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method

Background

INSEE has carried out the Decennial Health Survey (EDS) since 1960. Its purpose is to compare use of health services with reported health status and the socio-demographic characteristics of individuals.

During the 2002-2003 survey, a health examination was proposed to persons aged 18 and over living in one of the 5 regional extensions: Nord, Picardie, Ile de France, Champagne-Ardenne and the Provence-Alpes-Côte d'Azur region. The examinations were carried out by the Sickness Insurance Health and Examination Centres (CES). The study presented here is the result of a CETAF-IRDES collaboration.

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Differences between reported and diagnosed morbidity The examples of obesity, arterial hypertension and hypercholesterolemia

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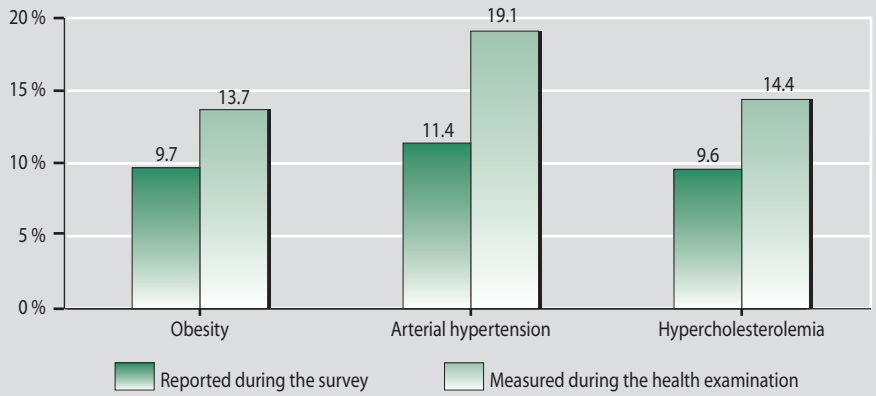
Using a sample of persons who both responded to a health survey by interview and agreed to have a medical examination, this study compares the prevalence rates reported from these two sources for three cardiovascular risk factors: obesity, arterial hypertension and hypercholesterolemia. Individuals under-report poor health whatever the health problem; in general, very few report a problem although the results of medical examination is negative. We note that,

- one person in three declared their height and weight incorrectly, resulting in an underestimation of the prevalence of obesity;
- almost one in two persons suffering from arterial hypertension did not report this at the time of the survey.

In the case of obesity, under-reporting seems to result from a problem of self evaluation, whether deliberate or not. However the significant under-reporting of arterial hypertension and hypercholesterolemia is of more concern because it probably indicates poor understanding of the problem due to inadequate screenning. The results of this study show that prevalence rates established on the basis of self-reporting must be interpreted carefully, as for example in prevention campaigns. This is a serious issue for cardiovascular mortality, which with 180 000 deaths per year, is the leading cause of mortality in France.

Difference between reporting and measurement in estimating the prevalence of obesity, arterial hypertension and hypercholesterolemia
Age-standardised rates, % of the matched population



Source : CES - Eds matching 2002-2003 - CETAF - CNAMTS

Several studies, of obesity in particular, have shown a difference between individuals' perceptions and clinical diagnosis, and have shown that this difference is related to several individual characteristics, notably sex and age.

There are few studies of differences related to social status. Among these, Böstrom et al (1997) showed that obesity estimated from reported data is underestimated among male managers and female manual workers, while Niedhammaer et al (2000) use French data to show a difference between reported height and measured height which increases with social class.

The over or underestimation of diseases or risk factors seems to be more significant for some population groups. Hence it can result in mistaken interpretation of the results of studies of health inequalities, and in poorly targeted public health interventions. Therefore we need to compare individual reporting with medical diagnoses in order to estimate the difference between these sources of information with a view to correcting them.

However we rarely have access at the same time to two sources of information for the same health problem in the same population. Hence an invitation to individuals interviewed in the 2002-2003 Health Survey to have a health examination in a Health Examination Centre[1] (CES) has made it possible to obtain for a sample of 1 889 subjects, individual declarations and medical diagnoses for a certain number of health problems (see the box below).

