RIVM report 261753001/2002

MONICA Optional Study on Nutrition: the dietary assessment methodology

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Erratum 9 May 2003 see last page

This investigation has been performed by order and for the account of Board of Directors of RIVM, within the framework of project 261753, Positive aspects of diet.

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Abstract

The WHO MONICA Project comprises a multi-centre study to monitor coronary heart disease and its risk factors over a period of 10 year. As part of the WHO MONICA Project, a Dietary Survey (MONICA Optional Study on Nutrition) was carried out in a sub-sample of around 4000 men aged 40-64 years from eleven European countries. In this report, the methodology used by individual centres in dietary assessment is described. This is followed by a comparison of the quality of the available food consumption data collected at the centres, which led to conclusions on the usefulness of these data for further research. The dietary record methods used in the study centres were assessed according to six criteria, including time at which data were recorded, instructions for describing food stuffs and portion sizes, data collection procedures, and instructions for the interviewers. Although the recording methods used in the different study centres have much in common, there were differences in several respects e.g. grouping of foodstuffs. In conclusion, dietary data need to be standardised before analysis can take place and study centres can be compared. This harmonisation of datasets will require more time. As no further funding is available, the MONICA Optional Study on Nutrition will not be continued.

Preface

This report describes the dietary assessment methods used in the MONICA Optional Study on Nutrition. This Dietary Survey was part of the WHO MONICA Project that monitored coronary events and its risk factors. From 1985 to 1994, Prof. G. de Backer (Ghent, Belgium) co-ordinated the MONICA Optional Study on Nutrition. Since 1995, this project was co-ordinated by the National Institute of Public Health and the Environment, Bilthoven, The Netherlands.

To complete the inventory of dietary assessment methods, the MONICA centres were contacted several times. From 1997 to 1999, Ellen Bokje visited many centres to collect information on data collection and data procession procedures. The results of her inventory are described in this report. Ellen did not finish the report on her work, because she took another job. She passed away suddenly thereafter at a far too early age. It took some time before we had the possibility to finish this report. We are grateful for the work of Ellen on the MONICA Optional Study on Nutrition. This year Annemien Haveman-Nies finalised the report.

We thank the project leaders of the MONICA Optional study on Nutrition and their colleagues for the pleasant co-operation.

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Summary

The WHO MONICA Project is a 10-year study that monitors deaths and occurrence of coronary heart disease (CHD), acute myocardial infarction, coronary care, and risk factors in men and women aged 35 to 64 years in defined communities (38 centres from 21 countries). As part of this Project, a Dietary Survey (MONICA Optional Study on Nutrition) was carried out in a limited number of study centres located in northern/central Europe (Northern Ireland, Denmark, Finland, Belgium, Germany, France-east and north) and southern Europe (France-south, Italy and Spain). One European study, the Caerphilly Study (Cardiff, UK), that includes similar data as the MONICA centres was added to the Optional Study on Nutrition. The Dietary Survey was performed in a sub-sample of men aged 45-64 years (participation rates ranged from 51 to 88%). Main objective of the MONICA Optional Study on Nutrition was to describe trends in dietary patterns in Europe in order to investigate how these trends are related to trends in coronary heart disease. In the Optional Study on Nutrition, information on dietary intake was collected using dietary record methods. Although the project group proposed a 3-day un-weighed record method, centres were free to adapt their dietary assessment methodology. For this reason an inventory on the comparability of collected dietary data is performed and reported here. The quality of the available food consumption data is discussed and conclusions are drawn on the usefulness of the data for further research.

The dietary record methods are compared on the following aspects: date of recording, instructions in the record book with respect to the description of food items and portion sizes. Further, we compared the data collection procedure and the instruction of the survey staff. Based on these aspects, six criteria were defined and study centres were judged according these criteria. We found that the record methods used in the different study centres have much in common, they differ in several respects. For example, in Helsinki dietary intake was merged together in a few food groups. For Ghent, Helsinki, Barcelona, Glostrup, and the French centres it could not be guaranteed that record days are representative for the whole week. In Helsinki, participants were not contacted twice during the data collection period. Furthermore, food quantities were estimated in different ways as a result of different record methods, food composition tables and coding rules.

We conclude that the dietary data need to be standardised before the data sets of the different study centres can be compared. This harmonisation of data sets requires additional activities. As no funding for this time-consuming work is available, we will not continue the MONICA Optional Study on Nutrition.

Samenvatting

Het WHO MONICA Project is een monitoringonderzoek naar veranderingen in hart- en vaatziekten en de risicofactoren over een periode van 10 jaar. Aan het onderzoek namen personen van middelbare leeftijd deel die afkomstig waren uit 21 landen. Als deelstudie van dit Project werd een voedingsonderzoek (OptionalStudy onNutrition) uitgevoerd dat zich beperkte tot mannen in de leeftijd van 45 tot 64 jaar uit de volgende landen: Finland, Denemarken, Duitsland, Ierland, Engeland, België, Frankrijk, Spanje en Italië. De doelstelling van de MONICA OptionalStudy on Nutrition is om trends in voedingspatronen in Europa te beschrijven en om vervolgens deze trends te koppelen aan trends in hart- en vaatziekten. Het doel van dit rapport is om de methodes die gebruikt zijn om de dagelijkse voedselconsumptie te meten, in kaart te brengen. De kwaliteit van de gebruikte methodes wordt vergeleken en vervolgens wordt nagegaan of deze gegevens geschikt zijn voor vervolgonderzoek.

