The public health workforce: An assessment in the Netherlands
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The public health workforce is a key resource of population health. How many people work in public health in the Netherlands, what are their characteristics and who does what? Remarkably, such information about the size and composition of the public health workforce in the Netherlands is lacking. A standardized system to collect these data is also unavailable.

This thesis introduces a new methodology to enumerate the public health workforce. By applying it to environmental public health and preventive youth health care, our insight in the quantity and quality of the current and future public health workforce in the Netherlands has increased.

The studies described in this thesis are among the first scientific studies into public health workforce enumeration in the Netherlands and the results contribute to an empirical base for public health workforce planning and development.
The public health workforce

An assessment in the Netherlands

Marielle Jambroes
The public health workforce
An assessment in the Netherlands
INTRODUCTION

This introductory chapter first provides background information on public health, the public health workforce, essential public health operations and public health in the Netherlands. The aim and outline of this thesis are presented at the end of this chapter.

PUBLIC HEALTH

Public health is often defined as ‘the science and art of preventing disease, prolonging life, and promoting health through the organised efforts of society’. (1) The focus on preventive measures through collective interventions distinguishes public and preventive care (public health) from providing medical care (curative sector). Public health is an essential part of the healthcare system and concentrates on the health of the population as a whole. As all patients are part of the population in fact medical care occurs within the context of public health. (2, 3)

In many high income countries, the rising burden of chronic diseases, ageing populations, increasing health inequalities and growing health care costs poses challenges for health systems to improve and maintain population health. (4-6) The health of populations and the individuals within that population is influenced by a range of factors both within and outside the individual’s control (7, 8), as described by the so-called rainbow model of Dahlgren and Whitehead (D&W), see Figure 1. (9) Starting from the inner layer, the model shows: 1) fixed factors, such as age and gender, 2) individual lifestyle factors, 3) social and community factors, 4) living and working conditions, and 5) general socioeconomic, cultural and environmental factors. This model illustrates that health is not only influenced by individual lifestyle choices and an individual’s ability to adapt and self-manage, but also by collective factors that determine the context of an individual, as reflected by layers 3, 4 and 5. For example, the 2008 economic crisis in Europe has pronounced and unintended effects on public health; the number of suicides and infectious disease outbreaks has increased since. (10) So, improving or maintaining population health requires medical care as well as public health interventions.

To deliver effective public health services, a qualified public health workforce and appropriate allocation of that workforce are necessary. Therefore there is a need to understand the composition and trends in the public health workforce. (11-14)

Public health workforce

In several high income countries, e.g., the United States of America (USA) and Australia, insight in the public health workforce is limited. (15, 16) Limited insight in the total public health workforce makes workforce planning impossible. To provide evidence on which to base decisions for workforce planning and development, appropriate data on the size and composition of the workforce and the services provided are needed. Around 2000, the Centers for Disease Control and Prevention in the USA (CDC) and national partners developed a strategic plan for public health workforce development. (17, 18) Part of that plan was a list with priority research topics. On top of that list was and still is ‘monitoring the size and composition of the workforce’. In the USA, the CDC strategic plan has been a driver for the growth of public health workforce research.

Insight in the public health workforce is also lacking in Europe. A study into the public health capacity in the EU performed in 2010-2011 showed that a clearly distinguishable workforce for public health has neither been defined nor formally established in the vast majority of the EU Member States. (19) Because of the limited data on the availability and distribution of the public health workforce in Europe, the World Health Organisation Europe (WHO Europe) launched an action plan to strengthen public health capacities and services in 2012. (20) Defining, assessing and strengthening the public health workforce are among the key priority areas.

Both the US and WHO Europe documents stress that more research is needed to be able to monitor the size and composition of the public health workforce. There are still a number of unsolved issues that complicate this monitoring. The first is related to the often indistinct boundaries of the public health sector. Public health, as part of the health care sector, has many interlinks with the medical care workforce. Part of the services delivered by medical care professionals in fact constitutes delivery of public health services, for example general practitioners executing the national influenza vaccination program. Outside the health care sector, also sectors such as the social welfare or the educational sector are involved in public health with social workers and teachers providing health promotion or other public health services. The multidisciplinary nature of the public health workforce constitutes again a factor that complicates workforce enumeration. Due to the many factors influencing health different professional disciplines are involved in public health. (19, 12, 21-23) For example, disciplines, like physicians, dentists or sometimes nurses, compulsory professional registers exist. Other disciplines, for example dieticians or health promotion specialists do not have such registries.

