

MONICA Publications

#85 MONICA Publications List

1. Tuomilehto J, Kuulasmaa K, Torppa J, for the WHO MONICA Project. WHO MONICA Project: geographic variation in mortality from cardiovascular diseases. Baseline data on selected populations, characteristics and cardiovascular mortality. *World Health Statistics Quarterly*, 1987, 40:171–184. PMID: 3617777. MONICA Publication 1.
2. Tunstall-Pedoe H, for the WHO MONICA Project. The World Health Organization MONICA Project (Monitoring Trends and Pajak Determinants in Cardiovascular Disease): a major international collaboration. *Journal of Clinical Epidemiology*, 1988, 41:105–114. PMID: 3335877. MONICA Publication 2.
3. Pajak A, Kuulasmaa K, Tuomilehto J, Ruokokoski E, for the WHO MONICA Project. Geographical variation in the major risk factors of coronary heart disease in men and women aged 35–64 years. *World Health Statistics Quarterly*, 1988, 41:115–140. PMID: 3232405. MONICA Publication 3.
4. Tunstall-Pedoe H. Problems with criteria and quality control in the registration of coronary events in the MONICA study. *Acta Medica Scandinavica Supplementum*, 1988, 728:17–25. PMID: 3202028. MONICA Publication 4.
5. Asplund K, Tuomilehto J, Stegmayr B, Wester PO, Tunstall-Pedoe H. Diagnostic criteria and quality control of the registration of stroke events in the WHO MONICA project. *Acta Medica Scandinavica Supplementum*, 1988, 728:26–39. PMID: 3202029. MONICA Publication 5.
6. Asplund K, Tuomilehto J, Kuulasmaa K, Torppa J, for the WHO MONICA Project. Multinational stroke mortality data at the baseline of the WHO MONICA Project. In: Meyer JS et al., eds. *Cerebral Vascular Disease*, Elsevier Science Publishers, B.V. (Biomedical Division), 1989, 7:167–170. PMID: nil. MONICA Publication 6.
7. Böthig S, for the WHO MONICA Project. WHO MONICA Project: objectives and design. *International Journal of Epidemiology*, 1989, 18(Suppl 1):S29–37. PMID: 2807705. MONICA Publication 7.
8. Tuomilehto J, Kuulasmaa K, for the WHO MONICA Project. WHO MONICA Project: assessing CHD mortality and morbidity. *International Journal of Epidemiology*, 1989, 18(Suppl 1):S38–45. PMID: 2807706. MONICA Publication 8.
9. Keil U, Kuulasmaa K, for WHO MONICA Project. WHO MONICA Project: risk factors. *International Journal of Epidemiology*, 1989, 18(Suppl 1):S46–55. PMID: 2807707. MONICA Publication 9.
10. Tunstall-Pedoe H. Diagnosis, measurement and surveillance of coronary events. *International Journal of Epidemiology*, 1989, 18(3 suppl 1):S169–173. PMID: 2807699. MONICA Publication 10.
11. Anonymous. (Prepared by MONICA Management Centre and MONICA Data Centre with other WHO collaborators.) The WHO MONICA Project. A worldwide monitoring system for cardiovascular diseases: Cardiovascular mortality and risk factors in selected communities. *World Health Statistics Annual*, 1989, 27–149. ISBN 92 4 067890 5. ISSN 0250–3794. MONICA Publication 11.
12. Chambless LE, Dobson AJ, Patterson CC, Raines B. On the use of a logistic risk score in predicting risk of coronary heart disease. *Statistics in Medicine*, 1990, 9:385–396. PMID: 2362977. MONICA Publication 12.
13. Döring A, Pajak A, Ferrario M, Grafnetter D, Kuulasmaa K, for the WHO MONICA Project. Methods of total cholesterol measurement in the baseline survey of the WHO MONICA Project. *Revue d'Epidémiologie et de Santé Publique*, 1990, 38:455–461. PMID: 2082451. MONICA Publication 13.
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18. Asplund K, Bonita R, Kuulasmaa K, Rajakangas AM, Schädlich H, Suzuki K, Thorvaldsen P, Tuomilehto J, for the WHO MONICA Project. Multinational comparisons of stroke epidemiology. Evaluation of case ascertainment in the WHO MONICA Stroke Study. World Health Organization Monitoring Trends and Determinants in Cardiovascular Disease. *Stroke*, 1995, 26:355–360. PMID: 7886706. MONICA Publication 18.
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42. Molarius A, Parsons RW, Dobson AJ, Evans A, Fortmann SP, Jamrozik K, Kuulasmaa K, Moltchanov V, Sans S, Tuomilehto J, Puska P, for the WHO MONICA Project. Trends in cigarette smoking in 36 populations from the early 1980s to the mid 1990s: findings from the WHO MONICA Project. *American Journal of Public Health*, 2001, 91:206–212. PMID: 11211628. MONICA Publication 42.
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44. Kulathinal SB, Kuulasmaa K, Gasbarra D. Estimation of an errors-in-variables regression model when the variances of the measurement errors vary between the observations. *Statistics in Medicine*, 2002, 21(8):1089–1101. PMID: 11933035. MONICA Publication 44.
45. Tolonen H, Mähönen M, Asplund K, Rastenyte D, Kuulasmaa K, Vanuzzo D, Tuomilehto J, for the WHO MONICA Project. Do trends in population levels of blood pressure and other cardiovascular risk factors explain trends in stroke event rates? Comparisons of 15 populations in 9 countries within the WHO MONICA Stroke Project. *Stroke*, 2002;33(10): 2367–2375. PMID: 12364723. MONICA Publication 45.

#86 Abstracts of MONICA Publications

The following 45 publications, which have appeared in print, are those regarded as central to the WHO MONICA Project. They include descriptions of the MONICA methods during the development stage of the project, early cross-sectional results, theoretical, particularly statistical papers from individuals eventually involved in the final analyses, some analyses of sub-sets of data, done to explore methods for the final results, and then major papers on the final collaborative findings. These publications are complemented by a very much larger literature from individual centres, published locally, and described in the pages from individual MONICA Collaborating Centres (MCCs) based on their own populations, see #51–#83.

The publications are numbered to correspond with those on the WHO MONICA Project Website and the Monograph CD-ROM, and also with the references in the text of this Monograph. They are used particularly in section #89 *MONICA Graphics*. The electronic media contain both an additional list and the text of Web publications from MONICA, some of which are appendices to the main published MONICA papers, such as MONICA Publications 38 and 39. They also contain a list of secondary publications such as editorials which appeared in print but have no abstracts.

The way in which the authorship of the papers is cited in some cases does not correspond exactly with what appears in the original papers. MONICA publication policy changed and it took time before the eventual method was agreed of sharing the responsibility between the authors (preparers) of the papers and the WHO MONICA Project, putting names first. The Principal Investigators agreed to make this division of credit retrospective for all MONICA citations, see #41 *Preparation of Manuscripts and Presentations*. When this

compromise was agreed on for the authorship of papers, journal editors still sometimes changed citations in the proof of new papers and subsequently had to publish corrections. All those named below as authors were responsible for the papers concerned. However, the original paper might have appeared to give almost all the credit to the WHO MONICA Project and none to the authors, or all to the authors and none to the WHO MONICA Project. Earlier methods of citing MONICA caused serious problems for indexing and citation systems. (For example, although very similar and from the same journal, MONICA Publications 1 and 3 are cited differently by PUBMED, the former as having three named authors and the latter as having no authors. MONICA Publication 24 was attributed by one indexing system to the complete list of MONICA participants, naming the first one named in the appendix of sites and personnel first, although he was not part of the manuscript group named on the front page, and did not feel he deserved it.)

Where there is no attribution “for the WHO MONICA Project” in the authorship of the papers below, this could be for several reasons: the authors concerned were operating as individuals, or invited as individuals addressing a problem of importance to MONICA, not on a remit from the MONICA Steering Committee or as representatives of MONICA, and/or they were not using unpublished MONICA core collaborative data. These papers have been adopted as MONICA publications because they are relevant to the problems that the project as a whole was addressing.

The place of work of the corresponding (usually the first) author has been listed, usually as it appears on the front page of the publication concerned. Sometimes work was done whilst visiting the institution concerned. This listing shows the

large number of different institutions involved in the authorship of MONICA Publications. We apologise to the later authors, whose contributions were also important, but it would have taken up too much space to list all the universities and institutions involved in the preparation of all the papers.

Readers involved in major collaborative studies may be interested in the administration of MONICA collaborative publications and authorship. This is discussed elsewhere in this Monograph in #41 *Preparation of Manuscripts and Presentations*, and in the MONICA Manual Part I, Section 2, paragraph 7, Publication Rules. The latter is available from the above MONICA Website and on the Monograph CD-ROM.

Note that the copyrights of abstracts belong to the publishing journal and are published here with permission.

This list of papers is complete as of December 2002. Other papers are in preparation and awaiting publication. Further additions will be listed on the MONICA Website as they appear. MONICA Website: <http://www.ktl.fi/monica/>

MONICA Publication 1

Tuomilehto J, Kuulasmaa K, Torppa J, for the WHO MONICA Project.

WHO MONICA Project: Geographic variation in mortality from cardiovascular diseases. Baseline data on selected population characteristics and cardiovascular mortality.

World Health Statistics Quarterly, 1987, 40(2):171–184.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

Introduction to paper, no abstract published. Death certificates are the most commonly used source of information for the estimation of the frequency of cardiovascular diseases (CVD) in populations. National mortality statistics have been the major tool used for studying geographic variations in CVD. Such comparisons have suggested that major differences in CVD mortality trends can be found

between countries, and that, even national trends can show diverging temporal variations.

To draw conclusions on the incidence and prevalence of CVD from national mortality statistics only is very difficult. Many epidemiologists and statisticians have questioned the accuracy of disease-specific death rates which are obtained from the certification of an underlying cause of death based on the International Classification of Diseases (ICD). The current state of medical knowledge, improper or varying coding practices and insufficient clinical or laboratory data are the main causes of inaccuracies in death certification. The ways in which underlying causes of death are classified in vital statistics offices may also introduce a bias that can contribute to international differences in cause-specific mortality. Another project, specific to geographic comparisons, is that national mortality statistics are produced by pooling data from large populations that may include several heterogeneous sub-populations presenting different mortality experiences.

A great deal of epidemiological research was initiated after the 1950s to explain the risk factors and natural history of CVD. However, neither these studies nor an analysis of national mortality statistics could adequately explain the dynamics of changes in CVD. There was an obvious need for more careful investigation of this disease group which accounts for about 30–50% of all deaths in the middle-aged population of most industrialized countries and is increasing in many countries in the world.

A series of consultations with experts in the field led to the development of a multinational research project, the MONICA Project. This article describes the patterns of CVD mortality by age and sex in the populations which are included in the MONICA Project.

PMID: 3617777.

MONICA Publication 2

Tunstall-Pedoe H, for the WHO MONICA Project.

The World Health Organization MONICA Project (Monitoring Trends and Determinants in Cardiovascular Disease): A major international collaboration.

Journal of Clinical Epidemiology, 1988, 41(2):105–114.

Cardiovascular Epidemiology Unit, Ninewells Hospital and Medical School, Dundee, Scotland

A World Health Organization Working Group has developed a major international collaborative study with the objective of measuring over 10 years, and in many different populations, the trends in, and determinants of, cardiovascular disease. Specifically the programme focuses on trends in event rates for validated fatal and non-fatal coronary heart attacks and strokes, and on trends in cardiovascular risk factors (blood pressure, cigarette smoking and serum cholesterol) in men and women aged 25–64 in the same defined communities. By this means it is hoped to measure changes in cardiovascular mortality and to see how far they are explained on the one hand by changes in incidence mediated by risk factor levels; and on the other by changes in case-fatality rates, related to medical care. Population centres need to be large and numerous; to reliably establish 10-year trends in event rates within a centre 200 or more fatal events in men per year are needed, while for the collaborative study a multiplicity of internally homogeneous centres showing differing trends will provide the best test of the hypotheses. Forty-one MONICA Collaborating Centres, using a standardized protocol, are studying 118 Reporting Units (sub-populations) with a total population aged 25–64 (both sexes) of about 15 million.

PMID: 3335877.

MONICA Publication 3

Pajak A*, Kuulasmaa K, Tuomilehto J, Ruokokoski E, for the WHO MONICA Project.

Geographical variation in the major risk factors of coronary heart disease in men and women aged 35–64 years.

World Health Statistics Quarterly, 1988, 41(3/4):115–140.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland. *School of Public Health, Jagiellonian University, Krakow, Poland

The WHO MONICA Project is designed to measure the trends in mortality and morbidity from coronary heart disease (CHD) and stroke, and to assess the extent to which they are related to changes in known risk factors in different populations in 27 countries. Risk-factor data are collected from population

samples examined in at least two population surveys (one at the beginning of the study and the other at the end). The results of the baseline population surveys are presented. In the populations studied, the proportion of smokers varied between 34–62% among men and 3–52% among women. The population median of systolic blood pressure varied between 121–146 mmHg in men. In women the figures were 118 mmHg and 141 mmHg respectively. In diastolic blood pressure, the variation of median was from 74 mmHg to over 91 mmHg among men and from 72 to 89 mmHg among women. The third major risk factor considered was total cholesterol, with the population median ranging between 4.1 to 6.4 mmol/l among men and 4.2 to 6.3 mmol/l among women. Caution is required when making cross-sectional comparisons between the risk-factor levels as the MONICA Project was not designed for this purpose. Nevertheless, these data do demonstrate clearly the large variety of baseline risk-factor patterns in populations studied in the MONICA Project.

PMID: 3232405.

MONICA Publication 4

Tunstall-Pedoe H.

Problems with criteria and quality control in the registration of coronary events in the MONICA study

Acta Medica Scandinavica Supplementum, 1988, 728:17–25.

MONICA Quality Control Centre for Event Registration, Cardiovascular Epidemiology Unit, Ninewells Hospital and Medical School, Dundee, Scotland, UK

This paper discusses the practical difficulties experienced in registering and coding coronary events. The populations being monitored for fatal and non-fatal coronary events in the World Health Organization MONICA study are too large for surveillance of individuals. Routine medical and medico-legal sources have to be used to identify potential events, which are then coded and categorized according to standard criteria. Methods are dependent on, and have to be adapted to the local system of medical care. Non-fatal cases in hospital are identified and registered either through their admission, 'hot pursuit', or through their discharge, 'cold pursuit'. Each method has its own advantages and disadvantages. Local legal and ethical constraints are also responsible for differences between MONICA Collaborating

rating Centres. Adequacy of investigation of events, and the availability and completeness of medical records are major determinants of the ease and quality of registration. Changes in medical care could cause spurious changes in event rates, and so potential biases need to be monitored and allowed for.

PMID: 3202028.

