure regarding percentage attending during the experimental period (Appendix 3).

The examination at the screening station comprised administration of the various questionnaires, a simple physical examination including blood pressure, pulse recording and the collection of venous non-fasting blood samples. At the screening the main questionnaire was collected from the attendees and they were given two supplementary questionnaires. They were instructed to fill in these questionnaires at home and return them by mail in self addressed pre stamped envelopes.

All the procedures at the screening station were performed by experienced and trained personal following a detailed protocol (HUBRO-protocol).

Four weeks after attending the physical examination, a letter with results of this examination and blood tests was sent to all participants. An evaluation of this letter was carried out before HUBRO started (Wøien, 2000 a). Those with the highest scores of cardiovascular risk (HUBRO-protocol, 2002, Tverdal et al., 1989) were offered a new physical examination at Ullevål University Hospital

### *Supplementary projects*

Researchers and specialists from different Universities and other research institutions are responsible for the 50 supplementary projects connected to the Oslo Health Study. Some of these projects include all participants in the health survey - others include only selected groups within the sample. Some of the projects also received blood and urine samples in addition to the data from the questionnaires. These blood samples were analysed for blood lipids, markers of infection response, nutrition, hormones, bone, liver- and kidney functions. One project measured bone mineral density in sub samples of the invited population (these were only reminded once).

### *Measurements*

Non-fasting serum total cholesterol, serum HDL cholesterol, glucose and serum triglycerides were measured directly by an enzymatic method (Hitachi 917 autoanalyzer, Roche Diagnostic, Switzerland). Serenorm Lipoprotein was used as internal quality control material for the lipid analyses and Autonorm Human Liquid for the glucose. The control material was done at the start and for every 30<sup>th</sup> sample. All the laboratory investigations were performed by the Department of Clinical Chemistry, Ullevål University Hospital, Oslo, Norway. The results were registered and transferred on data files to the National Health Screening Service. Pulse recordings, systolic and diastolic blood pressures were measured by an automatic device (DINAMAP, Criticon, Tampa, USA), which measured the blood pressure in mm Hg automatically by an oscillometric method. After 2 minutes preceding rest, three recordings were made at one-minute intervals. The values of the mean of the second and third systolic blood pressure measurements were used in calculating the cardiovascular risk score (CVD risk score) (Tverdal A et al., 1989).

Body weight (in kilograms, one decimal) and height (in cm, one decimal) was measured with electronic Height and Weight Scale with the participants wearing light clothing without shoes.

Waist circumference was measured at the umbilicus to the nearest cm with the subject standing and breathing normally. In obese individuals, waist circumference was defined as the midpoint between the iliac crest and lower margin of ribs. Hip circumference was measured as the maximum circumference around the buttocks. Both waist and hip were measured with a measuring tape of steel – which was emphasized to be horizontal. Waist and hip circumference were used to calculate the waist-hip ratio using the formula waist (cm)/ hip circumference (cm). All measures were performed according to a standard protocol (HUBRO protocol)

### *The questionnaires*

The *main questionnaire*<sup>2</sup> covered the following main topics:

Self-reported health and diseases such as diabetes, asthma, coronary heart disease, stroke and mental distress (regarding questions about mental distress – see Appendix 4)

Musculo-skeletal pains

Family history of disease

Risk factors and lifestyles

Environment while growing up, social network and social support

Quality of life

Education, work and housing

Occupation - coded according to Standard Classification of Occupants (Statistics Norway, 1999)

Industry/business - coded according to Standard Industrial Classification (Statistics Norway, 1997)

Use of health services

Use of medicine

Reproductive history (women)

The oldest age group (born 1924 and 1925) received a modified version of the main questionnaire, printed with larger letters. Some questions about employment and working were omitted, whereas questions about memory and functional ability were added.

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<sup>2</sup> In the English version of the main questionnaire we have discovered errors in question number:

1.2. The correct question should be the age on **first** occasion, not the last occasion.

1.2 Should be “Do you have any of these illnesses, or have you suffered from **any** of them in the past”? **Any** was omitted in the original questionnaire.

