

European Competence Criteria for Epidemiology

A Discussion Document

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Report of the Working Group on European Competence Criteria for Epidemiology (WG-ECCE) for the European Group of the International Epidemiological Association.

Address for correspondence:

Prof.dr. Gerhard A. Zielhuis (chairman)

Department of Epidemiology

P.O. Box 9101

NL-6500 HB Nijmegen

The Netherlands

Fax: +31-24-3613505

E-mail: G.Zielhuis@mie.kun.nl

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1. Background

The increasing amount of epidemiological research and the increasing number of epidemiologists have raised the issue of criteria for competence of epidemiological professionals in several European countries. Members of IEA and other epidemiologists are concerned about the potential misuse of the term "Epidemiologist" and have raised questions about competence criteria for epidemiology and certification of epidemiologists. The term "Epidemiologist" should only be used to characterise individuals and employees who possess appropriate theoretical knowledge and practical skills in epidemiology.

In addition, institutes who organise courses and teaching programmes in epidemiology ask for accreditation within the framework of epidemiology training in Europe.

As early as in 1995 the board of the IEA-European Group has put the issue of competence criteria, certification and accreditation on the agenda of IEA-Europe. The activities and developing insights since then can briefly be summarised as follows:

- A first orientation on the topic of training and certification was held at the IEA-regional conference in The Hague, August 1995. Major conclusions were:

- there are large differences between European countries in demands and opportunities for training in epidemiology; formal requirements are absent in most countries

- there is a strong development of epidemiology and density of professionals all over Europe; much need for courses and training programmes is noticed

- there was mutual understanding that experiences with epidemiology training should be discussed at the level of the IEA-European Group; combined efforts for courses and training programmes should be encouraged

- there is a need for continuation of the debate on these issues.

- A second orientation on this topic was held at the IEA-regional conference in Münster, September 1997. There was/were:

- a presentation of a Dutch proposal on qualification criteria for epidemiologists

- a basic discussion on the necessity of formal certification for all epidemiologists without definite conclusions

- apparent differences in national epidemiological cultures; epidemiology in some countries is embedded in public health, in others in medicine at large, in biostatistics, or in social sciences. A discussion on the definition of epidemiology illustrated the variety in national background

- agreement that international harmonisation on this topic is needed, forced by internationalisation of labour market, EU-regulations and international courses/programmes.

- a proposal, with a view to harmonisation, that an inventory should be made of MSc and PhD programmes for epidemiology in all European countries

- definite consensus that the IEA-Europe Group should co-ordinate further activities in close co-operation with European training centres.

- At a third workshop in the EA-regional conference in Bordeaux, September 1998, a discussion paper with pro's and con's was discussed, leading to the following conclusions:

- By then there was some agreement that certification of epidemiologists on a national level could be worthwhile. Arguments in favour seemed to overwhelm the contra-indications.

- Focus and terminology should shift from registration of epidemiologists to the establishment of competence criteria for epidemiology.

- There was also general agreement that national competence criteria should match with each other. This has led to the formation of an IEA-European working group on this issue.

- The assignment for the working group is to make an inventory of existing national criteria in Europe and USA, and to develop a set of competence criteria for epidemiologists in Europe. A proposal should be presented and discussed with the IEA European members at one of the IEA-meetings.

- Members of the working group participate on behalf of the national epidemiology societies who want to take part in the discussions. To that end all epidemiology societies in Europe were contacted.

All organisations in Europe and USA that potentially already have implemented some kind of list with competence criteria were contacted to get information for the inventory.

The Working Group on European Competence Criteria for Epidemiology had its first meeting in Florence at a workshop of the IEA-world conference in September 1999. By then the following members were listed (a full list of addresses is included in appendix I):

- Prof.dr. Gerhard Zielhuis (chairman; representative of the Dutch Epidemiological Society)
- Prof.dr. Hans Werner Hense (representative for the German Epidemiological Society)
- Dr. Finn Rasmussen (representative for the Swedish Epidemiological Society)
- Dr. Anne-Marie Nybo Andersen (representative for the Danish Epidemiological Society)
- Prof.dr. Vera Pompe Kirn (representative for the Slovenian Epidemiological Society)
- Dr. Marina Cuttini (representative for the Italian Epidemiological Society)
- Dr. Margaret Thorogood (representative for the British Society of Social Medicine)
- Dr. Michael Abdelnoor (representative for the Norwegian Epidemiological Society)
- Prof. Stuart Donnan (representative for the British Faculty of Public Health Medicine)
- Dr. Rosemary Ancelle-Park (representative for the French Epidemiological Society).