In this study we look more closely at three of them: obesity, arterial hypertension hypercholesterolemia.

[1] *Heath Examination Centres offer everyone insured in the general scheme a free health examination every five years.*

Two sources of information:
A general population survey and a clinical examination

The Decennial Health Survey (EDS) is carried out every 10 years by INSEE for a representative sample of households living in metropolitan France. The last survey took place between October 2002 and September 2003 and, for the first time, a sub-group of persons surveyed were invited to have a medical examination in a Sickness Insurance Health Examination Centre (CES).

1. The 2002-2003 INSEE decennial survey

The main objectives of the 2002-2003 Health Survey were to obtain information on individual use of health care and prevention services, the prevalence and incidence of self-reported morbidity and perceived health status. A total of 40 796 persons from 16 800 households were surveyed. A specific sampling design was used to obtain bigger samples in regional extensions: Nord-Pas-de-Calais, Champagne-Ardenne, Picardie, Ile-de- France and Provence-Alpes-Côte d'Azur. The households were surveyed over a period of eight weeks with three interviewer visits at one month intervals preceded by a telephone interview. Information on the socio-economic characteristics of individuals (living conditions, professional situation, social insurance), their health status (perceived health, functional limitations, prevalence and incidence of diseases in a 2 month period, weight, height) and information on their use of health care.

2. The periodic health examination

All persons insured in the general scheme and their dependants are eligible for a free health examination once every five years. The Centres for Health Examinations (CES) network has about 100 centres and satellites distributed across the whole of France and carries out approximately 600 000 consultations each year. The data collected during these periodic health examinations constitute an epidemiological database which is updated annually (Guégen, 2001). The periodic health examination takes place in several stages. A self-completed questionnaire completed at home before the check-up or in the company of one of the staff from a CES collects socioadministrative information, data on alcohol and tobacco consumption habits, indicators of social exclusion and perceived health status. In the first part of the examination physical measures of health status are collected: measurement of height and weight, blood pressure, blood and urine analysis to assess possible metabolic and cardiovascular problems, etc. Hearing and vision tests are also proposed to each individual, as well as a dental check, an electrocardiogram and a spirometry test. If necessary a mammography and a cervical smear to detect gynaecological cancers, and a Hémoccult® to detect colorectal cancer are proposed. The second part consists of a clinical examination: the doctor interviews the consultee on any illnesses and treatment being followed, personal and family history, and any problems revealed by the tests from the first stage of the examination.

Invitation to the periodic health examination and matching the two information sources

Those persons surveyed and living in one of the five regional extensions (Nord-Pas-de-Calais, Champagne-Ardenne, Picardie, Ile-de- France and Provence-Alpes-Côte d'Azur) and aged 18 and over, were invited during the third survey visit to have a health examination. Hence this health check was proposed to 14 207 persons, aged 18 or more, and one in two persons agreed to this in principle. Those persons accepting received a personal invitation from the INSEE survey managers. This person then had to contact the nearest CES to his home to make an appointment for the heath check which was the same in all respects as the standard CES periodic health examination. 1 889 persons in total, namely about one quarter of those who had agreed in principle to a health examination, actually received this.

The main reason for choosing these indicators was the fact that all three are cardiovascular risk factors. Furthermore they affect a large proportion of the population, and hence merit particular attention. It should be remembered that cardiovascular diseases, with 180 000 deaths per annum, are the leading cause of death. These are also diagnoses based on objective measures. Finally, from a technical point of view, the existence of large sample populations makes robust measurement of the difference between perception and diagnosis possible.

For each of the three health problems studied, we begin by looking at differences in prevalence according to whether the problem was diagnosed during the health check or reported during the Decennial Health Survey. Then we estimate the proportion of responses which agree or disagree. Amongst the latter we are particularly interested in those individuals who do not report any illness because they have a risk factor which has not been detected or for which there is a lack of information.

Finally, among those persons for whom a health problem was diagnosed during the examination, we try to establish whether those subjects who did not declare the problem during the survey have a particular profile in terms of lifestyle, health-seeking behaviour etc.