In de OptionalStudy onNutrition zijn door de deelnemende landen verschillende methodes gebruikt om de voedselconsumptie te meten. Onderzoekscentra werd geadviseerd om een driedaagse opschrijfmethode (zonder weging) te gebruiken, maar de centra waren vrij om deze methode aan te passen. De meetmethodes werden beoordeeld op de volgende punten: moment van rapportage, instructies met betrekking tot de beschrijving van geconsumeerde voedingsmiddelen en de schatting van portiegroottes, procedure voor gegevensverzameling en training van de interviewers. Op basis van deze items zijn 6 criteria gedefinieerd waarop de onderzoekscentra zijn beoordeeld. Het bleek dat er veel overeenkomsten waren in de meetmethodes die gebruikt werden in de verschillende onderzoekscentra. Toch had bijna elk onderzoekscentrum zijn beperkingen. Bijvoorbeeld, in Helsinki zijn voedingsmiddelen gegroepeerd in een klein aantal groepen. Het is niet zeker of in Gent, Helsinki, Barcelona, Glostrup en in de Franse centra meetdagen zijn geselecteerd die representatief zijn voor een gemiddelde week (2 weekdagen en 1 weekenddag). In Helsinki is slechts éénmaal, alleen bij aanvang van het onderzoek, contact geweest met de deelnemers. Naast deze verschillen is aandacht besteed aan de nauwkeurigheid van de schatting van portiegroottes. In de onderzoekscentra zijn portiegroottes op verschillende manieren geschat door verschil in codeerafspraken, meetmethodes en gebruikte voedingsmiddelentabellen.

Wij concluderen dat de voedingsgegevens van de verschillende centra eerst moeten worden gestandaardiseerd voordat ze kunnen worden vergeleken. Deze harmonisatie van datasets zal veel extra tijd vragen. Aangezien voor deze activiteiten geen financiering aanwezig is, zullen wij de MONICA OptionalStudy onNutrition niet te continueren.

1. Introduction

The WHO MONICA Project is a 10-year study that monitors deaths and occurrence of coronary heart disease (CHD), acute myocardial infarction, coronary care, and risk factors in men and women aged 35 to 64 years in 38 centres from 21 countries (WHO MONICA Project, 1989). A standardised coronary event registration provides the data on CHD morbidity and mortality (population survey). The measurement of the classic risk factors body composition (BMI), smoking, blood pressure, cholesterol concentration was liable to quality control procedures.

In 1985, it was decided by the MONICA investigators to assess the extent to which trends in CHD morbidity and mortality are related to changes in risk factors including diet. An Optional Study on Nutrition as part of the MONICA project was therefore advised for a subsample (men aged 45-64 years) of the population survey. In order to be able to assess changes in consumption patterns, a second survey was executed in the nineties. The proposed methodology was the 3-day un-weighed food record as described in the EURONUT report (Knuiman et al., 1985). However, centres were free to adapt their dietary assessment methodology. Therefore the actual survey methodology used in the individual centres should be described and carefully compared before pooled data analysis can be carried out.

Till 1994, the co-ordination of the MONICA Optional Study on Nutrition was being conducted by Prof. G. de Backer, Dept. of Hygiene and Social Medicine, Ghent, Belgium (Brussaard et al., 1992; Hanssens, 1993). Since 1995, Prof. D. Kromhout, National Institute of Public Health and the Environment, Bilthoven, the Netherlands is the co-ordinator of this study. So far, no papers have been published on the common dietary data. Only descriptive papers based on data of combined studies of two or three centres were published (Evans et al., 1995;Jost et al., 1990; Rosengren et al., 1999; Winkler et al., 1992a; Winkler et al., 1992b).

The objectives of the Optional Study on Nutrition are:

- to describe food consumption trends, including food patterns in Europe
- to describe trends in food consumption and trends in CHD-mortality (from the eighties to the nineties)
- to assess the relation between:
  - diet and risk factors
  - diet and CHD-mortality

So far, only in individual centres these objectives are investigated. In Denmark and Augsburg food consumption trends are described over a period of 10 years (Osler et al., 1997; Winkler et al., 2000). The relationship between diet and smoking, and diet and blood pressure is investigated in France (Nuttens et al., 1992; Simon et al., 1990). The relationship between

trends in the risk factors and trends in coronary event rates is investigated for the WHO MONICA Project (Kuulasmaa et al., 2000).
The objective of this report is to describe the dietary assessment methodology used by the individual centres. The quality of the available food consumption data is compared and conclusions are drawn on the usefulness of the data for further research.