MONICA Publication 5

Asplund K, Tuomilehto J, Stegmayr B, Wester PO, Tunstall-Pedoe H.

Diagnostic criteria and quality control of the registration of stroke events in the WHO MONICA project.

Acta Medica Scandinavica Supplementum, 1988, 728:26–39.

Department of Medicine, University Hospital, Umea, Sweden

Stroke events are being registered in 27 of the MONICA collaborating centres. Coding of test cases has shown the greatest discrepancies in coding of the type of stroke (different pathoanatomical diagnoses) and of the diagnostic category (whether a definite stroke has occurred or not), as 23% and 14% discrepancies respectively. A check for completeness of stroke registration at the Northern Sweden MONICA Centre showed that more than 91% of the events were retrieved by routine registration procedures. Measures to reduce the discrepancies in coding between centres and to check for completeness of data are suggested. In many centres, the number of stroke events below 65 years of age is too small to permit meaningful analyses. By also including stroke events in the 65 to 74 year age range, the number of fatal events in the Northern Sweden MONICA area increased by 195% and non-fatal events by 149%. Many other MONICA centres have also extended their upper age limit for the registration of stroke events, thus improving the preconditions for statistical evaluations of the long-term changes in stroke incidence.

PMID: 3202029.

MONICA Publication 6

Asplund K, Tuomilehto J, Kuulasmaa K, Torppa J, for the WHO MONICA Project. Multinational stroke mortality data at the baseline of the WHO MONICA Project.

In: Meyer JS et al, eds. Cerebral Vascular Disease, Elsevier Science Publishers,

B.V. (Biomedical Division), 1989, 7:167–170.

Department of Medicine, University Hospital, Umea, Sweden

Introduction since no abstract. In several countries, there has been a dramatic decline in age-specific mortality in cerebrovascular diseases over the last decades. In other populations, the stroke mortality rates have shown a much less impressive decline; in others they have been stable or even increasing. The reasons for these different secular trends are poorly understood.

The main aim of the MONICA Project is to monitor long-term trends in cardiovascular morbidity and mortality in well-defined populations and to assess to what extent these trends are related to changes in established cardiovascular risk factors. The project is initiated and managed by the WHO, and its background, methodology and organization have been described elsewhere.

During a 10-year period, data are collected from official vital statistics, population surveys and prospective uniform registration of acute myocardial infarctions and strokes. In this communication, the baseline age-specific mortality from cerebrovascular disorders in the MONICA populations, as derived from official death statistics, are described.

PMID: not listed.

MONICA Publication 7

Böthig S, for the WHO MONICA Project. WHO MONICA Project: objectives and design.

International Journal of Epidemiology, 1989, 18(3 Suppl 1):S29–37.

World Health Organization, Cardiovascular Diseases Unit, Geneva, Switzerland

The WHO MONICA Project is a multi-centre international collaborative project coordinated by the World Health Organization. Its objective is to measure trends in cardiovascular mortality and morbidity and to assess the extent to which these trends are related to changes in risk factor levels and/or medical care, measured at the same time in defined communities in different countries. Thirty-nine collaborating centres from 26 countries of Europe, North America, and the Western Pacific collaborate in this project, using a standardized protocol and covering a

population of approximately 10 million men and women aged 3564. The WHO MONICA Project is directed by the Council of Principal Investigators and a Steering Committee, and it is managed by a Management Centre, Data Centre, Quality Control Centres (for event registration, ECG coding and lipid determinations) and Reference Centres (for optional studies). The MONICA methodology is increasingly used as a measurement tool for cardiovascular and noncommunicable disease prevention and control programmes by centres within and outside the project.

PMID: 2807705.

MONICA Publication 8

Tuomilehto J, Kuulasmaa K, for the WHO MONICA Project.

WHO MONICA Project: assessing CHD mortality and morbidity.

International Journal of Epidemiology, 1989, 18(3 Suppl 1):S38–45.

Department of Epidemiology, National Public Health Institute, Helsinki, Finland

In the WHO MONICA Project mortality and morbidity from acute myocardial infarction is being monitored in 39 Collaborating Centres in 26 countries for a period of 10 years. The myocardial infarction registration procedures have been standardized and suspect coronary events are classified into diagnostic categories according to common criteria. This paper presents ischaemic heart disease mortality figures, based on routine statistics for the study populations and discusses cross-sectional comparability of morbidity data from event registration. Because of differences in availability of data used for diagnostic classification of events (such as autopsy data) the proportions of different diagnostic categories vary from centre to centre. There are, therefore, problems in cross-sectional comparison of morbidity data between the centres. The primary target of event registration in the project is to monitor morbidity changes within centres during the 10-year period. This goal should not be affected by the problems described in this paper.

PMID: 2807706.

MONICA Publication 9

Keil U, Kuulasmaa K, for WHO MONICA Project.

WHO MONICA Project: risk factors.

International Journal of Epidemiology, 1989, 18(3 Suppl 1):S46–55. Erratum appears in *Int J Epidemiol*, 1990, Sep, 19(3):following 775.

Ruhr-Universität Bochum, Abteilung für Sozialmedizin und Epidemiologie, Neuherberg, Federal Republic of Germany

The WHO MONICA Project was designed to measure trends and determinants in cardiovascular disease mortality and coronary heart disease and cerebrovascular disease morbidity, and to assess the extent to which these trends are related to changes in known risk factors in 39 collaborative centres in 26 countries. Results of the baseline population surveys are presented. Use of standardized methods allows cross-sectional comparisons to be made of data from the 39 collaborating centres. The proportion of smokers varied between 34 and 62% among men and 3 and 52% among women. The median systolic blood pressure (SBP) values varied from 121 mmHg to 145 mmHg in men and from 117 mmHg to 143 mmHg in women. Median diastolic blood pressure (DBP) values varied from 74 mmHg to 91 mmHg in men and from 72 mmHg to 89 mmHg in women. The prevalence of actual hypertension, defined as SBP and/or DBP greater than 159/94 mmHg, or on antihypertensive medication, varied between 8.4% and 45.3% in men and between 12.6% and 40.5% in women. Median serum total cholesterol values varied from 4.1 mmol/l to 6.4 mmol/l in men and from 4.2 mmol/l to 6.4 mmol/l in women. The results show that there is a large variability in the risk-factor patterns among the MONICA populations. They also indicate that populations with low levels of risk factors are in the minority.

PMID: 2807707.

MONICA Publication 10

Tunstall-Pedoe H.

Diagnosis, measurement and surveillance of coronary events.

International Journal of Epidemiology, 1989, 18(3 suppl 1):S169–173.

Cardiovascular Epidemiology Unit, Ninewells Hospital and Medical School, Dundee, Scotland, UK

Surveillance, monitoring, or registration of coronary heart disease (CHD) in

populations large enough to follow trends involve the collection and coding of data provided by routine medical and medico-legal sources. The data may be inadequate, missing from file, or in conflict, but because of the need for completeness, all cases must be used. Registration of a chronic disease in the form of episodes causes some logical problems, as does the need to allocate an underlying cause of death in fatal cases. The problems of extracting and coding the relevant information are discussed with reference to specific items and the results of an international quality control exercise are used to demonstrate how items differ in their consistency of coding. Possible causes of spurious trends are discussed, including inaccurate population data.

PMID: 2807699.

MONICA Publication 11

Anonymous. (Prepared by MONICA Management Centre and MONICA Data Centre with other WHO collaborators.)

The WHO MONICA Project. A worldwide monitoring system for cardiovascular diseases: cardiovascular mortality and risk factors in selected communities.

World Health Statistics Annual, 1989, 27–149.

No abstract in document—introductory paragraphs. Cardiovascular diseases are a major cause of preventable morbidity and premature mortality. They are not diseases of the developed world only, but are increasing and will continue to increase in developing countries as the major communicable diseases come under control.

There is evidence that coronary heart disease, cerebrovascular disease, hypertension, rheumatic fever and rheumatic heart disease are largely preventable. Furthermore, appropriate technology exists for the prevention and control of these diseases.

The main strategies of the WHO Cardiovascular Disease (CVD) Programme are:

- prevention in the population including the development and implementation of national action plans
- primordial prevention and prevention in early life
- integrated cardiovascular disease and non-communicable disease prevention and control measures, since they share common risk factors and common preventive measures.

In order to be able to design proper interventions and to measure their effectiveness, the basic disease pattern of a community has to be established. An appropriate health information system is therefore a necessity for targeted prevention and control programmes.

The WHO MONICA Project (multinational MONITORING of trends and determinants in Cardiovascular disease) was established to clarify the reasons for the differences in mortality trends of coronary heart disease, which in the 1970s were declining in several countries, but constant or rising in many others. The reasons for these differences in mortality trends were not clear since the changes might be caused by a decline in the disease incidence or by better survival of those affected; however, data on morbidity and risk factors were scarce or patchy and were not being collected in a uniform manner. The WHO MONICA Project for monitoring cardiovascular mortality and risk factors in selected countries was the response to this challenge.

PMID: not listed. ISBN 92 4 067890 5. ISSN 0250-3794.

MONICA Publication 12

Chambless LE, Dobson AJ, Patterson CC, Raines B.

On the use of a logistic risk score in predicting risk of coronary heart disease.

Statistics in Medicine, 1990, Apr, 9(4):385–396.

Department of Biostatistics, University of North Carolina, Chapel Hill 27514, USA

Many studies over the last 20 years have used logistic regression to model the relationship between the risk of developing coronary heart disease (CHD) and the levels of risk factors such as high blood pressure, high serum cholesterol, and cigarette smoking. Subsequently, several investigators have proposed the use of some of the published estimated logistic risk functions to predict risk in new populations. Because of great variation in the definition of events, duration of follow-up, population characteristics, definition of risk variables, and selection of other variables in the logistic functions, direct use of such established functions would generally not have validity for the prediction of absolute risk levels. A review of fifteen of these studies indicates on the one hand generally similar results in direction and order of magnitude of

effects of the major risk factors, confirming the importance of these risk factors of CHD. On the other hand the reviews indicate sufficient variation to suggest that extrapolation to new populations even to predict relative risk is not justified.

PMID: 2362977.

MONICA Publication 13

Döring A, Pajak A, Ferrario M, Grafnetter D, Kuulasmaa K, for the WHO MONICA Project.

Methods of total cholesterol measurement in the baseline survey of the WHO MONICA Project.

Revue d'Epidémiologie et de Santé Publique, 1990, 38(5-6):455-461. Erratum appears in 1991, 39(3):following 317.

GSF-Medis Institute, München-Neuherberg, Federal Republic of Germany

In the WHO MONICA Project (Monitoring of Trends and Determinants of Cardiovascular Disease) total cholesterol was measured in representative samples from 51 study populations in 26 countries. The biochemical measurements were done locally by the laboratories of collaborating. Differences in measurement procedures among the populations were found in the following factors: fasting status, posture of the subject, tourniquet use, use of serum or plasma, storage conditions, and the analytical method itself. This paper gives an overview of the methods used, and discusses the possible effects of the differences on the comparability of the results. The use of a posture other than that recommended and the use of EDTA (ethylene diaminetetraacetate) plasma are considered to be the most important factors, and were found in nine out of the 51 populations.

PMID: 2082451.

MONICA Publication 14

Hense HW, Kuulasmaa K, Zaborskis A, Kupsc W, Tuomilehto J, for the WHO MONICA Project.

Quality assessment of blood pressure measurements in epidemiological surveys. The impact of last digit preference and the proportions of identical duplicate measurements. WHO Monica Project.

Revue d'Epidémiologie et de Santé Publique, 1990, 38(5-6):463-468. Erratum appears in 1991, 39(3):following 317.

GSF-Medis Institute, Epidemiology Unit, Munich-Neuherberg, Federal Republic of Germany

In the WHO MONICA Project, cardiovascular risk-factor surveys, including measurements of arterial blood pressure (BP), were conducted in more than 50 different populations. In the course of a retrospective BP measurement quality assessment effort, two indicators of 'prejudiced' blood pressure reading, last digit preference and high proportions of identical results in duplicate measurements, are used in addition to other items to evaluate blood pressure measurement quality. We used fictitious blood pressure distributions and applied to them Last Digit Preference scores and Proportions of Identical Duplicate Measurements actually found in the MONICA surveys. The analysis showed that Last Digit Preference affects predominantly the shape of the BP distribution curve, whereas high Proportions of Identical Duplicate Measurements may cause a shift of the entire BP distribution curve. Although the two items are partly interrelated, a clear distinction between them and their effects is advocated.

PMID: 2082452.

MONICA Publication 15

Dobson AJ, Kuulasmaa K, Eberle E, Scherer J. Confidence intervals for weighted sums of Poisson parameters.

Statistics in Medicine, 1991, Mar, 10(3):457-462.

Department of Statistics, University of Newcastle, New South Wales, Australia

Directly standardized mortality rates are examples of weighted sums of Poisson rate parameters. If the numbers of events are large then normal approximations can be used to calculate confidence intervals, but these are inadequate if the numbers are small. We present a method for obtaining approximate confidence limits for the weighted sum of Poisson parameters as linear functions of the confidence limits for a single Poisson parameter, the unweighted sum. The location and length of the proposed interval depend on the method used to obtain confidence limits for the single parameter. Therefore several methods for obtaining confidence intervals for a single Poisson parameter are compared. For single parameters and for weighted sums of parameters, simulation suggests that the coverage of the proposed intervals is close to the nominal confidence levels. The method is illustrated using data on rates of myocardial infarction obtained as part of the WHO

MONICA Project in Augsburg, Federal Republic of Germany.

PMID: 2028128.

MONICA Publication 16

Tunstall-Pedoe H, Kuulasmaa K, Amouyel P, Arveiler D, Rajakangas AM, Pajak A, for the WHO MONICA Project.

Myocardial infarction and coronary deaths in the World Health Organization MONICA Project. Registration procedures, event rates, and case-fatality rates in 38 populations from 21 countries in four continents.

Circulation, 1994, Jul, 90(1):583-612.

Cardiovascular Epidemiology Unit, University of Dundee, Ninewells Hospital, Scotland, UK

Background The WHO MONICA Project is a 10-year study that monitors deaths due to coronary heart disease (CHD), acute myocardial infarction, coronary care, and risk factors in men and women aged 35 to 64 years in defined communities. This analysis of methods and results of coronary-event registration in 1985 through 1987 provides data on the relation between CHD morbidity and mortality.