The study population: persons paying some attention to their health are over-represented

The study population consists of 1 889 subjects, of which 51.6% are women and 48.4% are men. A high proportion of subjects live in the Ile-de-France (39.8%). The majority of individuals were in employment at the time of the survey (60.8%) and stated that they lived with a partner (72.9%).

Compared to the Decennial Health Survey sample which is representative of the population of metropolitan France, there are more persons aged between 35 and 64, and there are more individuals with higher education and in active employment. Engineers and managers are also over-represented, compared to unskilled workers and blue collar workers. The individuals in our sample also appear to pay more attention to their health. For example, persons who report practising a sport are relatively more numerous in the matched sample than in the sample surveyed (48% compared to 36.3%). They are also more interested in their nutrition and eat particular foods because they are concerned about their health (60.1% vs 50.9%). Finally, agreeing to a health examination shows that someone is interested in his/her health.

Statistical analysis

The comparative analysis of survey data and data from the medical examination is identical for each of the three indicators. It is carried out in three stages:

- Comparative rates standardised by age

We decided to present prevalence data standardised by age to compensate to some extent for recruitment bias related to participation in the health check. We use the direct standardisation to calculate prevalence rates by applying the age structure of the reference population, in this case the French population according to the INSEE census of 1999, to the study population. Hence the effect of age is taken into account: the rates are compared for the same age.

The rates are stratified by sex and expressed as percentages, with 95% confidence intervals which gives a measure of the precision of the estimate.Although the prevalence rates are standardised by age, they cannot be extrapolated to the whole French population.

- The crossed contingency table

This classifies all subjects by reported and measured data. It enables the identification of those subjects for whom information from the declaration and the measurement differ and those for whom it is the same.

- The multivariate logistical regression model

For each of the risk factors studied (obesity, hypertension or hypercholesterolemia), we use this statistical model to explain non-declaration of the health problem among those persons for whom it was identified in the Health Examination Centre (CES) health check. This enables us to determine whether under-reporting is associated significantly more often with certain socio-economic and demographic characteristics. The associations are calculated in order to identify the effect of each characteristic on the response independently of the other elements in the individual profile. This avoids wrongly imputing the effect of one characteristic (for example revenue) to another with which it is often associated (for example supplementary insurance).

The results of this model are:

- odds ratios expressing the effect of each characteristic on the risk of reporting no problem when the problem is detected by measurement;
- their confidence intervals at 95%.

The characteristics of the subjects studied were sex, age group, region, PCS (Professional activity), annual income in Euros by consumption unit, existence of supplementary insurance cover, general practitioner consultation during the last 12 months, marital status and self-perceived health status. For each indicator, measurement values obtained in the CES are also included in the models.

The average interval between the survey and the medical examination was two months. The effect of the delay between survey and medical check was examined by comparing the distribution of delays for persons for whom the measurements agreed or disagreed and by verifying the rates for persons wrongly grouped as a function of these delays. These analyses do not show any relationship between delay and disagreement for obesity or hypertension, and increasing but non-significant disagreement for hypercholesterolemia.

Other characteristics of the study population are a direct result of choosing the five extended regions : people living in rural communes are under-represented (15% in the matched sample compared to 23.2% in the survey population overall) to the advantage of inhabitants of the Parisian conurbation (33.8% vs 19.8%) and as a result MSA members are under-represented (4.8% in the matched sample vs 6.1% in the survey population) compared with affiliates of the general scheme or the civil servants' scheme (81.1% vs 77.5%).

If these differences are associated with reported or diagnosed illness, they are likely to bias the estimation of prevalence and hence the difference between reported prevalence and diagnosed prevalence. However the logistical regressions make it possible to deal with these sources of bias and to confirm the results of the descriptive analysis.

Obesity

One person in three declare wrongly their height and weight resulting in an underestimation of the prevalence of obesity

Information on the weight and height of each individual was collected by self-completion questionnaire in the survey, and as measured by nurses in the Health Examination Centres (CES) using standardised procedures. In both cases, the Body Mass Index (BMI) was calculated as weight (kg)/height² which enables us to define obesity as BMI equal to or over 30kg/m².