Experiences of national societies with the issue of competence criteria so far were presented and a general outline for the report was established, focussing on the competence criteria themselves.

A draft report was discussed at a special meeting in Amsterdam on March 31, 2000. All members approved the final report individually.

2. Objective

The assignment of the IEA-European Board was formulated as follows:

1. Report on the experience of certification in countries that have implemented a system.
2. Discuss advantages and problems related to certification.
3. Propose - if needed - a certification system, its scope, content and use.

Already from the start of its activities, the WG-ECCE noted large variety between national societies in Europe with respect to the priority given to the issue of certification of their members. Moreover, large differences are seen in national systems for training and certification.

Hence, the WG-ECCE considered that the focus of activities should lie on the development of the competence criteria themselves and not on organisational issues. The latter should be dealt with on a national level.

The aim of this report therefore, is to develop a set of competence criteria for epidemiology. This set of competence criteria should be recognised by the national societies. Moreover, it should match with the criteria already in use in Europe and preferably also with those in use in other continents (i.e. USA) to increase international acceptance. For national societies that are in process of developing a system for certification of individual epidemiologists and/or for accreditation of training programmes (or envision to do so in near future), the set of competence criteria should meet their needs.

This report first discusses general issues related to the nature of epidemiology, the need for competence criteria and its use as an instrument for quality assurance in epidemiology (chapter 3). Subsequently, an overview is presented of experiences and criteria of other societies and organisations in Europe and USA (chapter 4). A proposal about minimum competence criteria for epidemiologists in Europe is presented in chapter 5. The final chapter 6 discusses some procedure issues and presents concluding remarks.

The following terms are used in this report:

- Competence criteria: end-stage qualifications for a training in epidemiology to be defined by the requirements set by the practice of high quality epidemiological research, both in science as well as in applied epidemiological research in clinical and community health.
- Accreditation: the evaluation of a course or programme in epidemiology with respect to its contribution to the competence criteria for epidemiology.
- Certification: the evaluation of an individual with reference to the competence criteria for epidemiology.
- Registration: a list of certificates.

3. Underlying Issues

3.1 The nature of epidemiology

Epidemiology is part of the biomedical and health sciences. It aims at adding scientific knowledge about the distribution and aetiology of diseases, about diagnostic and prognostic problems and about the effect of interventions on the prognosis of disease in human populations. There are many definitions of epidemiology. We refrain from adapting a specific one. All definitions share the notion that epidemiology uses methods of frequency research: i.e. the study of the occurrence of disease in populations in relation to etiologic factors, in relation to diagnostic and prognostic characteristics and in relation to characteristics of intervention.

Epidemiology -by its nature- is applied medical research. Its application concerns both clinical medicine as well as community health.

From this it follows that a competent epidemiologist is academically trained in biomedical and health sciences with special emphasis on methods (design and analysis) of frequency research. As the domain of

research is as wide as clinical and community medicine itself, some degree of specialisation is necessary either with respect to the outcome (e.g. cancer, cardiovascular diseases, infections), or with respect to determinants (e.g. nutrition, pharmaceuticals, environment, genes) or with respect to methods (e.g. clinical trials, disease modeling). In general, epidemiological research requires multidisciplinary teamwork, with additional need for the epidemiologist to have basic understanding of the principles and methods of these co-operating disciplines.

3.2 The need for competence criteria for Epidemiology

The ultimate goal of implementing criteria for competence in epidemiology is to increase the quality of epidemiological practice in Europe. Although epidemiology (within and outside universities) in essence is an academic discipline with peer review of research output as the core instrument for quality assurance, there is a need for additional measures, especially in non-academic settings such as (non)governmental agencies, public health institutes, private companies etc. Several arguments for and against formal certification of epidemiologists are put forward:

Pro's:

- Certification of epidemiologists can provide quality assurance for (non)governmental agencies, the public, and the discipline at large.
- It can serve as a safeguard for employers; this is important with a view to the internationalisation of the labour market and the increasing importance of international companies.
- International courses and programmes at both national and international level are served by international accreditation.
- Access to data-registers and other formal issues are better organised in a situation where formal competence criteria for users can be applied.
- Protection of the title and work task of the 'epidemiologist' may be useful for employees who are competent to act accordingly.
- Certification creates the possibility to implement sanctions to those who do not work according to principles of GEP.