14.5 Do you use or have you used? The first of the three categories is wrong – “No” should be “**Now**”

Only one in 1000 filled in the English version.

These errors have been corrected (Nov. 2005) in the English version on fhi.no.

The *first supplementary questionnaire*, was identical for all age groups, and covered in more detail many of the same topics as the main questionnaire. In addition the participants were asked questions about life events (see Appendix 5), weight change and winter depression. The questionnaire also had a special section targeted at immigrants – with questions about why and when they moved to Norway, how they manage to cope with the Norwegian language, the health service and their every day life, and whether they had ever experienced any discrimination.

The *second supplementary questionnaire* asked about working conditions, health information, skin disease, metabolic diseases, gastrointestinal diseases, quality of life among those keeping dogs, self esteem, social anxiety and social phobia, reactions to grief, diet and nutrition, and questions about violence and urinary/ anal incontinence (to women only). This questionnaire was printed in four different versions and contained only questions connected to the supplementary projects. An overview of all the questionnaires, number of pages and target groups is given in table 1. A list of all topics covered in the questionnaires, explanations of the different questionnaires and the questionnaires in English can be obtained from the following website: <http://www.fhi.no/tema/helseundersokelse/oslo/index.html>.

Several of the questions have been used and validated in National Health Screening Service's previous studies (Tretli et al., 1982, Jacobsen & Thelle, 1987, Løchen & Rasmussen, 1992, Thune I et al., 1997, Joakimsen et al., 1998). Other questions have been used and evaluated by others (Saltin & Grimsby, 1968, Derogatis et al., 1974, Ainsworth et al., 1996, Brugha et al., 1985, Strand BH et al., 2003).

A pilot study of the main questionnaire (including the "old age" version) was carried out before HUBRO started.

### ***Participants and attendance***

The participants were invited to attend according to their date of birth – starting with those born in the beginning of January ending with those born at the end of December. Non-responders received one reminder 2-6 months after the original invitation. The second reminder was sent 2-10 months thereafter. The *first* reminder invited the participants to the main screening station – located in the city-centre. The *second* reminder invited most of those still not responding to a mobile unit (bus) - parked at 17 different locations in the neighbourhood of the invited (More information in Appendix 1). Those living close to the city-centre were invited to the main screening station. No reminder was sent to the two additional cohorts, i.e. persons born in 1954 and 1969 (see Appendix 2).

In connection with the second reminder, the participants were offered assistance with filling in the questionnaire (in 3 major languages besides Norwegian), and they were encouraged to send in the main questionnaire even if they were not able to attend the physical examination.

For those attending - and not returning the supplementary questionnaires, one reminder was sent ¼-1 year after the attendance, asking them to return the questionnaires handed out at the screening station.

163 men eligible for the Oslo Health Study were not invited initially to the physical examination because of their participation in one of three small intervention projects (HYRIM, DOIT, LIFE) under the auspices of Ullevål University Hospital (figure 1). At the completion of the Oslo Health Study, 148 of these had finished their participation in the intervention projects. A letter was then sent asking them to fill in the first questionnaire and return it by mail, but they did not undergo the physical examination at the screening station. 103 answered the questionnaire (figure 1). The Data Inspectorate of Norway granted us permission, with consent from the responders, to obtain the results of the blood tests and other measurements from these 147 subjects from Ullevål University Hospital. We were then able to match and link these results to the questionnaire-data returned by mail from the same subjects.

Of the 40 888 citizens invited in the seven original age groups, a total of 18 770 individuals (46%) participated in the survey (attended at the screening station and/or submitted at least one questionnaire). Of these, 643 sent in one or more questionnaires only, whereas all the other participants also underwent the physical screening. A flow-chart shows the number invited, attending and participating (figure 1). The proportion participating varied from 32% in 30 years old men to 58% in 75/76 years old men (table 2). More women than men attended in all age groups, except for the oldest. Except from this group, the attendance rate increased with age in both genders.

Of those invited, 46 % (n=18 746) responded to the main questionnaire, while the response rate of the first supplementary questionnaire was 84 % of those attending the screening (that is 37% of all invited) (table 3).