Public health workforce enumeration

Previous efforts to enumerate the public health workforce were using existing data sources. However, the limitations of using existing databases for public health workforce enumeration are known and have been emphasized. (15, 24-26) For instance, different job titles of public health professionals for the same kind of jobs are a drawback, and not all job titles are accurately labelled as ‘public health’ in the different data sources. (27) Also, registers use different definitions of public health workers, different disciplines are often registered in different registries and not all disciplines or workplace settings are represented in the databases. (28, 29) A recent study into the federal workforce at the CDC combined the data of two different data sources to characterize the public health workforce. An additional shortcoming of this method was that the existing data sources do not contain demographic information or education and professional training characteristics of the workforce. (30)
Essential public health operations
To overcome the indistinct boundaries and the multidisciplinary nature of the public health workforce as drawbacks for public health workforce studies, the services provided by public health professionals have been used to define the workforce. In 1994, the USA defined ten essential public health services, as a framework for public health activities that should be undertaken. (31) In 2012 the World Health Organisation in Europe (WHO Europe) followed and defined ten essential public health operations (EPHOs). (20) EPHOs describe the main tasks of public health and can be used as a unifying and guiding basis to monitor and evaluate policies, strategies and actions for reforms and improvement in public health. EPHOs have also been used to support the development of public health curricula. (32)

In most public health workforce studies the EPHOs were the basis to define the public health workforce as “all those responsible for providing any of the 10 essential services of public health”. Selections of the organizations in which they work and of specific job titles, such as public health nurse or public health manager, were used to further operationalise the definition of the public health work force for research purposes. The ten EPHOs are shown in Table 1.

PUBLIC HEALTH IN THE NETHERLANDS
Public health organisation
The Dutch minister of Health, Welfare and Sport is responsible for public health. By law, the Public Health Act, all Dutch municipalities have the obligation to provide pre-specified public health services and to support a local public health service. (33) There are about 400 municipalities in the Netherlands which are served by 25 local public health services. All local public health services have a number of uniform tasks, as specified in the law. Examples of these tasks include preventive youth health care, infectious disease control, health promotion and environmental public health. From the perspective of the EPHOs this means that local public health services take care of ‘surveillance of population health and wellbeing’ (EPHO 1), ‘health promotion’ (EPHO 4), ‘disease prevention’ (EPHO 5), ‘monitoring and response to health hazards and emergencies’ (EPHO 2), ‘assuring sustainable organisational structures’ (EPHO 8) and ‘assuring governance for health and wellbeing’ (EPHO 6).

Table 1 | Essential public health operations, WHO Europe

<table>
<thead>
<tr>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Surveillance of population health and wellbeing; to feed information to</td>
<td>Surveillance systems and registries for (non) communicable diseases</td>
</tr>
<tr>
<td>health needs assessments, health impact assessments and to planning for health</td>
<td></td>
</tr>
<tr>
<td>services</td>
<td></td>
</tr>
<tr>
<td>2 Monitoring and response to health hazards and emergencies; in order to</td>
<td>Preparing for emergencies like prevention of health effects of heat-waves</td>
</tr>
<tr>
<td>monitor health hazards so that risks can be assessed.</td>
<td></td>
</tr>
<tr>
<td>3 Health protection, including environmental occupational, food safety and</td>
<td>Legislation for assessing food safety</td>
</tr>
<tr>
<td>others; to use monitoring data to protect health from diseases and</td>
<td></td>
</tr>
<tr>
<td>environmental risks and hazards.</td>
<td></td>
</tr>
<tr>
<td>4 Health Promotion, including action to address social determinants and</td>
<td>The development, implementation and evaluation of policies to promote</td>
</tr>
<tr>
<td>health inequality; to promote population health and well-being by</td>
<td>healthy diets and to prevent overweight and obesity</td>
</tr>
<tr>
<td>addressing inequalities and the broader social and environmental</td>
<td></td>
</tr>
<tr>
<td>determinants</td>
<td></td>
</tr>
<tr>
<td>5 Disease prevention, including early detection of illness; to prevent</td>
<td>Provision of vaccination programmes</td>
</tr>
<tr>
<td>disease through preventive actions.</td>
<td></td>
</tr>
<tr>
<td>6 Assuring governance for health and wellbeing; to ensure that public health</td>
<td>Mobilizing action for health and health equity in local policies</td>
</tr>
<tr>
<td>services are well governed and maintain accountability, quality and equity.</td>
<td></td>
</tr>
<tr>
<td>7 Assuring a sufficient and competent public health workforce; to ensure</td>
<td>Education, training, development and evaluation of the public health</td>
</tr>
<tr>
<td>that there is a relevant and competent public health workforce sufficient for</td>
<td>workforce.</td>
</tr>
<tr>
<td>the needs of the population.</td>
<td></td>
</tr>
<tr>
<td>8 Assuring sustainable organisational structures and financing; to ensure</td>
<td>Ensuring services are responsive and sustainable</td>
</tr>
<tr>
<td>sustainable organisations and financing for public health to provide</td>
<td></td>
</tr>
<tr>
<td>efficient, effective and responsive services.</td>
<td></td>
</tr>
<tr>
<td>9 Advocacy communication and social mobilisation for health; to support</td>
<td>Improving health literacy and health status of individuals and populations.</td>
</tr>
<tr>
<td>leadership and advocacy for community engagement and empowerment.</td>
<td></td>
</tr>
<tr>
<td>10 Advancing public health research to inform policy and practice; to ensure</td>
<td>Development of new research methods or innovative solutions in public</td>
</tr>
<tr>
<td>that research findings are used to improve evidence-informed policy and</td>
<td>health</td>
</tr>
<tr>
<td>practice.</td>
<td></td>
</tr>
</tbody>
</table>