Contra's:

- A system that conserves can be counterproductive in enhancing creativity in research.
- It may not be worthwhile to add competence criteria to academic qualifications as MPH or PhD.
- There is a large variety of national 'epidemiology culture' making international harmonisation of competence criteria difficult or even impossible: public health orientation; clinical orientation; statistical orientation; demography orientation; epidemiology as a discipline for biometry.
- International differences in the need for accreditation of epidemiology programmes and certification, related to the variability in density of epidemiologists, prohibits realisation of international agreement.

Several epidemiologists combine their epidemiological activities with other duties, either in clinical medicine, community medicine or in other branches of research (e.g. medical sociology, pharmacology). As this is not a prerequisite for being a qualified epidemiologist, the competence criteria for epidemiology should be clearly distinguished from those for other activities. Being active in applied medical research, an epidemiologist should have some degree of understanding of the field of application (e.g. organisation of health care, nature of clinical and community medicine).

3.3 The use of a statement about competence criteria for epidemiology

Proper training in epidemiology is the most crucial element to become a competent epidemiologist. Formal training in epidemiology and biostatistics at a university or school of public health should include or be supplemented with a period of practical research experience in epidemiology under supervision of a qualified epidemiologist.

As training programmes vary from country to country and even from training centre to training centre and several epidemiologists become trained after a long period of active research and theoretical courses, it has become difficult to establish whether someone is qualified to call him/herself an epidemiologist. This situation is dissatisfactory from the point of view of the candidate him/herself, from the perspective of the employer or consumer of research, and from the perspective of training centres who organise courses, which may or may not lead to further accreditation.

By specifying and obtaining agreement about the competence criteria for epidemiology, this situation may be directed to a solution. Of course, such a list by itself does not lead to harmonisation and mutual recognition, and certainly not to improvement of the quality of epidemiological research. Such a situation can only be accomplished if the competence criteria are widely accepted by all stakeholders. The national societies can play a major role in that process.

In short, a list of competence criteria can be useful, at least in the following situations:

- A student in epidemiology who wants to set his or her training goals as a basis for an international career in epidemiology: "what do I have to learn to become recognised as a professional?"
- An employer who wants to hire an epidemiologist for his organisation may ask: "is this candidate competent for the job?"
- A training institute that wants to position its course offerings into a framework of internationally recognised epidemiology training.

4. State of the art

A wide variety of national training programmes and qualifications exists:

- Czech Republic: certification after 3 years postgraduate (MD) training in epidemiology organised by Institute of Postgraduate Education. In addition PhD degree in epidemiology for academics. Contact person: V. Prikežsky, National Institute Public Health.

- Denmark: epidemiology within the framework of specialisation in medicine. No formal certification.

- France: several training programmes are developed within the frame of the various universities in France. Both MSc and PhD levels are in use. An inventory of the programmes is taking place. There is no specific certification for epidemiologists.

- Germany: the German Epidemiological Association (DAE) holds a certificate on epidemiology: a post-graduate certificate at 'specialist level' (5 years) for graduates in medicine, natural sciences or social sciences. (Responsible person: Prof. Berger, chairman certification committee; 30-40 registered German epidemiologists).

- Italy: the issue of certification is under discussion within the Italian Epidemiologic Association. Contact person: Dr. M. Cuttini, Italian Epidemiologic Association.

- The Netherlands: a certificate on epidemiology on MSc level (held by the Netherlands Society of Epidemiology; 500 certificants) or PhD level (held by the Society for Biomedical Sciences; 300 certificants) for graduates in biomedical sciences. Responsible person: Dr. R.J.P.M. Scholten, secretary of the Registration Committee on Epidemiology of the Society for Biomedical Sciences.

- Serbia: postgraduate training in medical schools; MSc (2 year) and PhD programme, as well as specialisation in epidemiology. Formal certification of specialists by national Board of Epidemiology Certification (140 certificants in Epidemiology Specialisation). Contact person: Prof. Z. Radovanovic, Belgrade.

- Slovenia: a professional training and registration for public health epidemiologists has been established. Contact person: Prof. V. Pompe Kirn.

- Sweden: the issue of certification is under discussion within the Swedish Epidemiologic Association. The council does not propose a formal procedure for Sweden for the time being. Improvement in formal training is advocated. Contact person: F. Rasmussen, Swedish Epidemiologic Society.