2. Methods

The information concerning the dietary assessment methodology used by the centres was collected in three different steps:

1. First, global information regarding the methodology used was collected by mail from all the centres that carried out a nutritional survey. Further, the centres were asked whether they wanted to collaborate in the Optional Study on Nutrition.
2. Secondly, all selected centres were sent a checklist with questions regarding their study population and dietary assessment methodology.
3. Thirdly, all selected centres have been visited to collect original documents and missing information considering the methodology used. The reports of the meetings were sent to the centres afterwards in order to double-check all information.

Finally, the data have to be sent to the co-ordinating centre where a quality control procedure will take place.

In table 2.1.1 all study centres involved in this selection procedure are presented. The type of dietary record method is described and reason for exclusion is given for five centres.

Table 2.1.1: Study centres included in the selection procedure for the MONICA Optional Study on Nutrition.

Centre	*Dietary record method*	*Reason for exclusion*
Ghent (B)	3-day record	
Augsburg (GE)	7-day record	
Lille (F)	3-day record	
Strasbourg (F)	3-day record	
Toulouse (F)	3-day record	
Belfast (UK)	3-day weighed record	
Cardiff (UK)	7-day weighed record	
Helsinki (FIN)	3-day record	
Barcelona (E)	3-day 24-h recall	
Glostrup (DK)	7-day record	
Milan (I)	3-day record	
Warsaw (POL)	3-day record	low participation rate (31%)
Zepernick (GE)	3-day record	not interested
Udine (I)	interview method	deviant method
Umea (SWED)	1-day record	deviant method
Beijing (CHINA)	3-day record	non-European

In the first step, study centres were excluded for several reasons. Udine (Italy) and Umea (Sweden) did not use a dietary record method for more than one day. Further, the study centre

in Warsaw (Poland) considered the quality of their survey and participation rate not good enough for inclusion in the common database. Beijing (China) was the only non-European centre that collected dietary data. It was decided not to include Beijing in the Optional Study on Nutrition because of the assumed differences in food intake and other risk factors between Beijing and the European centres. One centre (Zepernick, East Germany) showed no interest in participating in the Optional Study on Nutrition. One study is added to the Optional Study: the Caerphilly Study (Cardiff, UK). This study carried out a similar registration regarding coronary events and the same kind of risk factor data was collected. For this reason Cardiff, which was not a MONICA centre, was included at this stage.

In the centres selected at this stage of the process, different record methods were used. In the centres Glostrup,Augsburg, and Cardiff the participants recorded their food intake for seven days instead of three. In Barcelona a 3-days repeated 24-hour recall was used because of the high rate of functional illiteracy among the participants. The first interview took place in a mobile unit and was carried out by a trained dietician. In case information was missing, the subject was contacted by telephone (Spaaij, 1997). The second and third recalls were carried out by telephone or home interview. Participation rates of the second and third recall were slightly lower than for the first recall. This methodology comes close to a 3-day record and gives generally similar results (Bingham & Day, 1997; Cameron & van Staveren, 1988; Sawaya et al., 1996; Willet, 1998). In addition, the survey was properly executed and the quality of the data is considered to be good (Spaaij, 1996).

In Glostrup a pre-structured diary consisting of 115 food groups was used with some space left for writing down recipes. Participants were instructed to write down their food intake in a notebook during the day and to transpose that information in the diary at evening. In Glostrup the protein intake estimated by the dietary records was validated against protein intake as calculated from nitrogen excretion in 24-h urine specimen during two periods. No significant difference appeared between both methods in both periods. Jørgerson et al. (1992a) concluded that the validity of the method on a group level was good.

In Augsburg and the first survey in Helsinki dietary intake data were comprised in less detailed food groups as in Glostrup. Dietary data of the first survey in Helsinki are only available as 25 food groups. The crude dietary intake data are not accessible anymore, because the description of the original food codes is not documented (Pietinen et al., 1988). The crude dietary intake data of the second survey (1992) are still accessible. In Augsburg, the food items are aggregated into 23 food groups, which are available for our study. The crude dietary intake data are still accessible in Augsburg, but releasing this information needs additional funding.

The 3-day estimated record method was used in Ghent, Helsinki, Milan, and the French centres. In France, a validation study was carried out in three centres. The weighed record method was compared with the 3-day record method in 85 persons. The 3-day record method

over- and underestimated macronutrient intake as compared to the weighed record method. Correction factors would not reduce the differences observed in all macronutrients and were therefore not applied (Jost et al., 1990).

Finally, weighed and un-weighed record methods were used. In Belfast and Cardiff, the main method of estimating portion sizes was weighing, while in the other centres portion sizes were mainly expressed in household measures, standard portions, or were assessed by means of a picture book (see paragraph 3.1). As part of the Caerphilly Study were for 50 men and 49 women, nutrient values obtained by a 7-day weighed record method compared to the nutrient values of the same records, having substituted quantitative estimates for some foods such as bread and milk. For other foods such as meat, fish and vegetables, group mean portion weight were used. It was found that most nutrient values obtained from the two methods were highly correlated in men and women. The estimated record method generally obtained lower nutrient values than the weighed record method. Hopkinson concluded that the 7-day estimated record method can be used for nutritional analysis in large study populations (Hopkinson, 1990).