Comparison of data declared in the survey, and measured in the CES, is carried out for 1 858 subjects for whom information is available in both sources.

Comparing self-reported data with measured data shows that obesity estimated from declarations is under-estimated. In fact, without distinguishing by sex, the rate is 9.7% from declarations and 13.7% from CES measurements. This difference is significant at the 5% probability level. It should be noted that these prevalence rates cannot be extrapolated to the whole French population because participation bias is different in the survey and the health examination.

By cross-checking the two sources of information for each individual we can determine the proportion of persons classed as obese based on measurement but not on self-reported weight and height.

- Among the 267 subjects classed as obese based on measurements taken in Health Examination Centres, 86 (i.e. 32.2%) are not according to height and weight self-reported in the survey;

- However, among the 1 591 subjects not classed as obese based on CES measurements, only 14 (0.9%) are classed as obese based on their declaration.

Overall, the two sources of information do not agree for 5.4% of the subjects. The self-reporting errors are essentially those of obese subjects who under-estimate their weight or over-estimate their height. Very few non-obese subjects over-estimate their weight or under-estimate their height.

Prevalence of obesity standardised by age, based on self-reported data in the EDS, and on CES measurements

	Men n = 901	Women n = 957	Total n = 1858
Obesity based on survey self-reporting	**10.1%** [8.2-12.0]	**9.4%** [7.4-11.3]	**9.7%** [8.4-11.1]
Obesity based on Health Examination Centre(CES) measurements	**13.4%** [11.2-15.5]	**14.3%** [11.9-16.,6]	**13.7%** [12.1-15.3]

Source : CES - EDS Matching 2002-2003 – CETAF - CNAMTS

Note for the reader: In the sample studied, the proportion of men reporting a weight and a height which classifies them as obese is 10% with a 95% confidence interval between 8.2% and 12.0%; this proportion is 13.4% according to Health Examination Centre measurements, with a 95% confidence interval of 11.2% to 15.5%.

Agreement between measured and reported data for an obesity threshold of 30 kg/m²

		Reported in a survey self-completion questionnaire		
		IMC > = 30	IMC < 30	Total
Measurements carried out in Health Examination Centres (CES)	IMC > = 30	181 (67.8%)	86 (32.2%)	267 (100%)
	IMC < 30	14 (0.9%)	1 577 (99.1%)	1 591 (100%)
	Total	195	1 663	1 858

Source : CES - EDS Matching 2002-2003 – CETAF - CNAMTS

Note for the reader : Among those persons identified as obese according to CES measurements, 181 (67.8%) are also obese according to their survey declarations, while 86 (32.2%) are not. Among those persons not identified as obese according to CES measurements, 1 577 (99.1%) are also not obese according to their survey declarations, while 14 (0.9%) are wrongly classified as obese.

Women and persons just above the obesity threshold are most likely to under-report

The 86 subjects classified as obese on the basis of measurements (BMI >= 30kg/m²) but who are not according to their declared weight and height, are then compared with the 181 subjects who had immediately reported weight and height which classified them as obese (see the method box on p. 3).

If we look at their overall characteristics, only associations with BMI measured during the health check are significant: under-reporting is less likely as weight increases (OR=0.41 [0.31-0.55]). Hence it is difficult to be mistaken about one's height and weight when the problem becomes obvious. The risk of under-reporting is also lower for men (OR=0.40 [0.20-O.77]). Finally it is greater for individuals who declare good health status (OR = 2.21 [1.04-4.68]). These individuals are perhaps less aware of any health problems they may have, in particular that of obesity.

Arterial hypertension

4 persons in 10 suffering from arterial hypertension do not declare this health problem, definitely due to lack of detection

During the survey, the respondents report both any current health problems and those which have resulted in a medical consultation or treatment during the survey. Hypertensive patients are detected based on both types of declaration.

In the Health Examination Centres, nurses measure systolic and diastolic blood pressure from the left arm. In the study arterial hypertension is deemed to exist[2] either where anti-hypertensive treatment is reported, or where systolic blood pressure is greater than 160mmHg and/or diastolic blood pressure is greater than 95mmHg.