Methods and Results Fatal and nonfatal coronary events were monitored through population-based registers. Hospital cases were found by pursuing admissions ('hot pursuit') or by retrospective analysis of discharges ('cold pursuit'). Availability of diagnostic data on identified non-fatal myocardial infarction was good. Information on fatal events (deaths occurring within 28 days) was limited and constrained in some populations by problems with access to sources such as death certificates. Age-standardized annual event rates for the main diagnostic group in men aged 35 to 64 covered a 12-fold range from 915 per 100 000 for North Karelia, Finland, to 76 per 100 000 for Beijing, China. For women, rates covered an 8.5-fold range from 256 per 100 000 for Glasgow, UK, to 30 per 100 000 for Catalonia, Spain. Twenty-eight-day case-fatality rates ranged from 37% to 81% for men (average, 48% to 49%), and from 31% to 91% for women (average, 54%). There was no significant correlation across populations for men between coronary-event and case-fatality rates ($r = -.04$), the percentages of coronary deaths known to have occurred within one hour of onset ($r = .08$), or the percentages of known first events ($r = -.23$). Event and case-fatality rates for women correlated strongly with

those for men in the same populations ($r = .85$, $r = .80$). Case-fatality rates for women were not consistently higher than those for men. For women, there was a significant inverse correlation between event and case-fatality rates ($r = -.33$, $P < .05$), suggesting that non-fatal events were being missed where event rates were low. Rankings based on MONICA categories of fatal events placed some middle- and low-mortality populations, such as the French, systematically higher than they would be based on official CHD mortality rates. However, rates for non-fatal myocardial infarction correlated quite well with the official mortality rates for CHD for the same populations. For men (aged 35 to 64 years), approximately 1.5 (at low event rates) to one (at high event rates) episode of hospitalized, non-fatal, definite myocardial infarction was registered for every death due to CHD. The problem in categorizing deaths due to CHD was the large proportion of deaths with no relevant clinical or autopsy information. Unclassifiable deaths averaged 22% across the 38 populations but represented half of all registered deaths in two populations and a third or more of all deaths in 15 populations.

Conclusions The WHO MONICA Project, although designed to study longitudinal trends within populations, provides the opportunity for relating rates of validated CHD deaths to non-fatal myocardial infarction across populations. There are major differences between populations in non-fatal as well as fatal coronary-event rates. They refute suggestions that high CHD mortality rates are associated with high case-fatality rates or a relative excess of sudden deaths. The high proportion of CHD deaths for which no diagnostic information is available is a cause for concern.

PMID: 8026046.

MONICA Publication 17

Stewart AW, Kuulasmaa K, Beaglehole R, for the WHO MONICA Project. Ecological analysis of the association between mortality and major risk factors of cardiovascular disease.

International Journal of Epidemiology, 1994, 23(3):505–516.

Department of Community Health, University of Auckland, Auckland, New Zealand

Background The WHO Multinational Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA)

Project has been established to measure trends in cardiovascular mortality and coronary heart disease and cerebrovascular disease morbidity and to assess the extent to which these trends are related to changes in known risk factors at the same time in defined communities in different countries. This cross-sectional study is based on data from the early part of the Project and assesses the association between mortality and population risk-factor levels.

Methods Thirty-five populations of men and women aged 35–64 years are used in correlation analyses between four mortality measures (deaths from all causes, cardiovascular diseases, ischaemic heart disease and stroke) and three cardiovascular risk factors (regular cigarette smoking, blood pressure and total cholesterol).

Results In male populations all-causes mortality and stroke mortality had more than 39% of their variance explained by the three risk factors but all cardiovascular and ischaemic heart disease mortality had less than 25% of their variance explained. For female populations each mortality measure except ischaemic heart disease mortality had more than 33% of their variance accounted for by the three risk factors. For both the male and female populations each of the mortality measures shows strong associations with high blood pressure but the associations with smoking and high cholesterol are generally weaker and much less consistent.

Conclusions This analysis has shown that accepted cardiovascular mortality risk factors measured cross-sectionally at the population level do not reflect well the variation in mortality between populations.

PMID: 7960374.

MONICA Publication 18

Asplund K, Bonita R, Kuulasmaa K, Rajakangas AM, Schädlich H, Suzuki K, Thorvaldsen P, Tuomilehto J, for the WHO MONICA Project.

Multinational comparisons of stroke epidemiology. Evaluation of case ascertainment in the WHO MONICA Stroke Study. World Health Organization Monitoring Trends and Determinants in Cardiovascular Disease.

Stroke, 1995, Mar, 26(3):355–360. **Erratum appears in 1995, Aug, 26(8):1504.**

Department of Medicine, University Hospital, Umea, Sweden

Background and Purpose As part of the WHO MONICA Project (World Health Organization Monitoring Trends and Determinants in Cardiovascular Disease), mortality and incidence rates of acute stroke in 14 centres covering 21 populations from 11 countries were compared.

Methods In this report, coverage and quality of the MONICA stroke registers were evaluated for five key indicators using data submitted to the MONICA Data Centre.

Results A low ratio of MONICA stroke register to routine statistics of stroke mortality and a low proportion of non-fatal out-of-hospital events were the most common biases; they indicate that identifications of fatal cases and/or case finding of non-fatal events occurring outside the hospital were inadequate in many MONICA centres. In 10 populations, the data quality analyses suggested that clarification of possible biases would be needed before these populations can be included in a comparative study. Data from the remaining 11 populations meet the data quality standards for multinational comparisons with respect to case ascertainment.

Conclusions These results show that multinational comparisons of stroke incidence involve considerable problems in developing and maintaining appropriate standards of data quality. However, after considerable efforts to ensure quality, comparisons of stroke data within the MONICA Project are possible among a large number of the MONICA populations. Our observations also indicate that results from multinational comparisons of stroke mortality based on routine statistics must be interpreted with caution.

PMID: 7886706.

MONICA Publication 19

Thorvaldsen P, Asplund K, Kuulasmaa K, Rajakangas AM, Schroll M, for the WHO MONICA Project.

Stroke incidence, case fatality, and mortality in the WHO MONICA project. World Health Organization Monitoring Trends and Determinants in Cardiovascular Disease.

Stroke, 1995, Mar, 26(3):361–367. **Errata appear in 1995, Aug, 26(8):1504 and 1995, Dec, 26(12):2376.**

WHO MONICA Project Annex, Glostrup Population Studies, Glostrup University Hospital, Denmark

Background and Purpose This report compares stroke incidence, case fatality, and mortality rates during the first years of the WHO MONICA Project in 16 European and two Asian populations.

Methods In the stroke component of the WHO MONICA Project, stroke registers were established with uniform and standardized rules for case ascertainment and validation of events.

Results A total of 13 597 stroke events were registered from 1985 to 1987 in a total background population of 2.9 million people aged 35 to 64 years. Age-standardized stroke incidence rates per 100 000 varied from 101 to 285 in men and from 47 to 198 in women. The combined stroke attack rates for first and recurrent events were approximately 20% higher than incidence rates in most populations and varied to the same extent. Stroke incidence rates were very high among the population of Finnish men tested. The incidence of stroke was, in general, higher among populations in eastern than in western Europe. It was also relatively high in the Chinese population studied, particularly among women. The case-fatality rates at 28 days varied from 15% to 49% among men and from 18% to 57% among women. In half of the populations studied, there were only minor differences between official stroke mortality rates and rates measured on the basis of fatal events registered and validated for the WHO MONICA stroke study.

Conclusions The WHO MONICA Project provides a unique opportunity to perform cross-sectional and longitudinal comparisons of stroke epidemiology in many populations. The present data show how large differences in stroke incidence and case-fatality rates contribute to the more than threefold differences in stroke mortality rates among populations.

PMID: 7886707.

MONICA Publication 20

Hense HW, Koivisto AM, Kuulasmaa K, Zaborskis A, Kupsc W, Tuomilehto J, for the WHO MONICA Project.

Assessment of blood pressure measurement quality in the baseline surveys of the WHO MONICA project.

Journal of Human Hypertension, 1995, Dec, 9(12):935-946.
Institute of Epidemiology and Social Medicine,
University Munster, Germany

Because of the general unavailability of reference standards, there exist no common procedures to assess the quality of blood pressure measurements in epidemiological population surveys. To approach this problem within the collaborative international WHO MONICA Project, a standardized assessment of BP measurement quality was developed and applied to the forty-seven baseline surveys of that project. The entire assessments were carried out in retrospect, that is, only after each population survey had been completed. The assessment was focused on the procedures of quality assurance and control as reportedly applied in each survey, and on quality indicators which were derived from the recorded blood pressure values of each survey. The definitions of specific quality assessment items were based on the MONICA Project protocol and on sources in the pertinent literature. The available information on quality assurance and control procedures depended solely on self-reports by local survey organizers and on site visits, and was occasionally found to be at variance with the actual blood pressure recordings. Therefore, quality indicators derived from actual blood pressure recordings were far more informative and comparable between surveys. Each survey was rated as optimal, satisfactory, or unsatisfactory with regard to single quality items and these single scores were used jointly to compute a summary score of blood pressure measurement quality for each survey. This summary score indicated that 39 out of 47 MONICA baseline surveys showed optimal or satisfactory BP measurement quality. Limitations and potential for improvement of quality assessments became apparent. We conclude that a standardized assessment of BP measurement quality in epidemiological population surveys seems feasible and propose that quality assessment methods similar to the ones suggested here become a routine part of future epidemiological analyses of blood pressure values and hypertension in populations. This should facilitate valid study comparisons.

PMID: 8746637.

MONICA Publication 21

Asplund K, Rajakangas AM, Kuulasmaa K, Thorvaldsen P, Bonita R, Stegmayr B, Suzuki K, Eisenblätter D, for the WHO MONICA Project.

Multinational comparison of diagnostic procedures and management of acute stroke—the WHO MONICA Study.

Cerebrovascular Diseases, 1996, 6:66-74.
Department of Medicine, University Hospital,
Umea, Sweden

Background and Purpose In the stroke component of the WHO MONICA Project, community-based registers of acute stroke have been undertaken in 20 populations in Finland, Sweden, Denmark, Germany, Italy, Yugoslavia, Hungary, Poland, Lithuania, Russia and China. This paper reports on diagnostic procedures and management of acute stroke in these populations.

Methods The MONICA stroke registers apply uniform registration procedures and diagnostic criteria. Data for three years were pooled and used for cross-sectional comparisons. Longitudinal analyses of the use of computerized tomography (CT) scans and autopsy rates were based on all years up to 1990 for which information was available. The total population in the age range investigated (35–64 years) was 3 250 000. Strokes were also recorded for the 65- to 74-year age range in seven of the 20 populations.

Results In all populations, more than three quarters of all 35–64-year-old stroke patients were managed in hospital; in nine populations more than 90% were managed in hospital. The use of CT scans ranged from 0% in Russia to 70–76% in West Germany, Italy, Sweden and two of the Finnish populations. During the mid-1980s, use of CT scan increased rapidly in China (Beijing), Denmark, Finland and Yugoslavia but spread only slowly in Poland, Lithuania and Russia. Autopsy rates varied from 0% in China to 76% in the Hungarian and one of the Russian populations. During the 1980s, autopsy rates were stable in most populations, but declined considerably in Lithuania, Poland and Sweden. Elderly patients (65–74 years) were less often hospitalized in China but this was not the case in European populations. In all populations, CT scan and autopsy were less often performed in older subjects.

Conclusions Large variations exist between countries in the use of diagnos-

tic procedures and the management of acute stroke. Data obtained before the late 1980s permit only very limited multinational epidemiological comparisons of stroke subtypes, but the possibility for making such comparisons is rapidly improving.

PMID: not listed.

MONICA Publication 22

Dobson A, Filipiak B, Kuulasmaa K, Beaglehole R, Stewart A, Hobbs M, Parsons R, Keil U, Greiser E, Korhonen H, Tuomilehto J.

Relations of changes in coronary disease rates and changes in risk factor levels: methodological issues and a practical example.

American Journal of Epidemiology, 1996, May 15, 143(10):1025–1034.

Centre for Clinical Epidemiology and Biostatistics, University of Newcastle, Australia

One of the main hypotheses of the World Health Organization (WHO) MONICA Project is that trends in the major coronary disease risk factors are related to trends in rates of fatal and non-fatal coronary disease events. The units of study are populations rather than individuals. The WHO MONICA Project involves continuous monitoring of all coronary disease events in the populations over a 10-year period and periodic risk-factor surveys in random samples of the same populations. Estimation of associations between average annual changes in mortality and risk-factor levels is illustrated with the use of data from a subset of MONICA centres. Crude estimates of regression coefficients are compared with estimates obtained by weighting for standard errors in both the outcome and explanatory variables. The results show that the strength of association may be either underestimated or overestimated if these errors are not taken into account.

PMID: 8629609.

MONICA Publication 23

Tunstall-Pedoe H.

Is acute coronary heart disease different in different countries in the two sexes: lessons from the MONICA Project.

Cardiovascular Risk Factors, 1996, 6:254–261.

Cardiovascular Epidemiology Unit, University of Dundee, Ninewells Hospital, Dundee, Scotland, UK

The World Health Organization Monitoring Cardiovascular Disease (MONICA) Project involves standardized recording of information on all acute coronary events (coronary deaths and acute myocardial infarction) occurring in men and women <65 in different populations in 21 countries. Although the long-term objective is to measure trends over time, interim analyses from the international study, and from the Scottish MONICA population in Glasgow, have exploited a unique opportunity for comparing acute coronary heart attacks in men and women. Women on average have a higher 28-day case fatality than men, but this is most marked where event rates are low, and not where they are very high, suggesting that a large number of non-fatal episodes in women may not be recognized and reported in low-incidence populations. The international study showed that more women than men had investigations carried out in fatal cases, and the data on survival showed a systematic difference across almost all centres, in that male fatalities occurred earlier than those in women. This has been corroborated in a very detailed comparison from Glasgow, where the case fatality at 28 days was the same in men and women, but more men died outside the hospital early in the attack and more women after admission. Women have a greater number of unconfirmed or possible infarcts compared with men and more subendocardial infarction. A number of other differences are reported from the Glasgow findings. Even given the apparent failure to recognize some attacks in women, there nonetheless seem to be true differences in the way in which coronary attacks behave in the two sexes. However, these differences are few and subtle, and for many, factors are equal. The study of trends during 10 years will show whether differences are widening or narrowing over time.

PMID: not listed.

MONICA Publication 24

Salomaa V, Dobson A, Miettinen H, Rajakangas AM, Kuulasmaa K, for the WHO MONICA Project.

Mild myocardial infarction—a classification problem in epidemiologic studies. WHO MONICA Project.

Journal of Clinical Epidemiology, 1997, Jan, 50(1):3–13.

Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

In studies assessing the trends in coronary events, such as the World Health Organization (WHO) MONICA Project (Multinational MONITORING of Trends and Determinants of Cardiovascular Disease), the main emphasis has been on coronary deaths and non-fatal definite myocardial infarctions (MI). It is, however, possible that the proportion of milder MIs may be increasing because of improvements in treatment and reductions in levels of risk factors. We used the MI register data of the WHO MONICA Project to investigate several definitions for mild non-fatal MIs that would be applicable in various settings and could be used to assess trends in milder coronary events. Of 38 populations participating in the WHO MONICA MI register study, more than half registered a sufficiently wide spectrum of events that it was possible to identify subsets of milder cases. The event rates and case-fatality rates of MI are clearly dependent on the spectrum of non-fatal MIs, which are included. On clinical grounds we propose that the original MONICA category 'non-fatal possible MI' could be divided into two groups: 'non-fatal probable MI' and 'prolonged chest pain'. Non-fatal probable MIs are cases, which in addition to 'typical symptoms' have electrocardiogram (ECG) or enzyme changes suggesting cardiac ischemia, but not severe enough to fulfil the criteria for non-fatal definite MI. In more than half of the MONICA Collaborating Centres, the registration of MI covers these milder events reasonably well. Proportions of non-fatal probable MIs vary less between populations than do proportions of non-fatal possible MIs. Also rates of non-fatal probable MI are somewhat more highly correlated with rates of fatal events and non-fatal definite MI. These findings support the validity of the category of non-fatal probable MI. In each centre the increase in event rates and the decrease in case-fatality due to the inclusion of non-fatal probable MI was larger for women than men. For the WHO MONICA Project and other epidemiological studies the proposed category of non-fatal probable MIs can be used for assessing trends in rates of milder MI.

PMID: 9048685.

MONICA Publication 25

Thorvaldsen P, Kuulasmaa K, Rajakangas AM, Rastenyte D, Sarti C, Wilhelmsen L, for the WHO MONICA Project.

Stroke trends in the WHO MONICA project.

Stroke, 1997, Mar, 28(3):500–506.

Glostrup Population Studies, Glostrup University Hospital, Denmark

Background and Purpose Stroke registers were established as part of the international collaborative World Health Organization Monitoring of Trends and Determinants in Cardiovascular Disease (WHO MONICA) Project in 17 centres in 10 countries. The aim of the present analyses was to estimate and compare temporal stroke trends across the MONICA populations.

Methods All stroke events in defined populations were ascertained and validated according to a common protocol and uniform criteria. Almost 25 000 stroke events in more than 15 million person-years were analysed. Age-standardized rates for fatal stroke and for all stroke events were calculated for whole calendar years for each of the populations. Temporal stroke trends were estimated using annual rates for five to six years.

Results Annual stroke attack rates decreased among men in 13 populations and among women in 15 of the 17 MONICA populations. Stroke mortality rates declined among men in 11 populations and among women in 14 of the populations studied. The estimated trends reached the level of statistical significance at the 5% level in only a small number of populations. The trends in official cerebrovascular death rates were in agreement with those estimated on the basis of MONICA data in the majority of the populations studied.

Conclusions Decreasing stroke mortality and attack rates in a large proportion of populations studied can be interpreted as an indication of declining stroke rates in most of the populations studied. The numbers of populations with statistically significant trends were small, and it is therefore not possible to determine with certainty in which of the populations the changes were real.

PMID: 9056602.

MONICA Publication 26

Stegmayr B, Asplund K, Kuulasmaa K, Rajakangas AM, Thorvaldsen P, Tuomilehto J, for the WHO MONICA Project.

Stroke incidence and mortality correlated to stroke risk factors in the WHO MONICA Project. An ecological study of 18 populations.

Stroke, 1997, Jul, 28(7):1367–1374.

Department of Medicine, University Hospital, Umea, Sweden

Background The aim of the present study was to determine the extent to which the variation in conventional risk factors contributed to the variation in stroke incidence among these populations.

Methods Within the WHO MONICA Project, stroke has been recorded in 18 populations in 11 countries. In population surveys, risk factors for cardiovascular diseases have been examined in the 35 to 64 year age group. Over a 3-year period, 12 224 acute strokes were registered in men and women within the same age range.

Results The highest stroke attack rates were found in Novosibirsk in Siberia, Russia, and Finland, with a more than three-fold higher incidence than in Friuli, Italy. The mean diastolic blood pressure among the populations differed by 15 mmHg between Novosibirsk (highest) and Denmark (lowest). In multiple regression analyses, the presence of conventional cardiovascular risk factors (smoking and elevated blood pressure) explained 21% of the variation in stroke incidence among the population in men and 42% in women. In Finland, in China, and in men in Lithuania, the stroke incidence rates were higher than expected from the population risk factor levels.

Conclusion Prevalence of smoking and elevated blood pressure explains a substantial proportion of the variation of stroke attack rates between populations. However, other risk factors for stroke that were not measured in the present study also contribute considerably to inter-population differences in stroke rates.

PMID: 9227685.

MONICA Publication 27

Molarius A, Seidell JC, Kuulasmaa K, Dobson AJ, Sans S, for the WHO MONICA Project. Smoking and relative body weight: an international perspective from the WHO MONICA Project.

Journal of Epidemiology and Community Health, 1997, Jun, 51(3):252–260.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

Study Objective To investigate the magnitude and consistency of the associations between smoking and body mass index (BMI) in different populations.

Design A cross-sectional study.

Setting and Participants About 69 000 men and women aged 35–64 years from 42 populations participating in the first WHO MONICA survey in the early and mid-1980s.

Main Results Compared to never smokers, regular smokers had significantly ($p < 0.05$) lower median BMI in 20 (men) and 30 (women) out of 42 populations (range -2.9 to 0.5 kg/m²). There was no population in which smokers had a significantly higher BMI than never smokers. Among men, the association between leanness and smoking was less apparent in populations with relatively low proportions of regular smokers and high proportions of ex-smokers. Ex-smokers had significantly higher BMI than never smokers in 10 of the male populations but in women no consistent pattern was observed. Adjustment for socioeconomic status did not affect these results.

Conclusions Although in most populations the association between smoking and BMI is similar, the magnitude of this association may be affected by the proportions of smokers and ex-smokers in these populations.

PMID: 9229053.

MONICA Publication 28

Kuulasmaa K, Dobson A, for the WHO MONICA Project.

Statistical issues related to following populations rather than individuals over time.

Bulletin of the International Statistical Institute: Proceedings of the 51st Session, 1997, Aug 18–26, Istanbul, Turkey, Voorburg: International Statistical Institute, 1997. Book 1: 295–298.

Also available from

URL:<http://www.ktl.fi/publications/monica/isi97/isi97.htm>.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

The paper considers the common situation where data on populations have been obtained by measurement of the individuals in a series of independent samples (e.g. risk factors of cardiovascular disease) and by continuous counting of events in individuals of the entire population (e.g. population mortality or incidence), but the risk factors of those getting the events are not known. Methods are described for the estimation of changes in the population mean of the risk factors, estimation of changes in the disease incidence and estimation of the extent to which the observed incidence changes are explained by the observed changes in the risk factors when data are available from a large number of populations. The units of the last analysis are the populations rather than the individuals, but the variances of the variables (i.e. risk factor changes and incidence changes) as well as qualitative information on the quality of the data are available for each population.

PMID: not listed.

MONICA Publication 29

Chambless L, Keil U, Dobson A, Mähönen M, Kuulasmaa K, Rajakangas AM, Lowel H, Tunstall-Pedoe H, for the WHO MONICA Project.

Population versus clinical view of case fatality from acute coronary heart disease: results from the WHO MONICA Project 1985–1990. Multinational MONItoring of Trends and Determinants in CArdiovascular Disease.

Circulation, 1997, Dec 2, 96(11):3849–3859.

Institute of Epidemiology and Social Medicine, University of Münster, Germany

Background The clinical view of case fatality (CF) from acute myocardial infarction (AMI) in those reaching the hospital alive is different from the population view. Registration of both hospitalized AMI cases and out-of-hospital coronary heart disease (CHD) deaths in the WHO MONICA Project allows both views to be reconciled. The WHO MONICA Project provides the largest data set worldwide to explore the relationship between CHD, CF and age, sex, coronary-event rate, and first versus recurrent event.

Methods and Results All 79 669 events of definite AMI or possible coronary death, occurring from 1985 to 90 among 5 725 762 people, 35 to 64 years of age, in 29 MONICA populations are the basis for

CF calculations. Age-adjusted CF (percentage of CHD events that were fatal) was calculated across populations, stratified for different time periods, and related to age, sex, and CHD-event rate. Median 28-day population CF was 49% (range, 35% to 60%) in men and 51% (range, 34% to 70%) in women and was higher in women than men in populations in which CHD-event rates were low. Median 28-day CF for hospitalized events was much lower: in men 22% (range, 15% to 36%) and in women 27% (range, 19% to 46%). Among hospitalized events CF was twice as high for recurrent as for first events.

Conclusions Overall 28-day CF is halved for hospitalized events compared with all events, and again nearly halved for hospitalized 24-hour survivors. Because approximately two-thirds of 28-day CHD deaths in men and women occurred before reaching the hospital, opportunities for reducing CF through improved care in the acute event are limited. Major emphasis should be on primary and secondary prevention.

PMID: 9403607.

MONICA Publication 30

Jackson R, Chambless L, Higgins M, Kuulasmaa K, Wijnberg L, Williams OD, for the WHO MONICA Project and ARIC Study.

Gender differences in ischaemic heart disease mortality and risk factors in 46 communities: an ecologic analysis.

Cardiovascular Risk Factors, 1997, 7:43–54.

Department of Community Health, University of Auckland, New Zealand

Internationally, mortality from ischaemic heart disease is consistently higher among men than women although the mortality:gender ratios differ considerably between countries. The objective of this study was to estimate the contribution of gender differences in ischaemic heart disease risk factors to gender differences in ischaemic heart disease mortality between selected communities in different countries.

Methods This cross-sectional study uses communities as the unit of analysis. Gender differences in age-adjusted ischaemic heart disease mortality between communities were correlated with gender differences in the age-adjusted prevalence of five major ischaemic heart disease risk factors [i.e. cigarette smoking, obesity,

high blood pressure, high blood total cholesterol and low blood high density lipoprotein cholesterol].

Data came from the World Health Organization coordinated MONICA (Multi-national Monitoring of Trends and Determinants in Cardiovascular Disease) Project and the US National Heart Lung and Blood Institute sponsored ARIC (Atherosclerosis Risk in Communities) Study, which have been collecting gender-specific data on ischaemic heart disease risk factors, morbidity and mortality from geographically defined communities in over 25 countries. Data from 46 communities in 24 countries participating in either the MONICA Project or the ARIC Study are included in these analyses. The analyses are restricted to the age group 45 to 64 years.

Results Ischaemic heart disease mortality rates in women were less than half the male rates in all but one community, suggesting that intrinsic biological factors influence gender differences in ischaemic heart disease. There was a more than one-fold variation in gender-specific ischaemic heart disease mortality between communities and a strong positive correlation between male and female ischaemic heart disease mortality across the 46 communities, indicating that environmental or lifestyle factors are also important determinants of gender differences in ischaemic heart disease death rates.

In multiple regression analyses using ischaemic heart disease mortality ratios as the dependant variable, only obesity (partial correlation coefficient: $r = 0.43$, $p = 0.008$) and cigarette smoking ($r = 0.48$, $p = 0.003$) contributed significantly to the model. There were strong correlations between gender ratios in the five risk factors. Approximately 40% of the variation in the gender ratios of ischaemic heart disease mortality across the communities could be explained by differences in the gender ratios of the five risk factors examined.

Conclusions The observed cross-national variation in gender differences in ischaemic heart disease mortality appears to be significantly influenced by gender differences in the standard ischaemic heart disease risk factors, particularly obesity and smoking. However, the strong correlations between the risk-factor gender differences illustrate the potential

for substantial confounding in this type of ecological analysis.

PMID: not listed.

MONICA Publication 31

Wolf HK, Tuomilehto J, Kuulasmaa K, Domarkiene S, Cepaitis Z, Molarius A, Sans S, Dobson A, Keil U, Rywik S, for the WHO MONICA Project.

Blood pressure levels in the 41 populations of the WHO MONICA Project.

Journal of Human Hypertension, 1997, Nov, 11(11):733–742.

Department of Physiology and Biophysics, Dalhousie University, Halifax NS, Canada

In the early to mid-1980s, the WHO MONICA Project conducted cardiovascular risk-factor surveys in 41 study populations in 22 countries. Study populations aged 35–64 years comprised 32 422 men and 32 554 women. Blood pressures (BP) and body mass index (BMI) were measured according to a standard protocol. Participants were asked about antihypertensive medication. In men, the average age-standardized BPs ranged among the populations from 124 to 148 mmHg for systolic (SBP) and from 75 to 93 mmHg for diastolic (DBP). The corresponding values in women were 118 to 145 mmHg for SBP and 74 to 90 mmHg for DBP. In all populations, women had lower SBP than men in the 35–44 age group. However, SBP in women rose more steeply with age so that in 34 of 41 populations women had higher SBP than men in the 55–64 age group. The proportion of participants with untreated major elevation of BP ranged from 4.5% to 33.7% in men and from 1.9% to 22.3% in women. The proportions of participants receiving antihypertensive medication were 4.3–17.7% for men and 6.0–22.0% for women. These proportions were not correlated with the prevalence of untreated hypertensives. Age-adjusted BMI was associated with SBP and accounted for 14% of the SBP variance in men and 32% in women. We found a large difference in SBP among the MONICA study populations and conclude that the results represent a valid estimate of the public health problem posed by elevated BP. We also have shown that almost universally the problem of elevated BP is more prevalent in women than in men, especially in the older age groups.

PMID: 9416984.

MONICA Publication 32

Dobson AJ, Evans A, Ferrario M, Kuulasmaa KA, Moltchanov VA, Sans S, Tunstall-Pedoe H, Tuomilehto JO, Wedel H, Yarnell J, for the WHO MONICA Project.

Changes in estimated coronary risk in the 1980s: data from 38 populations in the WHO MONICA Project. World Health Organization. Monitoring trends and determinants in cardiovascular diseases.

Annals of Medicine, 1998, Apr, 30(2):199–205.

University of Newcastle, Australia

The World Health Organization (WHO) MONICA Project is a 10-year study monitoring trends and determinants of cardiovascular disease in geographically defined populations. Data were collected from over 100 000 randomly selected participants in two risk-factor surveys conducted approximately five years apart in 38 populations using standardized protocols. The net effects of changes in the risk factor levels were estimated using risk scores derived from longitudinal studies in the Nordic countries. The prevalence of cigarette smoking decreased among men in most populations, but the trends for women varied. The prevalence of hypertension declined in two-thirds of the populations. Changes in the prevalence of raised total cholesterol were small but highly correlated between the genders ($r = 0.8$). The prevalence of obesity increased in three-quarters of the populations for men and in more than half of the populations for women. In almost half of the populations there were statistically significant declines in the estimated coronary risk for both men and women, although for Beijing the risk score increased significantly for both genders. The net effect of the changes in the risk factor levels in the 1980s in most of the study populations of the WHO MONICA Project is that the rates of coronary disease are predicted to decline in the 1990s.