The information collected in the second and third step is described in paragraphs 3.1 and 3.2. The following aspects which are liable to different approaches and which may bias the outcome will be described:

- study population (3.1)
- dietary assessment methodology (3.2)
  - record book
  - survey staff and data collection procedure
  - data coding and checking data-entry
  - food composition tables
  - recording food quantities

In chapter 4 the overall conclusions regarding the issues discussed in chapters 2 and 3 will be reported.

3. Results

3.1 Study populations

In table 3.1.1 study characteristics of the main Population Survey and the MONICA Optional Study on Nutrition are presented. The MONICA Optional Study on Nutrition is part of the WHO MONICA Project. The population surveys have been carried out in a standardised way according to the MONICA manual. About half of the centres used a two-stage sampling procedure. The other centres used random sampling procedure for the population surveys. Participation rates varied for the population survey from 41% in Strasbourg to 90% in Cardiff. For most surveys, the participation rate was in between 60 and 70 percent.

Further, in table 3.1.1 the study populations participating in the dietary survey are described. In most centres, except for Belfast, Glostrup and Cardiff, a sub-sample of men aged 45-64 y was selected from the MONICA Population Survey. In Belfast a group of men aged 45-64 y with the same main characteristics as the MONICA population was sampled for the dietary survey. For the dietary survey in the Caerphilly Study, men aged 45-59 years were selected from the cohort study. In Glostrup, the ages were exactly 40, 50 and 60 at the time of recruitment. Participation rates of the dietary surveys ranged from 51% in Glostrup to 88% in Cardiff. The participation rates in Helsinki, Glostrup and Strasbourg do not represent the study group of men aged 45-64 year, because in these centres also women and persons of a wider age range were invited to participate in the dietary surveys. However, it is expected that the participation rates are fairly comparable to the rates in the other centres.

The number of dietary surveys varied for the individual study centres. In Cardiff, Belfast, Barcelona and Milan, only one dietary survey was available. For these centres time trends in dietary intake cannot be studied. In Ghent and Toulouse dietary surveys were carried out in three measurement rounds. The other centres carried out two dietary surveys covering a period of about 10 years.

According to the protocol for the dietary surveys, each 10-year age group should consist of 250 participants. However, some centres surveyed a smaller number. The smallest number of participants was included in the dietary surveys in Ghent and Barcelona.

Table 3.1.1: Characteristics of the MONICA study populations.

			MONICA Population Survey (MON-PS)[1]			MONICA Dietary Survey (MON-DS)			
Research centre	Survey	Year of data collection	Sampling procedure	Partic. rate of ♂ and ♀ aged 35-64y	No.of ♂ and ♀ aged 35-64 y	Sampling procedure	Partic. rate	Age group	No. men
Ghent	1	1985/86	random age- and sex stratified	72%	1028	all men aged 45-64 y	84%	45-64 y	210
	2	1988/89	random age-and sex stratified	67%	937	from the MON-PS	77%	45-64 y	193
	3	1990/92	random age- and sex stratified	71%	1004	were selected	84%	45-64 y	210
Augsburg	1	1984/85	random two-stage, age stratified	76%	1388	all men aged 45-64 y	70%	45-64 y	421
(urban)	3	1994/95		74%	1365	from the MON-PS	71%	45-64 y	430
Lille	1	1986/89	random multi-stage, based on	69%	1191	sub-sample	67%	45-64 y	382
	3	1995/96	town size[2]	73%	1149	of MON-PS	73%	45-64 y	376
Strasbourg	1	1985/87	random multi-stage, based on	.	1381	sub-sample	67%	45-64 y	346
	3	1995/96	town size	41%	1079	of MON-PS	?	45-64 y	257
Toulouse	1	1985/87	random two-stage, age stratified	59%	1323	sub-sample	58%	45-64 y	400
	2	1988/91	random two-stage, age stratified	59%	586	of MON-PS	57%	45-64 y	358
	3	1994/96	random two-stage, age stratified	59%	1175		57%	45-64 y	330
Helsinki	1	1982	random, age- and sex stratified	80%	3085?	?	60%	45-64 y	326
	3	1992		76%	?		61%	45-64y	485
Barcelona	3	1995/96	random, age- and sex stratified	74%	2609	new random sample	72%	45-64 y	208
Belfast	1	1985/86	-	57%	1854	not subsample[3]	52%	45-64 y	356
Glostrup	1	1982/83	random age-and sex stratified	79%	2817	random, age- and	51%	40-60y	737
	3	1991/93		77%	1146	sex stratified	?	40-60 y	211
Milan	2	1989/90	random, age- and sex stratified	71%	1773	1 area selected	55%	45-64 y	325
Cardiff	1	1979-83	random sample	90%	2442	Systematic, on ID: 3 out of 10	88%	45-59 y	665

1) Main source: http:://www.ktl.fi/publications/monica/nonres/tables5_1.htm; 2) first round random sampling of addresses , third survey based on electoral roll sampling age and sex stratified

The representativeness of the study population is difficult to estimate. Although the participation rates are in general comparable to other studies on diet, participation rates in a few centres were low. In Glostrup a non-response study was carried out. It is found that a higher percentage of the participants never smoked or quitted smoking, and had a lower weekly consumption of beer. No difference in BMI was found (Jørgerson et al., 1992b). A sub-study in Helsinki on non-response in the dietary survey of 1992 showed that eating irregular meals, lower consumption of bread, sweet pastries and fruits and higher consumption of sausages, ready-prepared foods, and eggs were associated with lower response rates (Roos, unpublished).