The corresponding response rates for the four versions of the second supplementary questionnaire were: I: 82 %, II: 82 %, III: 85 %, IV: 87 %. Except for version IV (answered by 75/76 years old), a higher proportion of women than men answered all questionnaires

(table 3). As a result of the linkage with socio-demographic variables from Statistics Norway, we have reported the participation rates and the response rates to the first supplementary questionnaire as percent of people who attended at the screening station and percent of all invited persons who were eligible to participate, according to background variables (table 4).

The participation rates increased from 28 to 42 percent in men and from 33 to 49 percent in women after up to two written reminders. An article dealing with the effects of reminding the non-responders, has been published (Selmer et al. 2003).

At the end of the study period, two additional cohorts were invited to participate in the study. No reminder was sent to these age groups. More details about these cohorts are reported in Appendix 2.

### ***Ethics and approvals***

All the information from the health survey has been confidential in accordance with the guidelines of the Data Inspectorate of Norway. All concerned personnel and staff involved with the survey are bound by an oath of confidentiality. The data used for research purposes is anonymous as all names and personal ID numbers have been omitted.

All the participants of the Oslo Health Study have given their written signed consent. This also consents to subsequent control and follow-up, to the use of data and blood samples for research purposes, and to the possible link to other registers (subject to the approval of the Data Inspectorate).

The Norwegian Data Inspectorate has approved the Oslo Health Study, it has been presented to the Regional Committee for Medical Research Ethics and it has been conducted in full accordance with the World Medical Association Declaration of Helsinki.

The Steering Committee of the Oslo Health Study appointed an Ethics Committee with independent members not involved in the study, to advice the Steering Committee in questions related to ethical matters.

### ***Efforts to increase attendance***

An Information Committee with members from all the collaborating partners, developed an information plan for the study – and worked all through the study period to increase

attendance. They took several initiatives to inform the citizens of Oslo about the Oslo Health Study and motivate those invited to attend:

- Newsletters about the Oslo Health Study were sent to key persons and municipal institutions
- Reports and reportages were printed in newspapers, and commentaries were transmitted through TV and radio
- The Oslo Health Study were allowed to have information posters on all buses and trams in Oslo - inside and outside, during 2 x 2 weeks
- Wall Posters were sent to all medical doctors, maternal and child health centres, kindergartens, Social Security Office, libraries and shops
- Meetings were arranged with health personnel and bureaucrats
- To try to understand the reasons for non-response, a short questionnaire was sent to a random sample of 150 of those not responding to the invitation during the first month of the survey. We used the information collected (54 responded) to target the information more effectively (Wøien, 2000 b). We also made an ex-poll survey among 201 attendees, to learn why they attended, their viewpoints regarding the screening, the information given and the declaration of consent (Kværnsveen, 2001a). A short report has also been made based on an informal survey among the staff at the screening station (Kværnsveen, 2001b). They were asked about the practical and technical implementation of the survey and their impression about the attendee's expectations and opinions.
- During the fall 2000 we did a trial to test whether or not one extra letter of invitation could increase the attendance. 50% of those invited during a three weeks period received a letter informing them about the invitation package which would arrive one week later, whereas the other 50% received the regular invitation package. The evaluation of the trial showed no difference between the two procedures (Søgaard & Selmer, 2001). (More information in Appendix 3).
- In two urban districts we telephoned all those not responding to the first reminder, to ask them whether or not they wanted a second reminder to the screening unit in the mobile bus. The procedures and results are reported in Kværnsveen (2001c).
- A travel voucher worth 2000 Norwegian Kroners was drawn in a lucky draw in each district of Oslo and a gift coupon, worth 5000 Norwegian Kroners, was drawn in a lucky draw in the district with the highest attendance rate.

Special efforts were made to reach the immigrants:

- The questionnaires (main and first supplementary), the brochure and the declaration of consent were translated to 11 different languages. The second supplementary



questionnaires were translated into English only. The main “old age” questionnaire (table 1 and 3) was not translated.