- Switzerland: epidemiological training within the context of a modular structured Master of Public Health programme. No special certification for epidemiologists

- United Kingdom: epidemiological training within the context of social medicine/public health. No formal certification.

- United States of America: the American Epidemiological Society (250 active members only) holds criteria for admission of new members (academic achievements, publications, and impact on policy). Most professional epidemiologists in the USA have a formal MSc or PhD training in epidemiology. No formal certification at the national level.

For European countries not mentioned, there is no specific information available, despite attempts to find it. It is likely that in most countries epidemiologists are trained and active, without being formally certified. For some European countries there is not even recognition of the discipline Epidemiology yet.

Several national and international oriented training programmes and courses would profit from an internationally recognised list of competence criteria for epidemiology.

5. Proposal for a minimum set of competence criteria for epidemiology in Europe

Instead of harmonisation of training programmes at an international level and listing criteria for qualified training programmes, we propose a harmonisation of the end-stage qualifications of epidemiologists. Once consensus has been reached about what epidemiologists must know, understand and be able to do, every means fulfilling these criteria are, in principle, legitimate. This allows for differences in training facilities and certification procedures between countries and even within countries. In fact, with a clear description of end-point competence criteria, every individual who aims for a career in epidemiology can draw-up his or her own curriculum, depending on background, professional obligations, time frame, etc.

Medical schools or schools of public health can develop efficient curricula for 'typical' students, but these do not have to exclude other training routes. Obviously students need information about the position of specific courses in these curricula, especially regarding international courses. Again this can be done by referring to specific end-point requirements.

In this document, we first discuss levels of epidemiology qualification, then a proposal is made for specific end-stage qualifications.

5.1 Levels of qualification in epidemiology

Two levels of qualification are suggested: basic and advanced level (equivalent with international standards in university degrees): MSc and PhD respectively. Society requires epidemiologists on both levels. Advanced-level epidemiologists are responsible for in-depth epidemiological research. These professionals have proved to be capable of designing, performing and reporting on epidemiological studies on their own. Basic-level epidemiologists are needed to fill many positions in clinical medicine, public health and pharmaceutical industries. They have mastered epidemiological theory and basic skills, but their experience with research is limited. In addition, great many basic-level epidemiologists will continue in an advanced level programme. An advanced-level epidemiologist can be considered to be a basic-level epidemiologist who has also had several years of research experience and has published a number of epidemiological studies in international peer-reviewed journals.

5.2 Proposal for competence criteria for epidemiology at basic level

For epidemiologists at basic level, five competence criteria are considered elementary:

- a university degree in a relevant discipline
- a basic understanding of biomedical and/or health sciences
- knowledge and skills with respect to epidemiological and biostatistical methods
- knowledge of the epidemiology of major diseases
- actual experience with epidemiological research.

A first operationalisation will be given in this paragraph. For actual application as an instrument for evaluation of competence in epidemiology these concepts have to be translated into specific learning objectives.

A. Background education

Epidemiology is an academic discipline; that is, an academic degree is necessary to become an epidemiologist. It does not mean that epidemiological research can only be done at universities.

No academic discipline is excluded a priori as a basis for an epidemiological career. Candidates in medicine, (biomedical) health sciences, biostatistics, sociology, psychology and related sciences could opt for a training programme in epidemiology.

Basic knowledge and understanding of biomedical and/or health sciences is crucial for epidemiological research. This includes understanding of morphology and pathophysiology of cells, tissues and major organs, biochemistry, histology, disease processes, clinical aspects of major diseases etc. The necessary level of understanding is not easy to settle due to different traditions between countries and due to different requirements for specific research problems. Moreover, in multidisciplinary teamwork, the specific subject-matter knowledge can be provided by an expert on that field.

B. Epidemiological and biostatistical methods

An epidemiologist should have theoretical knowledge of, and practical abilities in epidemiology and biostatistics:

- frequency measures and measures of effect
- designs of epidemiological studies, their strengths and weaknesses. This includes principles of surveys, cohort studies, case-referent studies, intervention studies (trials)
- bias, precision and validity, including randomisation, causality, effect modification and confounding
- methods and instruments for data collection (including questionnaire design) and aspects of data quality
- basic biostatistics, including distributions, testing and estimation, p-values, confidence intervals
- methods of data analysis in epidemiology, including person-years analysis, life-table methods, standardisation, stratified analysis
- (multivariate) regression analysis
- computing, including data-base management, and at least one major statistical software package
- Good Epidemiology Practice.