3.2 Dietary assessment methodology

3.2.1 Record book

Table 3.2.1 provides information on the interview period and the contents of the record book. The daily dietary intake can be influenced by the day of the week, season and specific days like holidays or sickness (Knuiman et al., 1985). Therefore this information is collected for the participating centres. A representative estimate of the subject's daily dietary intake requires that the record days should be spread proportionally over week and weekend-days and all seasons should be included. In the centres Belfast, Glostrup, Cardiff, Milan and Augsburg week and weekend-days representative for the whole week were included. In most centres, data collection was carried out in several seasons. To assess trends within a region both surveys should be done in the same season. The centres that applied to this are Ghent, Augsburg, Lille, Strasbourg, Toulouse, Helsinki, and Glostrup. Another issue is the selection of days recorded. All centres instructed the subjects to select a random week, except for Glostrup. In two centres (Augsburg and Helsinki) the participants were instructed to write down circumstances like illness or travelling that could have influenced the dietary pattern on the recording day.

In most centres, detailed information on daily food intake was collected, including preparation method, type of food/brand names and often recipes are given. Helsinki asked for information regarding reform foods and used supplements. Vitamin supplements had to be recorded in Augsburg and Barcelona too. In paragraph 3.2.5 the coding of recipes is described in more detail. Different methods for description of portion sizes were used, while in most centres a combination of methods was used. As in Belfast and Cardiff a weighed record method was used, the main method was cumulative weighing. Further, in several centres picture books or food models were used for weight assessment. In Ghent, Helsinki and Milan standard household measures are used, while in the other centres the volume of individual household measures are checked at the subjects' house.

Table 3.2.1: Record book.

Research centre	Survey	Week(end) days included	Seasons included	Description food items				Description of portion sizes			
				cooking method	type of food (fresh,/canned(un)peele	product/ brand names	recipe	household measures	use food models/ picture book	standard units	weighted
Ghent	1	3 consec.days	Sept - Jan	yes	yes	yes	no	yes	no	yes	no
	2		Sept - Jan								
	3		Sept – Jan								
Augsburg	1	whole week	Oct – May[1]	yes	yes	yes	yes	yes	yes	yes	yes
	3	whole week	Oct – July[1]	yes	yes	yes	yes	yes	yes	yes	yes
Lille	1	3 consec. days	whole year	yes	yes	yes	yes	yes	yes	yes	yes
	3	3 consec. days	whole year	yes	yes	yes	yes	yes	yes	yes	yes
Strasbourg	1	3 consec. days	whole year	yes	yes	yes	yes	yes	yes	yes	yes
	3	2 weekdays/1 weekend-day	whole year								
Toulouse	1	3 consec. days	whole year	yes	yes	yes	yes	yes	yes	yes	no
	2	3 consec. days	whole year								
	3	3 consec. days	whole year								
Helsinki	1	not entered	Jan-April	yes	yes	yes	yes	yes	no	yes	no
	3		Jan-March					yes	yes	yes	no
Barcelona	3	whole week	whole year	yes	yes	yes	yes	yes	yes	yes	no
Belfast	1	2/7 weekend-day	whole year	yes	yes	yes	yes	no	no	no	yes
Glostrup	1	whole week	whole year	pre-structured food items			yes	yes	no	yes	yes
	3		whole year	are defined							
Milan	2	Sun, Mon, Tue	?	yes	yes	yes	yes	yes	yes	yes	yes
Cardiff	1	whole week	whole year	yes	yes	yes	yes	yes	no	yes	yes

1) These months are representative for the whole year (Winkler et al., 1992c)

3.2.2 Survey staff and data collection procedure

In table 3.2.2 the main points with regard to the training of personnel are compared across the centres. Training of survey personnel and instruction of participants influence the quality of dietary record data (Cameron & van Staveren, 1988). The training of the personnel is of prime importance for the between-dietician standardisation on participant instruction and coding issues. The instruction of the participant is necessary for the motivation of the participant and for the standardisation and accuracy of the dietary recording.

Ideally, the subject should be contacted three times during the recording period; one contact just before the recording, one while recording and one immediately after the last recording day. This procedure was followed in Augsburg and Cardiff, whereas in the other centres the second contact moment (revisit) was not included in the protocol. The content of the instruction differed among study centres. For two centres, the original instruction was not available and known anymore (Helsinki and Ghent). Three centres gave a demonstration how to write down the consumed foods (Augsburg, Glostrup, and Cardiff). These three centres and Helsinki gave their participants a written example to take home. All centres, with the exception of Helsinki, checked the diary by telephone contact or visit at home when the participant returned the diary. If information was missing the dietician tried to collect the missing information and could ask the participant to clarify unclear items.