- The Norwegian information brochure also contained short information in 11 languages (English, Urdu, Arabic, Serbo-Croatian, Albanian, Turkish, Vietnamese, Farsi, Somali, Spanish and Tamil) on how to get the translated material.
- A guide/host at the screening-station spoke English, Urdu and Hindi
- Two co-workers with immigrant backgrounds worked towards immigrant groups – they had lectures, formal and informal meetings with health personnel, political leaders, imams and other key persons among immigrants, they visited the mosques, and worked out radio-programs transmitted on special channels for immigrants
- The Oslo Health Study put announcements and reports in immigrants’ newspapers and had “stands” in the streets telling about the survey

A short report has been written about all the information efforts carried out during Oslo Health Study (Kværnsveen, 2002).

#### *Linkage to Statistics Norway*

To analyse the consequences of non-response in the Oslo Health Study, we had data from the measurements, the main questionnaire and the first supplementary questionnaire in the Oslo Health Study linked to socio-demographic information collected by Statistics Norway for all the invited individuals. Their unique 11 digits personal identification number identifies the subjects, and this number was used for the linkage of data files. The data used for research purposes is anonymous as all names and personal ID numbers have been omitted. The following variables were added: Statistics Norway's register of highest education completed per Oct 1, 2000, personal income and information about disability -, rehabilitation -, sickness -, unemployment and single parent benefit from the event-history database FD-Trygd (persons with long-term diseases) per Dec 31, 1999 (More information at [http://www.ssb.no/english/subjects/05/01/inntind\\_en/about.html](http://www.ssb.no/english/subjects/05/01/inntind_en/about.html) and <http://www.ssb.no/emner/03/fd-trygd/index.html>).

The significance of high attendance rate in population-based surveys and the importance of self-selection, based on data from HUBRO, has been presented (Selmer R, Sjøgaard AJ, 2001, Selmer et al., 2002) - and a non-response paper has been submitted (Sjøgaard et al., submitted).

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**Table 1.** The number of pages and the target groups for the different questionnaires

Age (yrs)	Main questionnaire		First supplementary questionnaire	Second supplementary questionnaire			
	Main *	“Old age” *		I	II	III	IV
30	3		4	6			
40	3		4		6		
45	3		4	6			
59-60	3		4			6	
75-76		3	4				4

\* In addition, one page containing the invitation and information about the screening appointment.

**Table 2.** Number of participants and participation rate according to age and gender in Oslo Health Study in 2000-2001 \*

Age (yrs)	Number invited			Number of participants			Participation rate (%)		
	Men	Women	All	Men	Women	All	Men	Women	All
30	5674	5730	11404	1826	2288	4114	32.2	39.9	36.1
40	4109	3798	7907	1547	1905	3452	37.6	50.2	43.7
45	3481	3282	6763	1389	1757	3146	39.9	53.5	46.5
59/60	3961	4116	8077	2117	2357	4474	53.4	57.3	55.4
75/76	2619	4118	6737	1525	2059	3584	58.2	50.0	53.2
All	19844	21044	40888	8404	10366	<b>18770</b>	42.4	49.3	<b>45.9</b>

\* Number attending the survey and/or submitting at least one of the questionnaires

**Table 3.** Number of answers and proportion answering to the different questionnaires according to age and gender in Oslo Health Study in 2000-2001.

	Number answering			Percent answering		
	Men n	Women n	All n	Men %	Women %	All %
Main questionnaire *	8391	10355	18746	42	49	46
Main (30-59/60 years)	6870 <sup>#</sup>	8299 <sup>##</sup>	15169	40	49	44
Old age (75/76 years)	1520	2057	3577	58	50	53
First supplementary questionnaire **	6729 <sup>§</sup>	8526 <sup>§§</sup>	15282	83	85	84
Second supplementary questionnaire ** <sup>5</sup>						
Version I (30 and 45 years) <sup>1</sup>	2550	3288	5838	81	84	82
Version II (40 years) <sup>2</sup>	1199	1545	2744	80	83	82
Version III (59/60 years) <sup>3</sup>	1738	1978	3716	85	86	85
Version IV (75/76 years) <sup>4</sup>	1207	1693	2900	88	86	87

\* Percentage of those eligible to participate (19 844 men, 21 044 women, 40 888 altogether,). In addition to 18 746 answering the first questionnaire, 20 only answered one of the other questionnaires and 4 more individuals did only have some measures done. The total number participating 18 770.