PMID: 9667799.

MONICA Publication 33

Evans A, Dobson A, Ferrario M, Kuulasmaa K, Moltchanov V, Sans S, Tunstall-Pedoe H, Tuomilehto J, Wedel H, Yarnell J, for the WHO MONICA Project.

The WHO MONICA Project: changes in coronary risk in the 1980s.

Proceedings of the XIth International Symposium on Atherosclerosis, 5–9 October 1997, Paris, France. Elsevier Science. *Atherosclerosis XI*, 1998, 49–55.

The Queen's University of Belfast, Belfast, Northern Ireland, UK

Background The WHO MONICA project is a 10-year study monitoring trends and determinants of cardiovascular disease in geographically defined populations.

Methods and Results Data were collected from randomly selected participants in two risk factor surveys conducted approximately five years apart. The net effects of changes in the risk-factor levels were estimated using risk scores derived from longitudinal studies in the Nordic countries. Prevalence of cigarette smoking decreased among men in most populations, but trends for women varied. Prevalence of hypertension declined in two-thirds of the populations. Changes in prevalence of raised total cholesterol were small. Prevalence of obesity increased in about three-quarters of the populations for both men and women. In almost half the populations there were statistically significant declines in estimated coronary risk for both men and women although for Beijing the risk score increased significantly for both genders.

Conclusions The net effect of changes in risk factor levels in the 1980s in the study populations of the WHO MONICA project is that rates of coronary disease are predicted to decline in the 1990s.

PMID: not listed.

MONICA Publication 34

Dobson AJ, Kuulasmaa K, Moltchanov V, Evans A, Fortmann SP, Jamrozik K, Sans S, Tuomilehto J, for the WHO MONICA Project.

Changes in cigarette smoking among adults in 35 populations in the mid-1980s. WHO MONICA Project.

Tobacco Control, 1998, Spring, 7(1):14–21.

Department of Statistics, University of Newcastle, New South Wales, Australia

Objective To examine changes in the prevalence of cigarette smoking in 35 study populations of the World Health Organization's MONICA Project.

Design Data from two independent, community-based surveys conducted, on average, five years apart.

Setting Geographically defined populations in 21 countries mainly in eastern and western Europe.

Subjects Randomly selected men and women aged 25 to 64 years. Numbers of participants in each study population ranged from 586 to 2817 in each survey.

Main Outcome Measures Changes in proportions of current smokers, ex-smokers, and never-smokers by age and sex using data collected by standardized methods.

Results Among men, smoking prevalence decreased in most populations, by three to four percentage points over five years. In Beijing, however, it increased in all age groups—overall by 11 percentage points. Among women there were increases in smoking in about half the populations. The increases were mainly in the age group 35 to 54 years and often in those populations where smoking prevalence among women has been relatively low.

Conclusions Smoking initiation by middle-aged women in parts of southern and eastern Europe and among men of all ages in Beijing is a matter of concern. The various public health measures that have helped to reduce smoking among men in developed countries should be vigorously extended to these other groups now at growing risk of smoking-related disease.

PMID: 9706749.

MONICA Publication 35

Molarius A, Seidell JC, Sans S, Tuomilehto J, Kuulasmaa K, for the WHO MONICA Project.

Waist and hip circumferences, and waist-hip ratio in 19 populations of the WHO MONICA Project.

International Journal of Obesity and Related Metabolic Disorders, 1999, Feb, 23(2):116–125.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

Objective To assess differences in waist and hip circumferences and waist-to-hip ratio (WHR) measured using a standard protocol among populations with different prevalences of overweight. In addition, to quantify the associations of these anthropometric measures with age and degree of overweight.

Design Cross-sectional study of random population samples.

Subjects More than 32 000 men and women aged 25–64 y from 19 (18 in women) populations participating in the

second MONItoring Trends and Determinants in Cardiovascular Disease (MONICA) survey from 1987–1992.

Results Age-standardized mean waist circumference ranges between populations from 83–98 cm in men and from 78–91 cm in women. Mean hip circumference ranged from 94–105 cm and from 97–108 cm in men and women, respectively, and mean WHR from 0.87–0.99 and from 0.76–0.84, respectively. Together, height, body mass index (BMI), age group and population explained about 80% of the variance in waist circumference. BMI was the predominant determinant (77% in men, 75% women). Similar results were obtained for hip circumference. However, height, BMI, age group and population, accounted only for 49% (men) and 30% (women) of the variation in WHR.

Conclusion Considerable variation in waist and hip circumferences and WHR were observed among the study populations. Waist circumference and WHR, both of which are used as indicators of abdominal obesity, seem to measure different aspects of the human body: waist circumference reflects mainly the degree of overweight whereas WHR does not.

PMID: 10078844.

MONICA Publication 36

Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amouyel P, for the WHO MONICA Project.

Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations. Monitoring trends and determinants in cardiovascular disease.

Lancet, 1999, May 8, 353(9164):1547–1557.

Cardiovascular Epidemiology Unit (MONICA Quality Control Centre for Event Registration), University of Dundee, Ninewells Hospital and Medical School, Dundee, UK

Background The WHO MONICA (Monitoring Trends and Determinants in Cardiovascular Disease) Project monitored, from the early 1980s, trends over 10 years in coronary heart disease (CHD) across 37 populations in 21 countries. We aimed to validate trends in mortality, partitioning responsibility between changing coronary-event rates and changing survival.

Methods Registers identified non-fatal definite myocardial infarction and definite, possible, or unclassifiable coronary

deaths in men and women aged 35–64 years, followed up for 28 days in or out of hospital. We calculated rates from population denominators to estimate trends in age-standardized rates and case fatality (percentage of 28-day fatalities = [100-survival percentage]).

Findings During 371 population-years, 166 000 events were registered. Official CHD mortality rates, based on death certification, fell (annual changes: men –4.0% [range –10.8 to 3.2]; women –4.0% [–12.7 to 3.0]). By MONICA criteria, CHD mortality rates were higher, but fell less (–2.7% [–8.0 to 4.2] and –2.1% [–8.5 to 4.1]). Changes in non-fatal rates were smaller (–2.1%, [–6.9 to 2.8] and –0.8% [–9.8 to 6.8]). MONICA coronary-event rates (fatal and non-fatal combined) fell more (–2.1% [–6.5 to 2.8] and –1.4% [–6.7 to 2.8]) than case fatality (–0.6% [–4.2 to 3.1] and –0.8% [–4.8 to 2.9]). Contribution to changing CHD mortality varied, but in populations in which mortality decreased, coronary-event rates contributed two-thirds and case fatality one-third.

Interpretation Over the decade studied, the 37 populations in the WHO MONICA Project showed substantial contributions from changes in survival, but the major determinant of decline in CHD mortality is whatever drives changing coronary-event rates.

PMID: 10334252.

MONICA Publication 37

Molarius A, Seidell JC, Sans S, Tuomilehto J, Kuulasmaa K, for the WHO MONICA Project.

Varying sensitivity of waist action levels to identify subjects with overweight or obesity in 19 populations of the WHO MONICA Project.

Journal of Clinical Epidemiology, 1999, Dec, 52(12):1213–1224.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

It has been suggested in the literature that cut-off points based on waist circumference (waist action levels) should replace cut-off points based on body mass index (BMI) and waist-to-hip ratio in identifying subjects with overweight or obesity. In this article, we examine the sensitivity and specificity of the cut-off points when applied to 19 populations with widely different prevalences of overweight. Our

design was a cross-sectional study based on random population samples. A total of 32 978 subjects aged 25–64 years from 19 male and 18 female populations participating in the second MONICA survey from 1987 to 1992 were included in this study. We found that at waist action level 1 (waist circumference \geq 94 cm in men and \geq 80 cm in women), sensitivity varied between 40% and 80% in men and between 51% and 86% in women between populations when compared with the cut-off points based on BMI (\geq 25 kg/m²) and waist-to-hip ratio (\geq 0.95 for men, \geq 0.80 for women). Specificity was high (\geq 90%) in all populations. At waist action level 2 (waist circumference \geq 102 cm and \geq 88 cm in men and women, respectively, BMI \geq 30 kg/m²), sensitivity varied from 22% to 64% in men and from 26% to 67% in women, whereas specificity was $>$ 95% in all populations. Sensitivity was in general lowest in populations in which overweight was relatively uncommon, whereas it was highest in populations with relatively high prevalence of overweight. We propose that cut-off points based on waist circumference as a replacement for cut-off points based on BMI and waist-to-hip ratio should be viewed with caution. Based on the proposed waist action levels, very few people would unnecessarily be advised to have weight management, but a varying proportion of those who would need it might be missed. The optimal screening cut-off points for waist circumference may be population specific.

PMID: 10580785.

MONICA Publication 38

Kuulasmaa K, Tunstall-Pedoe H, Dobson A, Fortmann S, Sans S, Tolonen H, Evans A, Ferrario M, Tuomilehto J, for the WHO MONICA Project.

Estimation of contribution of changes in classic risk factors to trends in coronary-event rates across the WHO MONICA Project populations.

Lancet, 2000, Feb 26, 355(9205):675–687.

Department of Epidemiology and Health Promotion, National Public Health Institute (KTL), Helsinki, Finland

Background From the mid-1980s to mid-1990s, the WHO MONICA Project monitored coronary events and classic risk factors for coronary heart disease (CHD) in 38 populations from 21 countries. We assessed the extent to which changes in

these risk factors explain the variation in the trends in coronary-event rates across the populations.

Methods In men and women aged 35–64 years, non-fatal myocardial infarction and coronary deaths were registered continuously to assess trends in rates of coronary events. We carried out population surveys to estimate trends in risk factors. Trends in event rates were regressed on trends in risk score and in individual risk factors.

Findings Smoking rates decreased in most male populations but trends were mixed in women; mean blood pressures and cholesterol concentrations decreased, body mass index increased, and overall risk scores and coronary-event rates decreased. The model of trends in 10-year coronary-event rates against risk scores and single risk factors showed a poor fit, but this was improved with a 4-year time lag for coronary events. The explanatory power of the analyses was limited by imprecision of the estimates and homogeneity of trends in the study populations.

Interpretation Changes in the classic risk factors seem to partly explain the variation in population trends in CHD. Residual variance is attributable to difficulties in measurement and analysis, including time lag, and to factors that were not included, such as medical interventions. The results support prevention policies based on the classic risk factors but suggest potential for prevention beyond these.

PMID: 10703799.

MONICA Publication 39

Tunstall-Pedoe H, Vanuzzo D, Hobbs M, Mähönen M, Cepaitis Z, Kuulasmaa K, Keil U, for the WHO MONICA Project.

Estimation of contribution of changes in coronary care to improving survival, event rates, and coronary heart disease mortality across the WHO MONICA Project populations.

Lancet, 2000 Feb 26, 355(9205):688–700.

Cardiovascular Epidemiology Unit, (MONICA Quality Control Centre for Event Registration), University of Dundee, Ninewells Hospital and Medical School, Dundee, UK

Background The revolution in coronary care in the mid-1980s to mid-1990s corresponded with monitoring of coronary heart disease (CHD) in 31 populations of the WHO MONICA Project. We studied the impact of this revolution on coronary end-points.

Methods Case fatality, coronary-event rates, and CHD mortality were monitored in men and women aged 35–64 years in two separate 3–4-year periods. In each period, we recorded percentage use of eight treatments: coronary-artery reperfusion before, thrombolytics during, and beta-blockers, antiplatelet drugs, and angiotensin-converting-enzyme (ACE) inhibitors before and during non-fatal myocardial infarction. Values were averaged to produce treatment scores. We correlated changes across populations, and regressed changes in coronary end-points on changes in treatment scores.

Findings Treatment changes correlated positively with each other but inversely with change in coronary end-points. By regression, for the common average treatment change of 20, case fatality fell by 19% (95% CI 12–26) in men and 16% (5–27) in women; coronary-event rates fell by 25% (16–35) and 23% (7–39); and CHD mortality rates fell by 42% (31–53) and 34% (17–50). The regression model explained an estimated 61% and 41% of variance for men and women in trends for case fatality, 52% and 30% for coronary-event rates, and 72% and 56% for CHD mortality.

Interpretation Changes in coronary care and secondary prevention were strongly linked with declining coronary end-points. Scores and benefits followed a geographical east-to-west gradient. The apparent effects of the treatment might be exaggerated by other changes in economically successful populations, so their specificity needs further assessment.

Comment in: *Lancet*, 2000, Feb 26, 355(9205):668–9.

PMID: 10703800.

MONICA Publication 40

Ingall T, Asplund K, Mähönen M, Bonita R, for the WHO MONICA Project

A multinational comparison of subarachnoid haemorrhage epidemiology in the WHO MONICA stroke study.

Stroke, 2000, May, 31(5):1054–1061.

Department of Neurology, Mayo Clinic, Scottsdale, Arizona, USA

Background and Purpose By official, mostly unvalidated statistics, mortality from subarachnoid haemorrhage (SAH) show large variations between countries. Using uniform criteria for case ascertain-

ment and diagnosis, a multinational comparison of attack rates and case fatality rates of SAH has been performed within the framework of the WHO MONICA Project.

Methods In 25- to 64-year-old men and women, a total of 3368 SAH events were recorded during 35.9 million person-years of observation in 11 populations in Europe and China. Strict MONICA criteria were used for case ascertainment and diagnosis of stroke subtype. Case fatality was based on follow-up at 28 days after onset.

Results Age-adjusted average annual SAH attack rates varied 10-fold among the 11 populations studied, from 2.0 (95% CI 1.6 to 2.4) per 100 000 population per year in China-Beijing to 22.5 (95% CI 20.9 to 24.1) per 100 000 population per year in Finland. No consistent pattern was observed in the sex ratio of attack rates in the different populations. The overall 28-day case fatality rate was 42%, with 2-fold differences in age-adjusted rates between populations but little difference between men and women. Case fatality rates were consistently higher in eastern than in western Europe.

Conclusions Using a uniform methodology, the WHO MONICA Project has shown very large variations in attack rates of SAH across 11 populations in Europe and China. The generally accepted view that women have a higher risk of SAH than men does not apply to all populations. Marked differences in outcomes of SAH add to the wide gap in the burden of stroke between east and west Europe.

PMID: 10797165.

MONICA Publication 41

Molarius A, Seidell JC, Sans S, Tuomilehto J, Kuulasmaa K, for the WHO MONICA Project.

Educational level, relative body weight, and changes in their association over 10 years: an international perspective from the WHO MONICA Project.

American Journal of Public Health, 2000, Aug, 90(8):1260–1268.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

Objectives This study assessed the consistency and magnitude of the association between educational level and relative body weight in populations with widely

different prevalences of overweight and investigated possible changes in the association over 10 years.