Table 3.2.2: Survey staff and data collection procedure.

Research centre	Survey staff					Data collection procedure				
						Visit before survey			Revisit	Visit day after survey
	Survey	Number	Training session	Pilot study	Manual/ protocol	Verbal/written instruction	Demon-stration	Written example		
Ghent	1	3	no	no	yes[2]	yes	no	no	no	yes
	2	3				survey 2 and 3 were carried out by the same 3 dieticians				
	3	3								
Augsburg	1	7	yes	yes	yes[3]	yes	yes	yes	2 times contacted	yes
	3	8	yes	yes	yes[3]	yes	yes	yes	by telephone	yes
Lille	1	2	yes[1]	yes	yes[2]	yes	no	yes	no	yes
	3	1	yes	no	yes[2]	yes	no	yes	no	yes
Strasbourg	1	2	yes[1]	yes	yes[2]	yes	no	no	no	yes
	3	1								
Toulouse	1	1	yes[1]	yes	yes[2]	yes	no	no	no	yes
	2	1								
	3	2								
Helsinki	1	?	yes	no	yes[2]	yes	no	yes	send diary in by	person not
	3		no	no	yes[2]				mail	contacted
Barcelona	3	2	yes	yes	yes	3-days repeated 24-hour recalls were collected by telephone or visit at home				
Belfast	1	1+clerk	yes	no	yes[2]	yes	yes	yes		yes
Glostrup	1	1	yes, writ-	no	yes[2]	yes	yes	yes	send in by mail	yes, by phone
	3		ten instr.							
Milan	2	?	?	?	?	yes	?	?	no	yes
Cardiff	1	1 + 30	yes			yes	yes	yes	yes	yes

1) In France, the three participating centres performed a joint training session; 2) Euronut 6 report; 3) Handbuch für die Ernährungsuntersuchung and Handbuch für die Kodierung

3.2.3 Data coding and checking data-entry

The participating centres checked the data before and after data-entry (table 3.2.3).

Table 3.2.3: Data coding and checking data-entry.

Research centre	Survey	Data coding		Check data-entry		
		record days identified	discussing problems	interviewer (iv) bias	double coding	Min/Max check (outlier values)
Ghent	1	no	yes	iv identifiable	no	no
	2	no	yes	iv identifiable	no	no
	3	no	yes	iv identifiable	no	no
Augsburg	1	yes	yes	iv identifiable	yes (10%)	yes
	3	yes	yes	iv identifiable	yes (10%)	yes
Lille	1	yes	yes	iv identifiable	no	yes
	3	yes	not applicable	1 interviewer	no	yes
Strasbourg	1	yes	no	iv identifiable	no	yes
	3		not applicable	1 interviewer		
Toulouse	1	yes	not applicable	1 interviewer	no	no
	2	yes	not applicable	1 interviewer	no	no
	3	yes	yes	iv identifiable	no	no
Helsinki	1	no	?	iv identifiable	no	yes
	3		yes	in original files	?	?
Barcelona	3	yes	yes	iv identifiable	no	
Belfast	1	yes	yes	iv identifiable	yes,partly	yes
Glostrup	1	no	not applicable	1 interviewer	yes	yes
	3					
Milan	2	probably yes	?	probably iv code available	?	?
Cardiff	1	yes	?	iv identifiable	yes,21 diaries	no

Most centres except for Ghent, Glostrup, and Helsinki, included the recording days in their data set, in order to assess the between-day variation. As in most centres several persons were responsible for data collection, coding problems could be discussed. In these centres a code for interviewer was included in the data set. With this code interviewer bias can be checked, which is already done in Augsburg. For the French centres data coding was done all together in Paris. In some centres data-entry was checked by double coding and/or by examining outlier values. No computer software program was used for this purpose. In Barcelona, some 24-h recalls were coded double during the training period, until agreement on the coding was obtained. In the Caerphilly Study, twenty-one original diaries coded by 8 persons were re-coded 15-18 years later by one dietician. The re-coding has been done completely blind to the original coding. The calculated nutrients of the re-coded diaries were compared with the calculated nutrients of the original coding. The overall conclusion is that the agreement between the original coding and the new coding is excellent for the major nutrients (coefficients of variation of 3.6% for total energy, 3.0% for total carbohydrate, 5.2% for total protein, and 6.8% for total fat). The coding can be used for further analyses (personal communication Peter M. Sweetnam, 1998).

3.2.4 Food composition tables

Table 3.2.4 presents the food composition tables used in the different centres. Some centres used food composition tables from other countries. In Ghent the Dutch food composition table of 1978 was used and in the French centres the table of Renaud was used supplemented by the English table. Also in Barcelona this English table was used supplemented with the table of Moreiras. Investigators from the French centres noted that the French food composition table was not good at that time. The food composition table has been validated and some mistakes have been found but not corrected. A copy of the list with possible mistakes and corresponding foods has been given. For example, missing nutrients are coded as '0'. For meat few adjustments were made to the food composition table of Renaud by using other tables. No information is available about conversion factors used in the tables.

Table 3.2.4: Food composition tables, number of food items and nutrients in dietary data of the MONICA Optional Study on Nutrition.