C. Knowledge of the epidemiology of health conditions

- occurrence of major diseases and of major determinants (material and social) for health and disease
- structure and dynamics of human populations
- use of registries for epidemiological purposes.

D. Epidemiology in practice

Actual experience with the major components of an epidemiological study is considered essential i.e.:

- literature research
- formulation of hypotheses
- study design
- study protocol
- data management
- data analyses
- inference and reporting.

This supervised research period should last a minimum of 6 months.

5. 3 Proposal for competence criteria for epidemiology at advanced level

A. Basic-level requirements and in addition

B. Three optional topics, e.g.

- **determinant oriented:**
 - - nutritional epidemiology
 - - occupational epidemiology
 - - pharmaco epidemiology
 - - genetic epidemiology
 - - environmental epidemiology
 - - health services research
 - - etc.
- **disease oriented:**
 - - cardiovascular epidemiology
 - - infectious disease epidemiology
 - - cancer epidemiology
 - - reproductive and perinatal epidemiology
 - - clinical epidemiology
 - - veterinary epidemiology
 - - dental epidemiology
 - - etc.
- **methodology oriented:**
 - - clinical trials
 - - specific biostatistical applications
 - - decision analysis
 - - epidemiology and health policy
 - - etc.

C. Major supervised experience with epidemiological research leading to at least four epidemiological publications in international peer-reviewed scientific journals with the candidate as the first author. (Note: in general a PhD dissertation will be included, but is not considered an absolute prerequisite).

This period of research training includes oral presentations at international scientific meetings and keeping track of new developments in epidemiology by reading the major epidemiology journals and attending major epidemiology meetings.

6. Concluding remarks

The cornerstone of this proposal is that certification of individual epidemiologists and accreditation of teaching programmes is the responsibility of national societies, organisations or agencies and not even a prerequisite. The concern is that competence criteria for epidemiologists and learning objectives of courses and programmes in Europe fit to each other. The list of criteria as proposed in chapter 5 might serve as a minimal basis. It has reached consensus in the Working Group and where possible been recognised by the respective national societies represented in the Working Group.

The ultimate criterion is that end-stage competence criteria have to be met. Therefore there is no limitation to the list of curricula that can lead to these ends.

Universities (schools of medicine or public health), who develop such curricula could apply for accreditation as training institutes for epidemiology. This is in the interest of potential students who want to know the international value of the programme.

Typical curricula that can fulfil the criteria for basic-level epidemiology are:

- A full-time basic level (MSc) course in epidemiology for graduates in medicine, biomedical or health sciences, public health etc. Such a course (duration about one academic year) should comprise several months of theory in epidemiology and biostatistics and at least 6 months conducting a supervised research project at an epidemiology department.
- Within graduate academic curricula on biomedical or health sciences, human nutrition etc, lasting 4 to 5 full-time years, an optional curriculum in epidemiology as part of this graduate curriculum may serve. Again theory on epidemiology and biostatistics should take at least 3-6 months and there should be research in epidemiology with a minimum of six months.

Basic and advanced level training in epidemiology can typically found at universities or other research institutes with epidemiology units that are active in both training and research at international recognised level. Both teaching and research performance should be established in case these training institutes apply for international accreditation.

For actual accreditation (and accreditation updates) of teaching programmes, international courses and national registries for individual epidemiologists, a small and internationally accepted committee should be installed by the IEA-European Group. This committee (3-5 professors in epidemiology with good track record in both teaching and research) has the following assignments:

- Finalisation of the set of competence criteria, defined in terms of learning objectives, publication of this set and evaluation in subsequent years; updates where necessary.
- Evaluation of national epidemiology registries who apply for accreditation by IEA-Europe. Actual accreditation and periodically update.

- Evaluation (including site visit) of national and international teaching programmes aiming at basic and/or advanced level epidemiology, who apply for accreditation by IEA-Europe. Actual accreditation and periodically update.
- Evaluation of international courses aiming at specific learning objectives within the framework of epidemiology, who apply for accreditation by IEA-Europe. Actual accreditation and periodically update.
- Hold an archive of all applications, decisions and actual accreditations as mentioned above.

Arrangements with respect to the formation of the committee, its members, period of membership, formal responsibilities, financial budget etc have to be settled by the Board of the IEA-European Group.