It was possible to measure the agreement of these two types of information (reported and measured arterial hypertension) for 1 598 persons among the matched sample of 1 889 subjects, some measurements of arterial hypertension not being available during data analysis.

Comparative analyses show that self-reporting considerably under-estimates hypertension. Estimated prevalence from survey declarations is approximately 11.4%, while prevalence estimated from CES measured data is approximately 19.1%.

By comparing the two sources of information for each individual we can specify where data disagrees.

- Among the 281 subjects for whom raised blood pressure was measured at a CES, 121 (i.e. 43.1%) did not report arterial hypertension during the survey.

- Among the 1 317 subjects for whom raised arterial blood pressure was measured in a CES, 9 (i.e. 0.7%) had reported raised blood pressure during the survey.

Prevalence of arterial hypertension standardised by age, based on EDS declarations and CES measurements

	Men n = 774	Women n = 824	Total n = 1598
Arterial hypertension reported in the survey	**9.7%** [7.7 - 11.7]	**13.2%** [10.6 -15.8]	**11.4%** [9.7 - 13.0]
Arterial hypertension measured by Health Examination Centres (CES)	**17.1%** [14.6 - 19.5]	**21.3%** [18.5 - 24.2]	**19.1%** [17.2 - 21,.0]

Source : CES - EDS Matching 2002-2003 – CETAF - CNAMTS

Note for the reader: In the sample studied, the proportion of men reporting raised blood pressure during the Decennial Health Survey is 9.7 % with a 95 % probability of this being between 7.7 % and 11.7 % ; this proportion is 17.1 % according to Health Examination Centre measurements, with a 95 % probability of being between 14.6 % and 19.5 %.

Agreement between reported and measured arterial hypertension in the matched sample (n = 1598)

		Aretrial hypertension reported in the survey		
		Yes	No	Total
Arterial hypertension measured in Health Examination Centres (CES)	Yes	160 (56.9%)	121 (43.1%)	281 (100%)
	No	9 (0.7%)	1 308 (99.3%)	1 317 (100%)
	Total	169	1 429	1 598

Source : CES - EDS Matching 2002-2003 – CETAF - CNAMTS

Note for the reader: Among those persons identified as suffering from blood pressure from CES measurements, 160 (56.9 %) also suffer from this according to Decennial Health Survey declarations while 121 (43.1 %) do not. Among those persons for whom blood pressure is not identified according to CES measurements, 1 308 (99.3 %) do not declare this problem either, while 9 (0.7 %) wrongly report that they have the problem.

2 *It should be noted that the criteria used by the Health Examination Centres in 2002 to define arterial hypertension differ from those currently recommended by WHO – for WHO systolic blood pressure above 140 mmHg and diastolic blood pressure above 90 mmHg constitute arterial hypertension.*

Overall the two information sources do not agree for 8.1% of subjects. As for obesity, these disagreements are essentially due to persons with the illness not reporting it, either because they forget, or because they are unaware of the problem.

This under-reporting of arterial hypertension has already been estimated for France. During the Monica project (French Register of Ischemic Cardiac Disease, 1998), blood pressure was measured for adults aged between 35 and 64 living in Lille, Toulouse and Strasbourg. With a higher blood pressure threshold, of 140/90 mm Hg, comparison with reported arterial hypertension showed that it was declared by only 39 to 44% of men and 57 to 65% of women.

Raised blood pressure and fewer medical consultations are associated with lower reporting of arterial hypertension

The profile of 121 persons with raised blood pressure who did not declare this was compared with the profile of the 160 subjects with raised blood pressure for whom the two information sources agreed (see the method box p.3).

Looking overall at the characteristics of the subjects, only those associations with blood pressure level and doctor consultation are significant. The risk of not declaring hypertension increases with measured arterial blood pressure (BP) (diastolic BP: OR = 1.05 [1.02-1.08] and systolic BP: OR = 1.02 [1.00-1.04])[3]. It is also higher among those subjects who had not consulted a general practitioner during the last twelve months (OR = 3.21 [1.18-8.75]).