Research centre	Food composition table	Food items	Nutrients
Ghent	NEVO (1978)	156	32
Augsburg	BLS2.1 based on Souci Fachmann-kraut (89/90)	88	30
Lille	Renaud + McCance & Widdowson 1978	470	20
Strasbourg	Renaud + McCance & Widdowson 1978	470	20
Toulouse	Renaud + McCance & Widdowson 1978	470	20
Helsinki	RTL84	25	38
	BASE92	36	40
Barcelona	Moreiras 1995+ McCance & Widdowson (ed.5)	359	42
Belfast	McCance & Widdowson 1978+ Dunn local foods	~1000	34
Glostrup	Helms 86/87+LEC	111	60
Milan	Tabelle di composizione degli alimente (Fidanza)	?	?
Cardiff	McCance & Widdowson 1978+Paul & Southgate+MRC local recipes	~1000	34

3.2.5 Recording food quantities

To assess food quantities, a clear description of weight assessments should be given. In paragraph 3.2.1 is described how food items were recorded in the diaries. In the subsequent coding step, this information was converted into food codes (as defined by the food composition table) and expressed in grams of a product per day. Systematic differences in coding rules became apparent and are discussed below.

Paragraph 3.2.1 already showed differences in weight assessments. In some centres food consumption was expressed in terms of (standard) household measures. These household measures were transferred into grams of a product per day. In table 3.2.5 factors that influence the assessment of food quantities are presented. In Ghent and Glostrup no specific factors for the conversion of the volume of fluid products into grams were used. In these centres it is assumed that one millilitre is equal to one gram. This is, however, not correct for fluids like oil, alcoholic beverages and ice cream with density below one. The centres in France used the factor 0.8 for alcoholic fluids and 0.7 for oil.

Table 3.2.5: Factors related to weight assessment of food items in the MONICA Optional Study of Nutrition.

Research centres	use of conversion factors to convert volume to weight	use of conversion factors to convert raw to cooked/cooked to raw product	with/without edible part
Ghent	no (1 ml=1g)	Food items were coded as raw or cooked product, dependent on how it was consumed Conversion factors are used for vegetables, fruits, rice, noodles	yes (vegetables)
Augsburg	yes	Coding was performed on prepared items when appropriate. Conversion factors are used for meat, rice, noodles; most other foods had the relevant codes in the data base (vegetables, fruits etc.)	
Lille	yes	yes (vegetables, potatoes, fruits, paste, rice, semolina, meat and fish)	no (fruit,meat) yes (chicken)
Strasbourg	yes	yes (vegetables)	no (fruit,meat) yes (chicken)
Toulouse	yes	yes (vegetables)	no (fruit,meat) yes (chicken)
Helsinki	yes	Food items were coded as raw product. Conversion factors are used for vegetables	no (fruit)
Barcelona	yes	Conversion factors are used for vegetables. Dried products as pasta and legumes are coded as dry products and water	yes (chicken)
Belfast	yes	food items were coded as raw or cooked product, dependent on how it was consumed.	leftovers are weighed
Glostrup	no (1 ml=1 g)	no	
Milan	-	-	-
Cardiff	not applicable	yes, if food code for prepared product was available	leftovers are weighed

Another issue is the coding of food items in terms of raw or cooked/prepared product. In case the food composition table includes a food code for the raw form and a code for the cooked form the coding options described in table 3.2.6 are possible. A product consumed in the raw state is coded with the food code for the raw product [1] and a food item consumed in the cooked form is coded with a code for the prepared product [2]. In this situation the foods are coded in the state that they are consumed. In case only one food code is available in the food composition table, no distinction can be made to the physical state of the product. Food products consumed as raw products can be given the food code of the prepared state [3] and more likely food products consumed as prepared products can be entered in the database as a raw product [4]. For example, in Helsinki and Glostrup food products consumed as prepared products (like meat) were coded as raw products. In France, the local foods that were coded according to the French food composition table were coded as raw products, and products that were coded according to the English food composition table were coded as raw or prepared products. For comparisons between study centres, all food products should be converted to the same form by using conversion factors.

Table 3.2.6: Coding of food products specified as raw or prepared product.

	Food product coded in data set as:	
Food product recorded in diary as:	raw product	prepared product
raw product	[1]	[3]
prepared product	[4]	[2]

In most centres specific food codes are available for food products with and without skin or edible part. In Ghent specific food codes are available for vegetables and in Augsburg specific food codes are available for meat. In the French centres no specific food codes are available for fruit and meat (except chicken). The first survey of Helsinki handled fruits as consumed with skin. Fruits could also be coded without skin in the second survey of Helsinki. In Barcelona only specific food codes for chicken with or without skin were available. Detailed information by food product is necessary for making comparisons between study centres.

In most centres, except Ghent, space is left in the diary to report recipes of mixed dishes, bakery products etc. In Ghent, composite products are recoded following standard recipes. In Cardiff, recipes are split into ingredients if there was no code available for the food item itself. This difference in coding rules can most likely be attributed to local coding habits and limitations of the food composition table. The impact of these coding differences for the composition of food groups should be investigated.