\*\*Percentage of those attending the screening/receiving the questionnaire

# Including one man 75/76 years old

## Including two women 75/76 years old

§ In addition – 21 women answering without attending the screening

§§ In addition – six men answering without attending the screening

<sup>1</sup> In addition – three 75/76 years old, eleven 59/60 years old and seventeen 40 years old have answered this questionnaire (n=31)

<sup>2</sup> In addition – six 59/60 years old and two 45 years old and one 30 years old have answered this questionnaire (n=9)

<sup>3</sup> In addition – four 75/76 years old, one 45 years old, five 40 years old and one 30 years old have answered this questionnaire (n=11)

<sup>4</sup> In addition –one 30 years old have answered this questionnaire (n=1)

<sup>5</sup> 27 participants have answered 2 different versions of the second supplementary questionnaire. They are counted twice in the table.

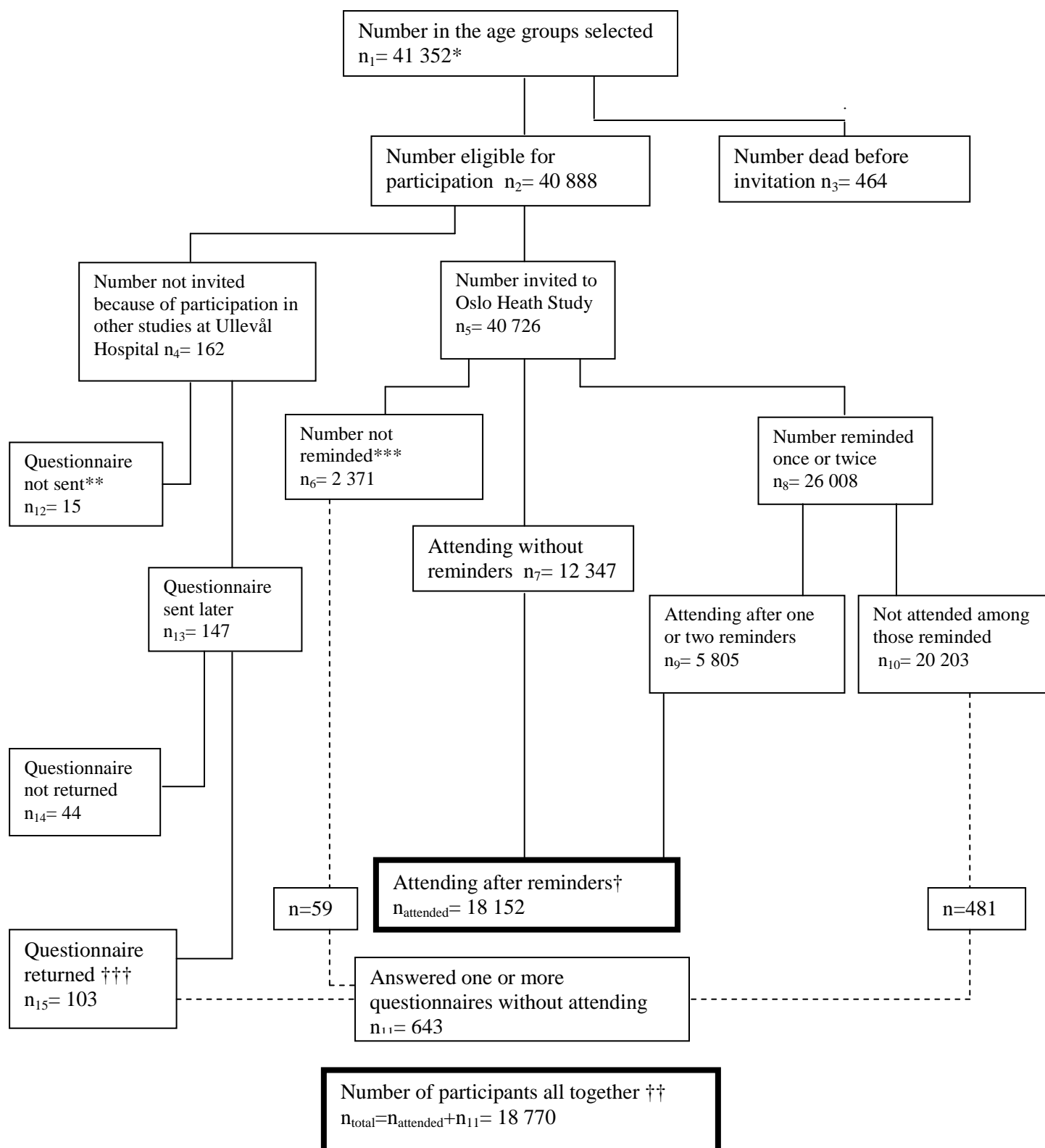
**Table 4** Participation rate (attended at screening and/or submitted at least one questionnaire) and response rate of the first supplementary questionnaire