Methods Differences in age-adjusted mean body mass index (BMI) between the highest and the lowest tertiles of years of schooling were calculated for 26 populations in the initial and final surveys of the World Health Organization (WHO) MONICA (Monitoring Trends and Determinants in Cardiovascular Disease) Project. The data are derived from random population samples, including more than 42 000 men and women aged 35 to 64 years in the initial survey (1979–1989) and almost 35 000 in the final survey (1989–1996).

Results For women, almost all populations showed a statistically significant inverse association between educational level and BMI; the difference between the highest and the lowest educational tertiles ranged from -3.3 to 0.4 kg/m². For men, the difference ranged from -1.5 to 2.2 kg/m². In about two-thirds of the populations, the differences in BMI between the educational levels increased over the 10-year period.

Conclusion Lower education was associated with higher BMI in about half of the male and in almost all of the female populations, and the differences in relative body weight between educational levels increased over the study period. Thus, socioeconomic inequality in health consequences of obesity may increase in many countries.

PMID: 10937007.

MONICA Publication 42

Molarius A, Parsons RW, Dobson AJ, Evans A, Fortmann SP, Jamrozik K, Kuulasmaa K, Moltchanov V, Sans S, Tuomilehto J, Puska P, for the WHO MONICA Project.

Trends in cigarette smoking in 36 populations from the early 1980s to the mid 1990s: findings from the WHO MONICA Project.

American Journal of Public Health, 2001, 91(2):206–212.

MONICA Data Centre, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

Objectives This report analyses cigarette smoking over 10 years in populations in the World Health Organization (WHO) MONICA Project (to monitor trends and determinants of cardiovascular disease).

Methods Over 300 000 randomly selected subjects aged 25 to 64 years participated in surveys conducted in geographically defined populations.

Results For men, smoking prevalence decreased by more than 5% in 16 of the 36 study populations, remained static in most others, but increased in Beijing. Where prevalence decreased, this was largely due to higher proportions of never smokers in the younger age groups rather than to smokers quitting. Among women, smoking prevalence increased by more than 5% in six populations and decreased by more than 5% in nine populations. For women, smoking tended to increase in populations with low prevalence and decrease in populations with higher prevalence; for men, the reverse pattern was observed.

Conclusions These data illustrate the evolution of the smoking epidemic in populations and provide the basis for targeted public health interventions to support the WHO priority for tobacco control.

PMID: 11211628.

MONICA Publication 43

Evans A, Tolonen H, Hense HW, Ferrario M, Sans S, Kuulasmaa K, for the WHO MONICA Project.

Trends in coronary risk factors in the WHO MONICA Project.

International Journal of Epidemiology, 2001, 30(Suppl 1):S35–S40.

Department of Epidemiology and Public Health, The Queen's University of Belfast, Mulhouse Building, Belfast BT12 6BJ, Northern Ireland, UK

Background The World Health Organization (WHO) MONICA Project was established to determine how trends in event rates for coronary heart disease (CHD) and, optionally, stroke were related to trends in classic coronary risk factors. Risk factors were therefore monitored over 10 years across 38 populations from 21 countries in four continents (overall period covered: 1979–1996).

Methods A standard protocol was applied across participating centres, in at least two, and usually three, independent surveys conducted on random samples of the study populations, well separated within the 10-year study period.

Results Smoking rates decreased in most male populations (35–64 years) but in

females the majority showed increases. Systolic blood pressure showed decreasing trends in the majority of centres in both sexes. Mean levels of cholesterol generally showed downward trends, which, although the changes were small, had large effects on risk. There was a trend of increasing body mass index (BMI) with half the female populations and two-thirds of the male populations showing a significant increase.

Conclusions It is feasible to monitor the classic CHD risk factors in diverse populations through repeated surveys over a decade. In general, the risk factor trends are downwards in most populations but in particular, an increase in smoking in women in many populations and increasing BMI, especially in men, are worrying findings with significant public health implications.

PMID: 11759849.

MONICA Publication 44

Kulathinal SB, Kuulasmaa K, Gasbarra D. Estimation of an errors-in-variables regression model when the variances of the measurement errors vary between the observations.

Statistics in Medicine, 2002, Apr 30, 21(8):1089–1101.

Department of Epidemiology and Health Promotion, National Public Health Institute, Mannerheimintie 166, 00300 Helsinki, Finland

It is common in the analysis of aggregate data in epidemiology that the variances of the aggregate observations are available. The analysis of such data leads to a measurement error situation, where the known variances of the measurement errors vary

between the observations. Assuming multivariate normal distribution for the 'true' observations and normal distributions for the measurement errors, we derive a simple EM algorithm for obtaining maximum likelihood estimates of the parameters of the multivariate normal distributions. The results also facilitate the estimation of regression parameters between the variables as well as the 'true' values of the observations. The approach is applied to re-estimate recent results of the WHO MONICA Project on cardiovascular disease and its risk factors, where the original estimation of the regression coefficients did not adjust for the regression attenuation caused by the measurement errors.

PMID: 11933035.

MONICA Publication 45

Tolonen H, Mähönen M, Asplund K, Rastenyte D, Kuulasmaa K, Vanuzzo D, Tuomilehto J, for the WHO MONICA Project.

Do trends in population levels of blood pressure and other cardiovascular risk factors explain trends in stroke event rates? Comparisons of 15 populations in 9 countries within the WHO MONICA Stroke Project.

Stroke, 2002;33(10):2367–2375.

Department of Epidemiology and Health Promotion, National Public Health Institute, Mannerheimintie 166, 00300 Helsinki, Finland

Background and Purpose Previous studies have indicated a reasonably strong relationship between secular trends in classic cardiovascular risk factors and stroke incidence within single population. To what extent variations in stroke trends

between populations can be attributed to differences in classic cardiovascular risk factor trends is unknown.

Methods In the World Health Organization Monitoring of Trends and Determinants in Cardiovascular Disease (WHO MONICA) Project, repeated population surveys of cardiovascular risk factors and continuous monitoring of stroke events have been conducted in 35- to 64-year-old people over a 7- to 13-year period in 15 populations in 9 countries. Stroke trends were compared with trends in individual risk factors and their combinations. A 3- to 4-year time lag between changes in risk factors and change in stroke rates was considered.

Results Population-level trends in systolic blood pressure showed a strong association with stroke trends in women but there was no association in men. In women, 38% of the variation in stroke event trends was explained by changes in systolic blood pressure when the 3 to 4-year time lag was taken into account. Combining trends in systolic blood pressure, daily cigarette smoking, serum cholesterol, and body mass index into a risk score explained only a small fraction of the variation in stroke event trends.

Conclusions In this study, it appears that variations in stroke trends between populations can be explained only in part by changes in classic cardiovascular risk factors. The associations between risk factor trends and stroke trends are stronger for women than for men.

PMID: 12364723.

#87 MONICA Publications on the World Wide Web

1. WHO MONICA Project. MONICA Manual. (1998–1999). Available from URL: <http://www.ktl.fi/publications/monica/manual/index.htm>, URN:NBN:fi-fe19981146. MONICA Web Publication 1.
2. Mähönen M, Tolonen H, Kuulasmaa K, Tunstall-Pedoe H, Amouyel P, for the WHO MONICA Project. Quality assessment of coronary event registration data in the WHO MONICA Project. (January 1999). Available from URL: <http://www.ktl.fi/publications/monica/coreqa/coreqa.htm>, URN:NBN:fi-fe19991072. MONICA Web Publication 2.
3. Moltchanov V, Kuulasmaa K, Torppa J, for the WHO MONICA Project. Quality assessment of demographic data in the WHO MONICA Project. (April 1999). Available from URL: <http://www.ktl.fi/publications/monica/demoqa/demoqa.htm>, URN:NBN:fi-fe19991073. MONICA Web Publication 3.
4. Mähönen M, Cepaitis Z, Kuulasmaa K, for the WHO MONICA Project. Quality assessment of acute coronary care data in the WHO MONICA Project. (February 1999). Available from URL: <http://www.ktl.fi/publications/monica/accqa/accqa.htm>, URN:NBN:fi-fe19991081. MONICA Web Publication 4.
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#88 MONICA Memos

‘(a)’ or ‘Add’ after a memo number initially meant follow-up circulation of additional material or a correction. Memos were circulated very widely. Those restricted and confidential to MONICA investigators were later labelled ‘A’ after the number, while ‘E’ means that the memo was distributed primarily by e-mail and/or through the World Wide Web. Scanned images of most of the MONICA Memos are to be found in the scanned document archive on the second CD-ROM attached to this Monograph. Exceptions are copies of unpublished papers still considered confidential in December 2002.

Number	Date	Title	Number	Date	Title
1	21.02.83	Serum banks	27	06.02.84	Recommendation for research on the surveillance of the dietary habits of the population with regard to CHD
2	22.02.83	Quality assurance of monitoring of diseases	28	12.03.84	MONICA optional study on vitamins and CHD
3	15.03.83	Codes and ‘optional’ studies	29	02.04.84	MONICA data management
4	30.03.83	MONICA substudies—Environmental risk factors for cancer	30	11.05.84	Report of the MONICA PIs meeting, Geneva, 28 February–1 March 1984
5	30.03.83	Analysis of expired air carbon monoxide concentration	31	21.05.84	ECGs for coding with MONICA criteria
6	27.04.83	Validation of smoking trends with plasma/serum thiocyanate	31 Add 1	05.02.87	1985 ECG Test Set—explanatory letter
6(a)	17.05.83	The determination of thiocyanate in blood serum	32	14.05.84	Model codes for case histories
7	10.05.83	MONICA Steering Committee	33	23.05.84	MONICA data management
8	31.05.83	MONICA Steering Committee (report of MSC Meeting Helsinki, 9–10 February 1983; amendments to MONICA Protocol)	34	15.08.84	Surveillance of population dietary habits with regard to cardiovascular diseases
9	31.05.83	MONICA ECG Coding and Standardization	35	10.12.84	Official MONICA Project appendix listing MONICA sites and key personnel
10	31.05.83	Socioeconomic and behavioural factors (Section 14 of MONICA Protocol)	36	19.12.84	Minutes of MONICA SC/6 and SC/7 and report of US-CCSP liaison meeting
11	06.06.83	Monitoring administrative data of health services	37	25.01.85	Stability of lipids in frozen sera—a report to the MONICA Project
12	06.06.83	Annual progress report	38	25.01.85	MONICA Quality Control Centre for ECG coding, Budapest, 1984 activity report
13	22.07.83	Physical activity surveys	39	08.02.85	Reporting Units
13a	06.09.83	Indices of physical activity	40	25.02.85	Derivation of MONICA diagnostic categories
14	10.08.83	Drug monitoring in MONICA	41	08.03.85	Electrocardiographic coding for MONICA—A diagnostic algorithm and test code sequences
15	12.08.83	MONICA local manuals	42	08.03.85	Confidentiality of MONICA data
16	15.09.83	Drug monitoring in MONICA	43	25.03.85	MONICA Annual Reports
17	27.09.83	Meeting of MONICA Principal Investigators (timing, manuals, test case histories, population descriptions)	44	06.05.85	Test case histories 1985 series
18	04.10.83	Sample case histories for test coding	45	15.05.85	Monitoring of other chronic diseases within the MONICA Project
19	04.10.83	Local MONICA manuals (checklist, choice of ICD codes to be selected for screening from hospital discharge records)	46	07.06.85	Plan for MONICA data collection documents
20	20.10.83	Specimen case histories (sudden death)	47	07.06.85	Dr Chambless’ report of his visit to the MDC in April 1985
21	26.10.83	Minutes of Second MONICA Steering Committee, Liège, Belgium, 8–9 September 1983	48	27.06.85	Coding exercise on test case histories, second series (coronary events, acute coronary care and stroke events)
22	10.11.83	Monitoring of radical scavenging vitamins in MONICA	49	28.06.85	Description of data collection procedures for the MONICA Project (draft)
23	09.12.83	Includes: list of MONICA centres, information on Meeting of PIs 1984, possible myocardial infarction, manuals, coding, pooling records	50	06.07.85	Sample selection description (including questionnaire)
24	16.01.84	MONICA data management	50 Add 1	31.10.85	Responses received to MNM 50
25	16.01.84	Draft pooling record—acute coronary care	51	09.07.85	Descriptive presentation of data from the WHO MONICA Project (survey data and event registration data)
26	18.01.84	Classification of drugs in the MONICA Project			

Number	Date	Title	Number	Date	Title
52	26.07.85	Organization and management of the WHO MONICA Project	80	25.09.86	Report of MONICA Steering Committee 10
53	06.08.85	MONICA Collaborating Centres and Reporting Units	81	05.09.86	Analysis of expired air carbon monoxide concentration
54	07.08.85	Transfer of demographic and mortality data	82	02.09.86	MONICA Collaborative Publication
55	12.08.85	MONICA Annual Reports (up to June 1985)	83	17.09.86	MONICA Optional Studies on Physical Activity
56	16.08.85	Annual Hospital Enzyme Use Reporting Form	84	17.09.86	Quality Control Activities in the MONICA project
56 Add 1	18.08.85	Set of Forms	85	03.10.86	Material Shipment from the MCCs to the MDC and the Use of Problem Communication Forms
57	02.12.85	Revised Coronary Event and Acute Coronary Care Record Formats and Specific Instructions	86	03.10.86	Preparation of Magnetic Tapes
58	27.02.86	Reports on MONICA Meeting of Principal Investigators and MONICA Steering Committee, Helsinki and Porvoo, August 1985	87	10.12.86	Annual Reports 1985/1986
59	15.04.86	Report on Test Case Histories 1985 Series—Coronary Events	88	15.12.86	Stroke Case Histories for Coding
60	27.09.85	Autopsy Studies	88 Corr 1	19.02.87	Stroke Case Histories for Coding—test case history form stroke events (Form M)
61	18.12.85	MONICA Collaborating Centres and Reporting Units	89	18.12.86	Monitoring of Medical Care in MONICA
62	25.01.86	MONICA Optional Studies Report	90	22.01.87	Results of 1986 Coronary-Event Coding Exercise
63	06.02.86	Transfer of Event Registration and Population Survey Data to the MONICA Data Centre	91	23.01.87	MONICA Manual (explanatory letter)
64	07.02.86	Annual Hospital Enzyme Use Reports	92	12.02.87	Optional Study Meeting on Physical Activity, 8 April 1987
65	06.03.86	Quality Control of ECG Measurements	93	22.02.87	ECG Coding Seminar, Budapest, 30 March–3 April 1987
65 Add 1	07.04.86	Minnesota Code Learning Packets and Answer Sheets (no longer available)	94	05.03.87	Results of the 1986 ECG Test Coding
66	14.03.86	Test Case Histories (Coronary Events) 1986 series	95	09.03.87	Evaluation of Quality Control
66 Add 1	22.07.86	Compliance Report on Test Case Histories (Coronary Events), 1986 Series	96	11.03.87	Optional Study Meeting—EURONUT-MONICA: Surveillance of Dietary Habits of the Population with regard to Cardiovascular Diseases
67	04.07.86	Electrocardiographic Coding for the MONICA Project	97	22.03.87	Management Reports to MONICA Council of Principal Investigators
68	20.03.86	Site Visit Procedures	98	23.03.87	MONICA Optional Study Meetings, Berlin, 8 April 1987
69	21.04.86	Standard Population for the MONICA Project	99	24.06.87	New Genetic Risk Factors for Coronary Heart Disease: Proposal for a Case Control and Family Study
70	21.04.86	Berlin PIs Meeting, 6–11 April 1987	100	02.08.87	MONICA physical activity questionnaire
71	21.04.86	2nd International MONICA Congress, August 1987	101	12.02.88	MONICA Key Sites and Personnel—request for update
71 Corr 1	04.07.86	2nd International MONICA Congress, August 1987	102	31.07.87	1986/87 MONICA Annual Reports
72	23.05.86	Electrocardiogram Test Set	103	04.08.87	WHO Lipid Reference Programme—Attempt to Standardize Dry Chemistry Cholesterol Method
73	29.05.86	Dr Heinemann's visit to IARC, May 1986	104	14.08.87	Coronary-Event Data and Population Survey Data Edit Specifications
74	04.07.86	MONICA Diagnostic Algorithm—Coronary Events	105	28.08.87	1987 Test Set of Electrocardiograms for Standardized Coding
75	19.06.86	Annual Reports 1985/86	105 Add	02.10.87	1987 Test Set of Electrocardiograms for Standardized Coding
76	04.07.86	Revised Population Survey Data Transfer Formats	106	09.09.87	Call for research workers to assist MDC in analysis and preparation of data reports
77	04.07.86	Draft Edit Specifications for Coronary-Events Data	107	28.10.87	Changes in administrative structure of the MONICA Data Centre
78	17.07.86	MONICA Data Collection Forms	108	28.10.87	Minutes of the 4th Council of Principal Investigators, Berlin, GDR, 9–11 April 1987
79	28.07.86	Revised Stroke Event Data Transfer Formats	109	–,–,–	Not issued
79 Corr 1	25.09.86	Revised Stroke Event Data Transfer Formats—enclosing revised page 17/18			