This result for the frequency of use of health services suggests lack of knowledge about this illness among persons who have misunderstood their doctor's diagnosis or who have limited access to health services. Hence under-reporting here is more likely to be due to lack of knowledge of the disease rather than oversight. Hence the differences between measurement and reporting of arterial hypertension indicate unmet care needs. The fact that under-reporting is more likely for higher blood pressure strengthens this hypothesis. In this case persons who are not aware of this problem obviously have higher blood pressure than those who are treating the condition. The difference between the threshold used by Health Examination Centres and the threshold normally used to define hypertension does not change our interpretation of these results. However it is important to be aware that the measurement of arterial pressure as carried out in the CES does not enable us to confirm the existence of arterial hypertension, merely to say that it may exist. In fact a diagnosis of arterial hypertension is only possible after several measurements in different consultations[4].

Hypercholesterolemia

One in two people suffering from hypercholesterolemia are not aware of it

Hypercholesterolemic subjects were identified in the Decennial Health Survey using two types of reported information: on current health problems and on those which have resulted in a medical consultation or treatment during the survey.

In the Health Examination Centres total cholesterol levels were assessed in standardised conditions in all subjects up to the age of 75.

3 *Because the strong correlation between these two variables may affect the precision of estimations of their effect on self-reporting by respondents (the problem of "multicolinearity"), we performed the regressions with only one of these variable at a time. The results were virtually identical.*

4 *To confirm arterial hypertension, a doctor must find a level above normal in three successive consultations with at least two measurements at each consultation, after several minutes of rest, in a sitting or lying down position (Diagnosis and treatment of arterial hypertension in adults aged between 20 and 80 years, High Health Authority, http://www.anaes.fr/anaes/Publications.nsf/wEdition/TS_LILF-3XYCW9?OpenDocument&Retour=wSpecialites?OpenView ; consulted 16/10/2006).*

Prevalence of hypercholesterolema reported in the EDS survey and measured in the Health Examination Centres (CES) - rates in % standardised by age

	Men n = 880	Women n = 931	Total n = 1811
Hypercholesterolemia reported in the survey	**9.2%** [7.2 -11.2]	**10.0%** [7.8 -12.2]	**9.5%** [8.0 -11.0]
Hypercholesterolemia measured in the CES	**14.3%** [12.0 -16.6]	**14.8%** [12.2 -17.4]	**14.4%** [12.7-16.1]

Source : CES - EDS Matching 2002-2003 – CETAF - CNAMTS

Note for the reader: In the sample studied the proportion of men reporting hypercholesterolemia during the Decennial Health Survey is 9.2% with a 95% probability of this being between 7.2% and 11.2%; this proportion is 14.3% based on CES measurements with a 95% probability of this being between 12.0% and 16.6%.

Those subjects with a level equal to or above 7 mmol/l and/or stating that they were being treated for hyperlipaemia were considered to have hypercholesterolemia.

We compared reported and measured hypercholesterolemia for 1 811 persons for whom information from both sources was available.

The prevalence of hypercholesterolemia is seriously under-estimated in the reported data. It is 9.6% compared to 14.4% based on CES measurements.

- Among the 252 subjects for whom hypercholesterolemia was diagnosed in Health Examination Centres, 126 (i.e. 50%) did not report hypercholesterolemia in the survey.

- Among the 1559 subjects for whom hypercholesterolemia was not detected in the Health Examination Centres, 29 (i.e. 1.9%) had declared this problem during the survey.

Overall, the two information sources disagree for 8.6% of subjects. These results show that, as for the two illnesses discussed above, the disagreements relate essentially to individuals who have a disease but do not report it because they are unaware of it.

Under-reporting of hypercholesterolemia is more frequent among young people and those with high cholesterol levels

As for the other risk factors, we have compared the profiles of the 126 persons who did not report hypercholesterolemia with the 126 subjects who declared this problem immediately (see the method box on p. 3).