Based on the available information in table 3.2.5, we conclude that different coding rules are followed in the MONICA study centres. As a result, differences in weight assessments occurred between study centres. To make comparisons between countries possible, conversion factors from the EPIC study could be helpful in transforming all products to the same form.

Further the impact of these differences in coding rules for the composition of food groups and nutrient calculations need to be discussed.

4. Conclusions

This report describes the details of the methodologies used for selecting subjects and collecting dietary records in eleven centres of the MONICA Optional Study on Nutrition. In this chapter the study population and different aspects of the dietary assessment methodology will be discussed.

Participation rates of the dietary surveys ranged from 51% to 88%. Although the participation rates are in general comparable to other studies on diet, participation rates in a few centres were low. Non-response studies in Glostrup and Helsinki indicate that differences in dietary patterns exist between responders and non-responders. Therefore, it is expected that the differences in participation rates have some implications for the comparability between study centres.

In this report, dietary assessment methods are compared on the following aspects: date of recording, instructions in the record book with respect to the description of food items and portion sizes, survey staff involved, data collection procedure, data coding, and data-entry. The centres were judged according the following criteria:

- Dietary intake should be recorded for at least 3 days
- A detailed description, including cooking method, type of food, product/brand name, recipe, of daily food intake should be given
- Record days are representative for the whole week (2 weekdays and 1 weekend-day)
- Portion sizes should at least be quantified in household measures that are checked at the subject's house
- Interviewers should be instructed before interviewing by a training session or manual
- Participants should be instructed in a personal contact before the survey started. In addition, a second contact should be arranged (by telephone or personal contact) after the survey in order to check data collection.

Table 4.1.1: Specification of deviant assessment methods, by study centre.

Research centre	Record days	Weight assessment	Data collection	Data coding
Ghent	day of week not specified	household measures not checked at home + standard recipes are used		
Augsburg				food groups
Lille	day of week specified, not representative for whole week			
Strasbourg	not representative for whole week			
Toulouse	day of week not specified, not representative for whole week			
Helsinki	record day not specified	household measures not checked at home	no second contact	food groups
Barcelona	day of week is specified, not representative for whole week			
Belfast				
Glostrup	non-random week			pre-structured diary
Milan				
Cardiff				

This report shows that most research centres met the defined criteria, deviations are reported in Table 4.1.1 and can be summarised as follows:

- Dietary intake should be recorded for at least 3 days
  This criterion is fulfilled by all centres, although different type of methods are used

- A detailed description, including cooking method, type of food, product/brand name, of daily food intake should be given
  A detailed description of dietary intake is given in the record books. However, in Augsburg and Helsinki, this information is merged together in a few food groups. Further, in Glostrup a pre-structured diary was used including 115 food items.

- Record days are representative for the whole week (2 weekdays and 1 weekend-day)
  Record days are representative for the whole week in Augsburg, Belfast, Milan, and Cardiff. In the other centres record day is not specified or record days are not representative for the whole week. Hopefully the study centres can provide some additional information on this issue (see Winkler et al., 1991).
  In contrast to the other centres, in Glostrup subjects are instructed to select a non-random week.

- Portion sizes should at least be quantified in household measures that are checked at the subject's house
  Standard household measures are used in Ghent and Helsinki

- Interviewers should be instructed before interviewing by a training session or manual.
  All centres fulfil this criterion.

- Participants should be instructed at home before the survey started. In addition, a second contact should be arranged (by telephone or visit at home) after the survey.
  In Helsinki, participants are not contacted after the survey

In order to get more insight into the validity of the collected data some additional activities have to be carried out:

- Data-entry and data coding have to be checked in all centres
- Interviewer bias has to be checked in most centres
- All local dietary data sets have to be harmonised
- Weight assessments have to be standardised by means of conversion factors for all centres.

The dietary data have to be standardised before the data of the individual centres can be compared. This time-consuming procedure is very expensive. No funding is available for this type of activity. Therefore we decided not to continue this project.

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Appendix I MONICA list of participants

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28	Bureau Rapportenregistratie
29	Bibliotheek RIVM
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40-44	Reserve exemplaren
45-46	Depot CZE, 2 exemplaren voor algemeen gebruik (secretariaat)

Bilthoven, May 9 2003.

Erratum page for RIVM report 261753001/2002,
titled 'MONICA Optional Study on Nutrition. The dietary assessment methodology'

page 13, table 3.1.1. Column 'year of data collection', line 'Barcelona' should read: '1994/96'.

page 13, table 3.1.1. Column 'sampling procedure', line 'Barcelona' should read: 'subsample of MON-PS'.

page 18, table 3.2.2. Column 'data collection procedure', line 'Barcelona' should read: '3 repeated interviewed 24-hour recalls: 1st in mobile unit, 2nd/3rd by telephone or visit at home'.

page 19, table 3.2.3. Column 'Min/max check', line 'Barcelona' should read: 'yes'.

page 27, This reference should be included: Moreiras O, Carbajal A, Cabrera L. (1995) Tablas de composición de alimentos. Madrid: Pirámide, SA.