Number	Date	Title	Number	Date	Title
110	28.10.87	Test Case Histories—Coronary Events 1987 series	137	10.08.88	Meeting of MONICA Principal Investigators, Augsburg: Proposal for Monitoring of Medical Care in MONICA
111	28.10.87	Acute Coronary Care	138	–,–,–	Not issued
112	12.11.87	Confidential Distribution of MONICA Memos	139	–,–,–	Not issued
113A	23.11.87	Copies of Transparencies presented at the 2nd MONICA Congress, Helsinki, 14–15 August 1987	140	10.08.88	New Questions for the Core Data Transfer Format: Population Survey Data
114	23.11.87	Data checking system for the MONICA data	141	12.08.88	Status of Acute Coronary Care Data Transfer to MDC
115	04.12.87	Optional Study: Physical Activity	142	30.08.88	MONICA Council of Principal Investigators: Optional Study Meeting on Nutrition
116	11.12.87	Use of electronic mail	143	31.08.88	MONICA Council of Principal Investigators: Discussion Paper for Monitoring of Medical Care in MONICA
117	17.12.87	Coronary and stroke procedure questionnaire	144	19.09.88	Management Reports to the MONICA Council of Principal Investigators
118	–,–,–	Not issued	145A	20.09.88	Corrections for Draft Baseline Population Survey Data Book
119	11.01.88	Call for stroke case histories	146	20.09.88	Proposed revision of MONICA Manual Section 3
120	11.02.88	Possible study of heart disease and risk factors in migrants	147	12.10.88	New telephone numbers and postal code at the MONICA Data Centre
121	15.02.88	5th MONICA Pls' meeting, Augsburg, 1988—accommodation request form.	148A	26.10.88	Assessing Trends in Coronary Heart Disease Mortality and Morbidity: The MONICA Project
122	03.03.88	Draft Agenda for Augsburg Pls' meeting 1-3 October 1988	149	14.11.88	Issues relating to the monitoring of Stroke
123	03.03.88	Information to authors and for Principal Investigators on the preparation of the Acta Medica Scandinavica	150A	05.12.88	MONICA Articles for clearance
124A	28.03.88	Draft manuscript on collaborative MONICA Risk-Factor Data to be published in the World Health Statistics Quarterly, September 1988	151	05.12.88	MONICA Publications: WHSQ and Congress Proceedings
125	11.03.88	Cumulative list of MONICA publications	152	05.12.88	Study of Heart Disease and Risk Factors in Migrants: Results of Survey
126	11.03.88	New mortality statistics reporting forms	153	16.01.89	3rd MONICA Congress Nice 15–16 September 1989
127	15.04.88	MONICA Optional Study on the Surveillance of Dietary Habits	154(i)	18.01.89	1988 ECG Test Set (i) 25 mm/sec
128	11.05.88	Optional Study of Physical Activity: (Questionnaire of Dr K. Powell)	154(ii)	18.01.89	1988 ECG Test Set (ii) 50 mm/sec
129	19.05.88	Assessment of Medical Care in MONICA: Availability of Routinely Collected Hospital Data. (Questionnaire of Professor M. Hobbs)	155	06.02.89	Physical Activity Optional Study—Visit of Dr Carl Casperson to Europe
130	06.06.88	5th Council of MONICA Principal Investigators, Augsburg, FRG—finalized programme	156	25.02.89	MONICA Annual Reports 1987–88
131	15.06.88	MONICA Optional Study on Physical Activity—meeting to be held on 1 October in Augsburg	157	25.02.89	MONICA Manual Version 2—Preliminary Order Form
132A	04.07.88	Draft Baseline Population Survey Data Book	158	17.03.89	Changes to telephone, telex and telefax numbers at the MDC
133	01.08.88	MONICA Council of Principal Investigators—Travel to Augsburg from Munich and Frankfurt Airports	159	01.05.89	1989 Stroke Case Histories for Coding
134	01.08.88	MONICA Optional Study on Genetics	160	01.05.89	1989 Coronary-Event Case Histories for Coding
135	01.08.88	MONICA Council of Principal Investigators 1988: Workshop on Internal Quality Control—Survey	160 Add	14.06.89	Coronary case histories for coding—Form L
136	10.08.88	Meeting of MONICA Principal Investigators, Augsburg: Workshop on Coding of Stroke Events (Item 9b of Agenda)	161A	04.12.89	Methods of total cholesterol measurements in the baseline survey
			162A	13.06.89	Quality Assessment of Blood Pressure Measurements in the First Surveys of the WHO MONICA Project
			163	11.07.89	Suggested Revision to MONICA Manual Section 3: Additional Survey Questions
			164A	13.07.89	World Health Statistics Annual 1989
			165	28.07.89	Third MONICA Congress, Nice, 15–16 September 1989: Programme

Number	Date	Title	Number	Date	Title
166	28.09.89	MONICA Presentations in Nice, September 1989	185	22.03.90	Atherosclerosis in Selected European Regions (ASER Project)—Outline of a study proposed by MONICA-France.
167	28.09.89	Instructions for the preparation of publications after the 3rd MONICA Congress	186	06.04.90	Schedules of MONICA Meetings, Lugano, 26 April–2 May 1990
168	22.09.89	MONICA Data Centre—new telephone and telefax numbers	187A	05.04.90	Quality Assessment of Blood Pressure Measurements in Epidemiologic Surveys
169	18.10.89	6th Council of MONICA Principal Investigators, Lugano, Switzerland, 26 April–2 May 1990—preliminary information, draft agenda and accommodation reservation form	188	06.04.90	WHO MONICA Project: 1990 Mid-term Review
169 Add	03.11.89	6th Council of MONICA Principal Investigators—hotel categories and prices	189	06.04.90	Global MONICA Network
170	24.10.89	Assessment of Medical Care in MONICA: Annual Structural Medical Care Assessment	190	25.06.90	Advocacy of CVD Prevention
171	31.10.89	Vacancy for an Epidemiologist in the MONICA Data Centre	191	03.08.90	Questionnaire on Global MONICA Network
172	29.11.89	Proposed Teleconference following the MONICA Council of Principal Investigators in Lugano	192	06.12.90	Timing of the 3rd MONICA Survey
173A	11.02.90	Coronary Event Registration Quality Assessment Report	193	07.12.90	MONICA Population Survey Data Component
174	13.02.90	WHO MONICA presentations at the Regional European Meeting of the International Epidemiological Association, “Epidemiological Evaluation of the Strategy Health for All”, Granada, Spain, 14–16 February 1990.	194	12.12.90	MONICA Optional Study of Haemostatic Factors and CHD
175A	14.02.90	Quality Assessment of Total Cholesterol Measurements in the first surveys of the MONICA Project	195	14.12.90	MONICA Publications Plan and Priorities
176A	12.03.90	Quality Assessment of Smoking Data in the first surveys of the WHO MONICA Project	196	11.12.90	Proposed Training Video for the 3rd Survey
177	15.02.90	Eligibility of MCCs for publication of Coronary-Event Data	197	01.03.91	Report of the 6th Meeting of Principal Investigators, Lugano, Switzerland, 30 April–2 May 1990
178A	16.02.90	MONICA Baseline Population Survey Data Book	198	14.03.91	Proceedings 3rd MONICA Congress—RESP Contents List
179A	02.03.90	MONICA Coronary Event Registration Data Book—1980–86	198 Add 1	29.04.91	Erratum to above
179A(Add)	02.03.90	Annex II to Coronary Event Registration Data Book: Distribution limited to MSC, SAG, and those who prepared the document. MCCs to receive their own data direct from MDC.	199(i)	18.04.91	1991 Test Set of Electrocardiograms for Standardized Coding: 25 mm/sec paper speed
180	08.03.90	Update: Satellite Teleconference on Cardiovascular Diseases	199(ii)	18.04.91	1991 Test Set of Electrocardiograms for Standardized Coding: 50 mm/sec paper speed
181	09.03.90	Third MONICA Survey	200	22.04.91	7th Council of MONICA Principal Investigators, Barcelona, 1992
182	14.03.90	MONICA Publications Priorities	201	01.05.91	MONICA Data Centre—new telephone and telefax numbers
183A	15.03.90	Ecological Analysis of the Relationship between Mortality Data and Major Risk Factors of Cardiovascular Disease: paper for clearance	202A	11.10.92	Draft report—HDL-Cholesterol (HDL-CH)
184	19.03.90	Report of the 5th Meeting of MONICA Principal Investigators, Augsburg, FRG, 3–5 October 1988	203	14.10.91	Health Services Reporting Forms
			204	16.10.91	Schedule of meetings for remaining years of MONICA
			205	12.11.91	Stroke Case Histories for Coding, 1991
			206	15.11.91	Coronary Case Histories for Coding, 1991
			205/6 Add	12.02.92	Coronary Case Histories for Coding 1991, electronic transfer
			207	17.01.92	7th Council of MONICA Principal Investigators, Barcelona, Spain, 24–29 August 1992
			208	20.01.92	Atherosclerosis in Selected Regions: The ASER Project
			209A	30.01.92	Quality Assessment of Smoking Data in the First Survey of the WHO MONICA Project
			210A	30.01.92	Assessment of Blood Pressure Measurement in the Baseline Surveys of the WHO MONICA Project
			211A	03.02.92	Stroke Event Registration Quality Report

Number	Date	Title	Number	Date	Title
212A	03.02.92	Draft Stroke Event Registration Data Book 1982–1987	233	23.11.92	MONICA Collaborative Publications
213	06.02.92	Presentation of MONICA Coronary Events in Amsterdam in August 1991	234	11.12.92	Preliminary information concerning the organization of a Training Seminar on 3rd MONICA Survey Methods
214	04.05.92	MONICA Manual, Part III, Section 1—Population Survey Data Component: Revision, March 1992	235	14.12.92	Call for Investigators to analyse the MONICA 2nd Survey data
215	06.05.92	MONICA Manual, Part V, Section 1—Data Transfer to the MONICA Data Centre: Revision, March 1992	236	18.12.92	Instruction Manual of MONICA Quality Control Summary Report
216	08.05.92	Medical Services Reporting Forms—UA, UB, UC, UD	237	29.12.92	MONICA Core Data Edit Specifications
217A	22.05.92	Quality of Stroke Subtype Data in the MONICA Stroke Event Registration	238A	26.02.93	Minutes of MONICA Steering Committee Telephone Conferences of 15 October and 16 December 1992
218A	24.06.92	Interim Report: Blood Pressure Measurement Quality in the Second Surveys of the MONICA Project	239	14.05.93	Report on the Training Seminar on 3rd MONICA Survey Methods, Gargnano, Italy, 7–12 March 1993
219A	03.07.92	Coronary-Event Registration—Documents for MONICA Principal Investigators' meeting, Barcelona, August 1992	240A	17.05.93	Minutes of MONICA Steering Committee Telephone Conferences of 11 February and 4 March 1993
220A	03.07.92	Workshop on Health Services in MONICA Populations—Documents for MONICA Principal Investigators' Meeting, Barcelona, August 1992	241A	26.05.93	Abstracts of MONICA presentations
221A	14.07.92	Workshop on Population Surveys (Documents for 7th Council of MONICA Principal Investigators, Barcelona, 24–29 August 1992)	242A	25.06.93	Acute coronary care data (covering letter)
222A	14.07.92	Workshop on Stroke—Documents for 7th Council of MONICA Principal Investigators, Barcelona, 24–29 August 1992	242A(a)	28.06.93	Acute coronary care data—Quality Assessment Report
223	14.07.92	Workshop on Methodological Issues—Documents for 7th Council of MONICA Principal Investigators, Barcelona, 24–29 August 1992	242A(b)	28.06.93	Acute coronary care data—Quality Assessment Report for longitudinal data
224	14.07.92	Schedules of MONICA Meetings, Barcelona, 24–29 August 1992	242A(c)	28.06.93	Draft data book for cross-sectional comparisons of data on acute coronary care
225	24.07.92	Errors in MONICA Risk-Factor Slides	242A(d)	28.06.93	Draft data book for preliminary longitudinal analyses on acute coronary care
226	23.07.92	Studies in the Elderly	243	16.07.93	Updating of MONICA Manual appendices
227A	16.09.92	Assessment of the Quality of Demographic Data in the WHO MONICA Project	244	23.07.93	MONICA publication rules
228	30.09.92	Management Report of the MONICA Quality Control Centre for Event Registration, Dundee and Reports on Test Case History Exercises 1991–1992	245	26.07.93	8th Council of MONICA Principal Investigators, Udine, Italy, week of 18 April 1994
229	26.10.92	Interrelationship between Arterial Blood Pressure and Serum Lipids Across Populations	246A	23.08.93	Myocardial infarction and coronary deaths in the World Health Organization MONICA Project: Registration procedures, event rates and case fatality in 38 populations from 21 countries in 4 continents
230	23.10.92	Membership, Working Group on Epidemiology and Prevention, European Society of Cardiology	247A	16.09.93	Quality assessment of smoking data in the 2nd survey
231	06.11.92	MONICA Participation at IEA Conference, Sydney, Australia, 26–29 September 1993	248A	16.09.93	Age and date of examination in the first and second survey
232A	16.11.92	Action List from the 7th Council of MONICA Principal Investigators, and Minutes of 24th MONICA Steering Committee	249	03.12.93	8th Meeting of MONICA principal investigators Udine, Italy 18–22 April 1994
			250(ii)	03.12.93	1993 test set of electrocardiograms for standardized coding 50 mm/sec paper speed
			250(i)	03.12.93	1993 test set of electrocardiograms for standardized coding 25 mm/sec paper speed
			251	06.12.93	Presentation of slides at 3rd International Conference on Preventive Cardiology, Oslo, 27 June–1 July 1993
			252A	17.12.93	Quality assessment of HDL-cholesterol measurements in the first surveys of the WHO MONICA Project