	Eligible for participation	Participation (%)	Returned first supplementary questionnaire % of attendees	% of all invited
<i>Sex</i>				
Men	19839	42	83	34
Women	21035	49	85	41
	40874 <sup>†</sup>	46	84	37
<i>Age</i>				
30	11404	36	82	29
40+45	14668	45	82	36
59-60	8072	55	86	47
75-76	6730	53	86	43
	40874	46	84	37
<i>Marital status</i>				
Unmarried	14067	39	86	33
Married	18083	52	83	42
Widowed	2545	49	85	40
Separated/divorced	5900	43	83	35
Reg. partnership	111	47	94	43
	40706	46	84	38
<i>Country of birth</i>				
Norway	33519	47	87	40
Western countries	2422	42	86	36
Other	4933	39	57	22
	40874	46	84	37
<i>Region of residence</i>				
Outer east	16696	50	82	40
Outer west	10167	50	88	42
Inner west	5939	40	87	34
Inner east	6215	40	81	32
	39017	47	84	38
<i>Education</i>				
Compulsory	6766	40	78	29
Upper secondary	16808	47	84	38
College/university	14906	49	89	42
Unknown	1504	24	63	15
	39984	45	85	37
<i>Total income (NOK)</i>				
< 100 000	5014	34	76	25
- 199 000	9490	43	80	33
- 399 000	19473	49	87	42
400 000+	6178	44	89	38
	40155	45	85	37
<i>Disability*</i>				
no	30918	44	85	36
yes	2689	39	78	30
	33607	44	84	36
<i>Single parent*</i>				
no	33138	44	84	36
yes	469	36	70	25
	33607	44	84	36
<i>Rehabilitation*</i>				
no	33156	44	84	36
yes	451	42	77	32
	33607	44	84	36
<i>Sickness*</i>				
no	32166	44	84	36
yes	1441	45	81	35
	33607	44	84	36
<i>Unemployment*</i>				
no	32716	44	84	36
yes	891	39	79	30
	33607	44	84	36

<sup>†</sup> Numbers differ from table 1 due to updating of data register with respect to number of deaths before screening

\* The numbers are based on invited individuals below 75 years – to be able to include social security benefits

## THE OSLO HEALTH STUDY (HUBRO)



\* Included 11 individuals who moved to Oslo after March 2000. Met without an invitation.

\*\* Still participating in other studies (HYRIM, DOIT, LIFE), emigrated, moved, ill.

\*\*\* Moved, emigrated, note from relatives about serious disease or disablement, did not want reminder.

† Include 29 individuals attending without filling out any questionnaire. We have blood tests and/or other measures from 4 of these.

†† 25 individuals are registered as attending, but we have no data from them. They are not included in  $n_{total}$

††† Blood tests and results from physical examination from these subjects from Ullevål Hospital were linked to HUBRO after permission from the Data Inspectorate of Norway and with consent from the participants.