Agreement between reported and measured data for hypercholesterolemia in the matched population (n = 1 811)

		Hypercholesterolemia declared in the survey		
		Yes	No	Total
Hypercholesterolemia measured in the Health Examination Centres (CES)	Yes	126 (50.0%)	126 (50.0%)	252 (100%)
	No	29 (1.9%)	1 530 (98.1%)	1 559 (100%)
	Total	155	1 656	1 811

Source : CES - EDS Matching 2002-2003 – CETAF - CNAMTS

Note for the reader: Among those persons identified as suffering from hypercholesterolemia based on CES measurements, 126 (i.e. 50.0%) also report this problem to the Decennial Health Survey while 50% do not. Among those persons identified as not suffering from hypercholesterolemia based on CES measurements, 1530 (98.1%) also do not report this problem in the survey, while 29 (1.9%) wrongly declare the problem.

Age and hypercholesterolemia are associated with under-reporting: the disagreement between reporting and measurement is less frequent in persons aged 45 and older (OR = 0.36 [0.13-0.97], for subjects aged 45 to 59 and an OR = 0.20 [0.07-0.55] for subjects aged 60 or older) compared to those younger than 45. Among the youngest individuals, hypercholesterolemia is undoubtedly looked for less systematically during medical examination, which could explain under-reporting of this disease. In addition under-reporting is more frequent among persons with a raised cholesterol level (OR = 1.82 [1.45-2.27]).

This study enables us to assess the comparability of self-reporting by questionnaire in the Decennial Health Survey and measurements taken at Health Examination Centres for the same population. Based on an analysis of three different health indicators, it shows that data collection by self-completion questionnaire results in significant under-reporting of the prevalence of some health problems.

The differences between reporting and measurement are more important for those health problems which cannot be directly observed by the subject. A problem of excess weight is visible, whereas hypertension is not detectable without prior examination.

These results suggest that, for arterial hypertension and cholesterol, under-reporting is more likely to result from ignorance of health status rather than failure to report the problem if known. They also show that there is no bias resulting from reporting of health problems: not many variables are associated with under-reporting and they are very different for the three health indicators: sex for obesity, frequency of use of health services for arterial hypertension and age for hypercholesterolemia. This lack of reporting bias should be looked at further however, given the relatively limited number of subjects in our study.

The results of this study show that prevalence rates established on the

basis of self-reporting need to be interpreted with care. In the case of the indicators studied here, the effect of under-reporting can be considerable. Hence it would seem important in health preven-tion campaigns to target those individuals who do not appear to be concerned about health problems which in fact require attention, more effectively. This is a serious issue for cardio-vascular illness, which with 180 000 deaths per annum, is the leading cause of death in France.

This study should help to qualify the interpretation of self-reported data from general population surveys. In fact, a lot of national data on disease prevalence and risk factors is based on self – reporting in the large health surveys (Decennial Health Survey, Health and Social Protection Survey, Health Barometer, etc.). The extent of the measured differences reported here should constitute the first phase of a considered debate on how to improve self-reported data.

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Further information

Dauphinot V., Naudin F., Guéguen, R. (2006), *Biais de participation et confrontation des données de santé déclarées lors de l'Enquête décennale santé 2002-2003 et mesurées dans les CES de l'Assurance maladie*. Avec la participation du Dr Catherine Sermet et de Marc Perronnin de l'IRDES, 60 p. Rapport en ligne sur le site : www.cetaf.asso.fr

See as well

Bostrom G., Diderichsen F. (1997), Socioeconomic differentials in misclassification of height, weight and body mass index based on questionnaire data. *International Journal of Epidemiology* 26 [4]. pp. 860-66

Guéguen R., Guénot C. (2001), Géographie de la santé et prévention : apport des Centres d'examens de santé. Technologie santé 45. pp. 28-31

Niedhammer I., Bugel I., Bonenfant S. *et al*. (2000), Validity of self-reported weight and height in the French GAZEL cohort. *International Journal of Obesity and related metabolic disorders*. 24 [9]. pp. 1111-18

Registres français des cardiopathies ischémiques. (1998), Facteurs de risque et comportements de prévention dans la population des trois registres Monica-France. Enquête de population 1994-1997.