Number	Date	Title	Number	Date	Title
253A	17.01.94	Quality assessment of data on marital status and educational achievement in the first survey of the MONICA Project	280A	06.09.94	Article on diagnostic procedures and management of stroke
254A	26.01.94	Minutes of MONICA Steering Committee Telephone Conferences 33–38	281A	20.10.94	Minutes of MONICA Steering Committee telephone conferences 41–43
255	11.02.94	8th Council of MONICA principal Investigators, Udine, Italy, 18–23 April 1994	282	01.11.94	MONICA publications policy (MONICA Manual Part I, section 2)
256	11.02.94	Local arrangements for 8th council of MONICA principal investigators Udine, Italy, 18–23 April 1994	283A	21.11.94	Xth International Symposium on Atherosclerosis, Montreal 9–14 th October 1994: slides and abstract of presentation on risk factor trends
257A	24.02.94	Quality assessment of coronary event data for 1980–1990	284A	12.01.95	Quality assessment of weight and height measurements in the first and second MONICA survey
258A	01.03.94	Stroke incidence, mortality, and case-fatality in the WHO MONICA Project	285A	27.01.95	Smoking Questionnaire: Professor Constance Nathanson
259A	01.03.94	Participation rate and the quality of sampling frame in the first and second risk-factor surveys of the WHO MONICA project	286	17.02.95	Coronary event registration quality control—reminder
260A	01.03.94	Second Population Survey Data Book	287A	10.05.95	Non-fatal possible myocardial infarction—a classification problem in epidemiological studies
261	04.03.94	MONICA streamlined publication plan	288A	06.05.95	Minutes of MONICA Steering Committee Telephone Conferences 44–48
262	04.03.94	MONICA Data Centre—new telephone and telefax numbers	289A	15.05.95	Submission to the European Commission for funding for the MONICA project
263A	07.03.94	Gender differences in IHD mortality and risk factors in 43 communities: an ecological analysis	290A	22.05.95	Stroke publication
264	24.03.94	Working documents for CPI-8	291A	05.06.95	Assessment of blood pressure measurement quality in the baseline surveys of the WHO MONICA Project
265A	16.03.94	Coronary case histories for coding 1994	292A	25.08.95	Changes in cigarette smoking among adults in 35 populations during the 1980s
266	21.03.94	Minutes of 25th MONICA Steering Committee, 15–17 June 1993	293	12.10.95	MONICA and the Internet
267	21.03.94	The WHO MONICA publications plan for centrally generated publications	294A	03.11.95	Smoking and relative body weight: An international perspective from the WHO MONICA project
268A	28.03.94	Minutes of MONICA Steering Committee telephone conferences 39–40	295(a)	10.11.95	“Life after MONICA”
269	5.04.94	Draft strategic plan for MONICA; Section 3.5 Constraints and Solutions	295(b)	10.11.95	“Life after MONICA”
270	28.04.94	Report of the 7th Meeting of MONICA Principal Investigators Barcelona, Catalonia, Spain, 24–29 August 1992	296A	12.02.96	Draft stroke event registration data book 1982–90
271	02.05.94	A study of baseline risk factors for coronary heart disease: results of population screening in a developing country	297A	15.02.96	Quality assessment of blood pressure measurements in the 1st and 2nd MONICA surveys
272	05.05.94	List of MONICA Memos	298A	04.04.96	Cigarette smoking and official mortality release of data to MCC 11: Newcastle
273	20.05.94	Abbreviations of MONICA population names	299A	26.04.96	Quality assessment of total cholesterol measurements in the first and middle surveys of the WHO MONICA Project
274	30.05.94	ARIC Study and NHLBI activities	300A	03.05.96	Quality assessment of data on waist and hip circumference in the second survey
275	02.06.94	MONICA Annual Reports 1993–1994	301A	10.05.96	Quality assessment of data on marital status and educational achievement in the second survey of the WHO MONICA project
276A	20.06.94	Coronary Event Registration Data Book 1980–90	302A	24.05.96	Assessment of the quality of demographic data in the WHO MONICA project
277A	23.06.94	Quality assessment of stroke event data for 1982–1990	303	25.06.96	Standardization of total cholesterol determinations in MONICA
278	24.06.94	Reports of workshops and optional studies at the 8th Council of MONICA Principal Investigators, Udine, Italy, 19–23 April 1994			
279(A)	24.08.94	Presentation of slides in the conference on epidemiology and prevention of stroke, Umeå, Sweden 29–31 May 1994			

Number	Date	Title	Number	Date	Title
304A	03.06.96	Quality assessment of the data on hypertension control in the first and second population surveys of the WHO MONICA Project	327A	10.06.97	Quality assessment of data on blood pressure in the WHO MONICA Project
305	01.07.96	CVDs and alcohol consumption	328A	27.06.97	Participation rates, quality of sampling frames and sampling fractions in the MONICA surveys
306	01.07.96	MONICA in Internet	329A	17.06.97	Quality assessment of data on marital status and educational achievement in the WHO MONICA Project
307A	01.07.96	Internal MONICA pages on the World Wide Web	330	17.07.97	9 th Council of MONICA Principal Investigators, draft programme
308A	26.08.96	Stroke trends in the WHO MONICA Project	331	17.07.97	9 th Council of MONICA Principal Investigators, future governance of MONICA
309	30.08.96	9 th Council of MONICA Principal Investigators	332	17.07.97	9 th Council of MONICA Principal Investigators, certificates of good service
310A	10.09.96	Future of MONICA data base	333A	17.07.97	9 th Council of MONICA Principal Investigators, future of the MONICA data base
311	16.09.96	MONICA Data Centre: new telephone and telefax numbers	334A	25.07.97	MONICA Steering Committee telephone conferences 58–66: action lists
312	16.09.96	Life after MONICA	335A	28.08.97	Quality assessment of data on hypertension control in the WHO MONICA Project
313A	02.10.96	Presentation of slides at the 18th Congress of the European Society of Cardiology, Birmingham, 25–29 August 1996	336A	25.08.97	MONICA publications plan (memo includes only about half of the publication plan)
314	14.11.96	Manuscript groups for papers on ten-year trends	336 Add	17.09.97	MONICA publications plan
315	18.11.96	Stroke incidence and mortality correlated to stroke risk factors in the WHO MONICA Project: an ecological study of 18 populations	337	25.08.97	MONICA publications and internal reports
316	26.11.96	9 th Council of MONICA Principal Investigators, Milan, 28 September–1 October 1997	338A	01.09.97	Quality assessment of coronary event registration data in the WHO MONICA Project
317A	02.12.96	Smoking Cross-Sectional Paper—Second Survey: Release of data to MCC 34: Belfast MONICA	339A	03.09.97	Coronary event registration data book 1980–1995
318	20.12.96	Updated list of MONICA Collaborating Centres	340A	12.09.97	Quality assessment of stroke event registration data in the WHO MONICA Project
319A	14.01.97	Large blood pressure differences are found between the populations of the WHO MONICA Project	341A	12.09.97	WHO MONICA Project. Stroke event registration data book 1982–1995
320A	24.01.97	Draft manuscript of Changes in Estimated Coronary Risk in 1980s: Data from 38 populations in the WHO MONICA Project	342A	04.09.97	2nd application to BIOMED
321A	14.02.97	Population versus clinical view of case fatality from acute coronary heart disease: results from the WHO MONICA Project 1985–1990.	343	09.09.97	Proposal to modify publication rules (MONICA Manual I.2.7)
322A	28.02.97	Subtypes of stroke: international comparisons possible? Observations in 13 populations in the WHO MONICA Project	344A	19.09.97	Quality assessment of acute coronary care data in the WHO MONICA Project
323A	17.03.97	Quality assessment of HDL-cholesterol measurements in the first and middle surveys of the WHO MONICA Project	345A	19.09.97	WHO MONICA Project. Acute coronary care data book: 1981–1995
324A	26.03.97	Age, date of examination and survey periods in the MONICA surveys	346A	16.09.97	Second meeting of EARWIG one: MONICA main results manuscript group
325A	04.04.97	Quality assessment of data on smoking behaviour in the WHO MONICA Project	347A	29.09.97	Waist and hip circumferences and waist-hip ratio in 19 populations of the WHO MONICA Project
326A	23.05.97	Quality assessment of weight and height measurements in the WHO MONICA Project	348	07.10.97	MONICA Annual Reports: 1996–1997
			349	29.10.97	Global prevention and control of cardiovascular diseases: resolution adopted at CPI9
			350	21.11.97	Stroke monitoring
			351	21.11.97	Addresses of MONICA Collaborating Centres

Number	Date	Title	Number	Date	Title
352A	08.12.97	Subarachnoid haemorrhage in MONICA Release of stroke data to MCC 60: Northern Sweden/STRAG	371A	26.01.99	Election of members of MCCs to the MONICA Steering Committee: Proposed modification of procedures for counting postal votes
353A	18.12.97	MONICA sessions at the 4th International Conference on Preventive Cardiology, Montreal, Canada, 29 June–3 July 1997	372A	27.01.99	Call for nominations for new MSC Member
354	20.01.98	For information, new telephone numbers of MDC	373	16.02.99	MONICA at IEA XV Scientific Meeting
355A	06.02.98	Myocardial infarction and coronary deaths in the WHO MONICA Project 1985–90: How trends in male and female incidence, population case-fatality and mortality relate across 40 populations	374A	01.03.99	Quality assessment of data on HDL-cholesterol in the WHO MONICA Project
356A	05.03.98	Quality assessment of data on waist and hip circumferences in the WHO MONICA Project	375A	15.03.99	How trends in survival and coronary-event rates contribute to changing coronary heart disease mortality: ten-year results from 37 WHO MONICA Project populations
357A	29.04.98	Varying sensitivity of waist action levels to identify subjects with overweight or obesity in 19 populations of the WHO MONICA Project	375A	25.03.99	How trends in survival and coronary-event rates contribute to changing coronary heart disease mortality: ten-year results from 37 WHO MONICA Project populations
358A	29.04.98	MONICA Manual Part I, Section 2: Organization and Management of the WHO MONICA Project	Add1		
359A	17.07.98	Quality assessment of demographic data in the WHO MONICA Project	376A	16.03.99	Trends in cigarette smoking in 36 populations from the early 1980s to the mid 1990s: findings from the WHO MONICA Project
360A	27.07.98	MONICA symposium at the European Society of Cardiology Working Group on Epidemiology and Prevention Scientific Meeting, Shannon, Ireland, 14–17 May 1998.	377	21.04.99	Result of MONICA Steering Committee Elections—1999
361A	27.07.98	MONICA events at the European Congress of Cardiology, Vienna, Austria, 22–26 August 1998	378	27.05.99	MONICA Workshops at IEA satellite symposium in Rome, 6–7 September 1999
362A	20.08.98	Quality assessment of total cholesterol measurements in the WHO MONICA Project	379A	06.09.99	Sampling frames and response rates for heart disease risk-factor surveys: the experience of the WHO MONICA Project
363A	02.11.98	Relationship between abdominal obesity and dyslipidemia in various populations. Release of data to MCC50: Switzerland	380A	16.09.99	WHO MONICA Project Monograph
364A	23.11.98	Endorsement of changes to MONICA Manual	381A	27.09.99	A multinational comparison of subarachnoid haemorrhage epidemiology in the WHO MONICA stroke study
365	18.12.98	Newsletter	382A	03.11.99	Major MONICA manuscripts for approval as soon as possible: MONICA first and second hypotheses
366A	12.01.99	Educational level and relative body weight, and changes in their association over 10 years—an international perspective from the WHO MONICA Project	383A	20.12.99	Total serum cholesterol in relation to age, body mass index and gender: a multinational comparison
367A	12.01.99	Quality assessment of data on menopausal status and hormones in the WHO MONICA Project	384A	15.02.00	The global burden of coronary heart disease and stroke: release of MONICA data to the MMC for inclusion in the World Health Report 2000
368A	12.01.99	Quality assessment of data on awareness and treatment of high cholesterol in the WHO MONICA Project	385	24.03.00	Au revoir—Auf wiedersehen!
369A	12.01.99	Variation between populations in the management of myocardial infarction: what the WHO MONICA Project showed in 1989	386E	15.12.00	MONICA Memoranda revived
370A	18.01.99	Quality assessment of data on use of aspirin in the WHO MONICA Project	387E	15.12.00	MONICA Monograph (Updated Proposal)
			388E	29.08.01	Manuscripts on 10-year trends in stroke for approval for publication
			389E	30.08.01	MONICA posters at the ESC XXIII Congress
			390E	16.11.01	Manuscript on current smoking and the risk of non-fatal myocardial infarction for approval for publication
			391E	07.02.02	MONICA manuscripts for approval for publication
			392E	19.03.02	Postponement of elections of MSC members

Number	Date	Title	Number	Date	Title
393E	16.04.02	MONICA Monograph and Multimedia Sourcebook	398E	09.10.02	Call for nominations for members for the MSC for a five years period
394E	07.05.02	Future Management of the MONICA Project	399E	06.11.02	Postal ballot for the election of a new MSC
395E	07.05.02	MONICA Monograph about to go to the WHO Editor	400E	04.12.02	Results of MONICA Steering Committee elections-2002
396E	10.06.02	Manuscript on trends in the management of myocardial infarction for approval for publication	401E	10.12.02	Manuscript on the relationship between total cholesterol, age and body mass index for approval for publication
397E	22.08.02	Manuscript on trends in stroke and coronary heart disease for approval for publication			