## Appendix 1

*Who were invited to the screening station in the Oslo Health Study, who were the ones not reminded - and how was the invitation- and reminding process carried through?*

### **Who were invited to the screening station? (Yngve Haugstvedt)**

Initially, all men and women born during the years 1924, 1925, 1940, 1941, 1955, 1960 and 1970 residing in Oslo December 31, 1999, were invited.

Those moving to Oslo between December 31 and March 3, were invited in connection with the reminder process.

Those moving to Oslo after 03.03.2000 were not invited. However, individuals in this category appearing at the screening station without an invitation and born in the relevant years of birth (n=11), were added to the invited population. (Are included in the total number of 41 352). If individuals in this category just called, they were not invited to attend.

Of those moving out of Oslo after 03.03.2000, but before they should have received their invitation according to the invitation plan, only those moving to the neighbouring county of Akershus, were invited. Individuals moving out of Oslo were discovered through updating of the main population file used for invitation. This file was received from Statistics Norway and was updated every third month. We also discovered persons who had moved by letters of invitation coming back with the new address written on the envelope or by relatives/neighbours calling.

At the end of HUBRO two additional cohorts, born 1954 and 1969, were also invited.

### **Who were not reminded? (Gudmund Dybvik)**

Those 2 371 (figure 1) individuals not receiving reminders were:

- Persons who died after the invitation was sent – where relatives sent a message/called
- Persons who were registered as dead or emigrated *after* the planned date of invitation, discovered when we had the main population file updated from Statistics Norway
- Individuals who had emigrated
- Individuals moving outside Oslo/Akershus - where the postal service/relatives/neighbours gave information
- Individuals staying abroad for a long period of time - relatives/neighbours gave information
- Individuals who were diseased or functionally disable – and the respondent/relatives/neighbours called to ask us not to send reminders

### **The invitation – and reminder process (Gudmund Dybvik)**

The seven regular age cohorts were invited according to date of birth – with a few exceptions. The random sample selected for measuring bone mineral density, were all

invited before December 31 2000, because this supplementary project ended at this date. These individuals were also reminded before this date, but they were only reminded once. Another exception happened during the trial with 2 versus 1 letter of invitation. This trial lasted for 3 weeks during the fall 2000 – 50% received an additional letter of invitation one week before the usual invitation package – the other 50% received the usual invitation.

The regular invitation for the seven regular age cohorts was sent from 04.05.00 to 23.03.01. The first reminder was sorted according to date of birth for all parts of the town (bydeler) taken together – and was carried through from 06.11.00 to 04.05.01. At the second reminder those living in the central parts of the town (bydeler), were invited to the main screening station in the city centre from 07.05.01 to 29.06.01. Those living in the suburbs were invited to 17 different locations. One or more parts of the town (bydeler) were invited to each place – and the mobile unit (bus) was parked each place 1-3 days. We invited those eligible to the bus from 20.08.01 to 27.09.01. These persons were also allowed to meet at the screening station in the city centre until 27.9.01, where they were offered assistance with filling in the questionnaire in three major foreign languages besides Norwegian.

Thus, the interval between the first invitation and the first reminder varied from 6 month in the beginning of the reminding process to 2 months against the end. The interval between the first and the second reminder for the central parts of the city, varied correspondingly between 6 and 12 month – whereas the interval in the suburbs varied between 3,5 and 10,5 months depending on date of birth and location for the examination bus.

No reminder was sent to the two additional cohorts, i.e. persons born in 1954 and 1969.

## Appendix 2

### *Information about the additional cohorts – born 1954 and 1969 (31- and 46 years in 2000).*

Number of participants and participation rate according to age and gender in the two additional cohorts invited to the Oslo Health Study in 2000-2001 \*

Age (yrs)	Number invited			Number of participants			Participation rate (%)		
	Men	Women	All **	Men	Women	All	Men	Women	All
31	5586	5336	10922	946	1240	2186	17	23	20
46	3190	3178	6368	695	1048	1743	22	33	27
All	8776	8514	17290	1641	2288	3929	19	27	23

\* Number attending the survey and/or submitting at least one of the questionnaires

\*\* 20 individuals who had died or emigrated before the time set for invitation, were excluded. The numbers include 11 persons participating in HYRIM, DOIT or LIFE – see explanation page 5. Five of these sent in at least one questionnaire (participated).