The following procedure is suggested with respect to closing discussion about the content of this report, the actual competence criteria for epidemiology:

- * Presentation of the report at the next Annual Meeting of the IEA-European Group.
- * Presentation of the report on the IEA-website, and in the European Group e-mail newsletter with explicit request for comments by IEA-European Group members.
- * Presentation of the report to the national epidemiological societies with invitation to discuss and accept the report, i.e. the competence criteria. National societies, who explicitly accept the competence criteria as a basis for their activities, may express a request to be listed by the IEA-European Group. This includes national societies who want to receive accreditation for their system of certification of individual members. In the latter case the accreditation committee of IEA-Europe will evaluate the national system.
- * Final report established by the Board of the IEA-European Group and installation of an accreditation committee (with formal assignment, rules and budgetary arrangements).
- * Start of the activities of the accreditation committee, including a biannual report of the activities to the IEA-European Board.

7. Recommendations

1. This report presents an outline for European Competence Criteria for Epidemiology and for a procedure to give accreditation to teaching programmes, courses and national certification systems. In order to create maximum support from the European Epidemiological Community it is recommended that the Board of the IEA-European Group submits this report to all IEA-European members and to all national epidemiological societies and give them opportunity to comment on the report before it is established in its final version.
2. The competence criteria as described in this report, once established, should be translated into specific learning objectives.
3. Once agreement has been reached about the competence criteria and procedures, an accreditation committee should be installed by the Board of the IEA-European Group.
4. The final version of the report should be submitted for publication in the International Journal of Epidemiology.

Appendix I.

List of members of the Working Group on
European Competence Criteria for Epidemiology
(WG-ECCE)

Prof Dr Gerhard Zielhuis (chairman)
Dept Epidemiology PO Box 9101
NL-6500 HB NIJMEGEN
The Netherlands
Tel +31-24-3616975
Fax +31-24-3613505
e-mail G.Zielhuis@mie.kun.nl

Prof Dr Hans Werner Hense
Institut für Epidemiologie und Sozialmedizin
Universität Münster
Domagstr 3
48129 MÜNSTER
Deutschland
Tel +49-251-8355399
Fax + 49-251-8355300
e-mail hense@uni-muenster.de

Dr Finn Rasmussen
Division of Epidemiology
Karolinska Institute
Norrbacka Building
S-171 76 STOCKHOLM
Sweden
Tel +46-8-51776592
Fax +46-8-51776529
e-mail Finn.rasmussen@imm.ki.se

Dr Anne-Marie Nybo Andersen
The Epidemiology Science Center
Bygning 206
Artillerivej 5
2300 COPENHAGEN
Denmark
Tel +45-32-683953
Fax +45-32-688242
e-mail any@ssi.dk

Prof Dr Vera Pompe Kirn MD
Cancer Registry of Slovenia
Institute of Oncology Ljubljana
Zaloska 2

1000 Ljubljana
Slovenia
Tel +386-61-323063
Fax +386-61-1314180
e-mail: vpompe@onko-i.si

Dr Marina Cuttini
Istituto per l'infanzia
"Burlo Garofolo"
Via Dell'Istria 65/1
34137 TRIESTE
Italy
Tel +39-040-3785401
Fax +39-040-3785401
e-mail cuttini@burlo.trieste.it

Dr Margaret Thorogood
London School of Hygiene & Tropical Medicine,
Health Promotion Sciences Unit
Room 420
Keppel Street
London WC1E 7HT
United Kingdom
Tel +44-171-9272167
Fax +44-171-6373238
e-mail m.thorogood@lshtm.ac.uk

Dr Michael Abdelnoor
Clinical Epidemiology Unit, Research Forum
Ullevaal University Hospital
Kikeveien-166
0407 Oslo
Norway
Tel +47-22119296
Fax +47-22118479
e-mail michael.abdelnoor@oslo.online.no

Prof Stuart Donnan
Health Policy & Public Health Directorate
Lambeth, Southwark and Lewisham Health
Authority
1 Lower Marsh
London SE1 7NT
Tel +44-171-7167207
Fax +44-171-7167018
e-mail:
stuart.donnan@shaw.lsh.sthames.nhs.uk

Dr Rosemary Ancelle-Park
Institut de Veille Sanitaire
Unité Maladies Chroniques
12 rue du val d'Osne
94415 St Maurice
France
Tel +33-1-41796789
Fax + 33-1-41796788
e-mail: r.ancellepark@rnsp-sante.fr