These two cohorts followed the same procedure as described above, but no reminder was sent. They were, however, invited at the end of the survey, and all information material and information activities were targeted at the predefined cohorts 30-, 40-, 45-, 59/60- and 75/76 years.

They received the main questionnaire, the first supplementary questionnaire and the second supplementary questionnaire – version I (see persons 30 and 45 years old in table 1).

### Appendix 3

#### *Two steps invitation - an experiment (Søgaard & Selmer, 2001).*

During a period of 18 days in October 2000 all participants (n = 4 680) to the Oslo Health Study were randomly selected to receive standard invitation procedure or a two steps procedure.

Randomisation was based on last figure in the national identification number.

#### **Standard procedure**

*Mailed about 2 weeks before the time of appointment:*

- Letter with time of appointment
- Three-page questionnaire - with instructions on how to fill in
- Booklet with the aims of the study, content, procedures, etc
- Map

#### **Two steps procedure**

*Mailed 2 weeks before the time of appointment:*

- Letter of invitation - with time of appointment and information about the questionnaire
- The booklet

*Mailed 1 week before the time of appointment:*

- The questionnaire – with instructions on how to fill in - and the time of appointment
- The map

#### **Results**

Attendance rate (%)

	Men		Women	
	n	%	n	%
Standard	1231	37	1391	45
2 steps	928	38	1140	45

#### **Conclusion**

In The Oslo Health Study an invitation in two steps *did not* increase the attendance-rate compared to a standard "one-package" invitation.

## Appendix 4

### *Additional information about - and correct translation of The Hopkins Symptom Check List (HSCL-10) – in the main questionnaire:*

The Hopkins Symptom Check List (HSCL) is a widely used, self-administered instrument designed to measure psychological distress in population surveys (Derogatis LR et al. 1973, Derogatis LR et al. 1974, (Lipman et al. 1979). The HSCL-10 consists of 10 items on a 4-point scale ranging from ‘not at all’ to ‘extremely’ (Strand BH, et al., 2002). The average HSCL-10 score is calculated by dividing the total score by number of items – i.e. ten. Missing values are replaced with the sample mean values for each item. Records with three or more missing items are, however, excluded.

The wording of the items in HSCL-10 used in HUBRO, is *incorrectly translated* – both in the adult (3.1 in main questionnaire) and the youth part of the study (6.1 in main questionnaire). The original English version is quoted below (Lipman et al. 1979).

Listed below are some symptoms or problems that people sometimes have. Please read each one carefully and decide how much the symptoms bothered or distressed you during the last week, including today? (*Place a check in the appropriate column*)” (Categories: Not at all, A little bit, Quite a bit, Extremely)

Suddenly scared for no reason  
 Feeling fearful  
 Faintness or dizziness  
 Feeling tense or keyed up  
 Blaming yourself for things  
 Trouble falling asleep  
 Feeling blue  
 Feelings of worthlessness  
 Feeling everything is an effort  
 Feeling hopeless about the future.

## Appendix 5

### *Additional information about - and correct translation of the questions about “Life events” in the first supplementary questionnaire*

The questions about life events and problems in the first supplementary questionnaire have previously been used by Brugha, T et al., 1985.

The translation in the English version of the questionnaire (T 6.1) is **incorrect**. The correct translation is presented below:

#### *Life events and problems.*

“Have any of the following events or problems happened to you during the last 6 months? (*Put a cross for each line – yes or no*)

You yourself suffered a serious physical illness, injury or assault

A serious illness, injury or assault happened to a close relative

Your parent, child or spouse died

A close family friend or another relative (aunt, cousin, grandparent) died

You had a separation due to marital difficulties

You broke off a steady relationship

You had a serious problem with a close friend, neighbour or relative

You became unemployed or were seeking work unsuccessfully for more than one month

You were sacked from your job

You had a major financial crisis

You had problems with the police and a court appearance

Something you valued was stolen or lost”.