Complementary to local public health services, other local and national organisations provide public health services, including academic research groups conducting public health research and thus providing the scientific basis of public health practice (EPHO 10). The National Institute for Public Health and Environment ('RIVM') contributes significantly to public health by conducting public health research and advising the national government on public health policy. National training and education institutes such as the Netherlands School of Public and Occupational Health, contribute to public health by developing public health curricula and offering training programmes (EPHO 7). Innovation and knowledge institutes support the health of specific population groups.
General Introduction

Chapter 1

or public health topics. The national center for youth health care (NCJ) can serve as an example. The NCJ supports youth health care practice by developing guidelines and aggregating knowledge.

Population health status

Public health has contributed significantly to population health in the Netherlands. Noteworthy successful public health interventions over the past 40 years include the national child immunisation programme (RVP), prevention of HIV/AIDS, anti-smoking measures, safety belts in cars, prevention of burns and the implementation of national organised screening programmes for breast, cervical and colorectal cancer. (34)

Nevertheless, the current state of population health in the Netherlands offers important challenges for public health. The current life expectancy of Dutch men of 79 years is among the highest in the European Union. With 83 years, the life expectancy of Dutch women is in the middle range in the EU and the life expectancy will probably continue to rise in the coming years in the Netherlands. (35) However, the wide inequalities in life expectancy across socio-economic classes are persistent. Life expectancy of Dutch people with low levels of education is around 6 years less than the life expectancy of people with high levels of education. In terms of life expectancy in self-perceived good health, the difference between the lowest and the highest educational groups is 19 years and this difference has been quite constant over the years. Reduction of socioeconomic gaps in health has remained a major challenge for public health.

Chronic diseases such as mental disorders, cardiovascular conditions and cancer caused the largest burdens of disease in 2011 in the Netherlands, see Table 2. Half of this burden can be attributed to unhealthy behaviour, like smoking, excessive alcohol use, sedentary behaviour and overweight and may thus essentially / theoretically be preventable. Among these, smoking remains the major cause of death and illness by far (causing 13% of the disease burden), see Table 3. (35) To reduce the burden of chronic diseases, healthier behaviours and environments need to be promoted and supported, which substantiates again the importance of public health for population health.

Table 2 | Ranking diseases causing the largest burden of disease in the Netherlands , 2011*

<table>
<thead>
<tr>
<th>Burden of disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mental disorders</td>
</tr>
<tr>
<td>2 Cardiovascular disease</td>
</tr>
<tr>
<td>3 Cancer</td>
</tr>
<tr>
<td>4 Injuries</td>
</tr>
</tbody>
</table>

Public health workforce in the Netherlands

The above mentioned trends in population health and the corresponding public health needs will impact the public health services and the public health workforce. Therefore, also in the Netherlands, there is a need to understand the size and composition of the public health workforce, in order to secure sufficient qualified and appropriate allocation of that workforce to maintain and improve population health.

Like in other countries, total size and composition of the public health workforce in the Netherlands is unknown and a standardized system for regularly and systematically collecting public health workforce data is lacking. This is remarkable because public health contributes significantly to population health, and public health is a public service with a high societal impact. The lack of evidence based public health workforce governance limits the potential to optimize population health in the Netherlands.

The main aim of the research in this thesis is to contribute to increasing insight in the quantity and quality of the current and future public health workforce in the Netherlands, in order to support workforce planning and policy development for better population health. The public health workforce is in this thesis defined as all workers involved in prevention, promotion and protection of population health, as distinct from activities directed to medical care. We use the Netherlands as a case study to develop and test methodologies that are also internationally applicable to collect public health workforce data.

Table 3 | Ranking determinants of health and their contribution to the burden of disease in the Netherlands in 2011*

<table>
<thead>
<tr>
<th>Determinants of health</th>
<th>% causing the disease burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Smoking</td>
<td>13.1</td>
</tr>
<tr>
<td>2 Overweight</td>
<td>5.2</td>
</tr>
<tr>
<td>3 Sedentary behavior</td>
<td>3.5</td>
</tr>
<tr>
<td>4 Excessive alcohol use</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*RIVM, Volksgezondheid Toekomst Verkenning 2014
RESEARCH QUESTIONS OF THIS THESIS

The studies presented here address public health workforce enumeration at three levels: the current situation, strategy development to enumerate the public health workforce and future public health needs. We address the following research questions:

1. What is currently known about the public health workforce in the Netherlands?

In the first part of the thesis we aim to assess the public health workforce in the Netherlands using existing data sources and to identify potential data gaps. The research question is:

   What is the quantity and quality of the Dutch public health workforce, using existing data sources? (Chapter 2)

2. How to enumerate the multidisciplinary public health workforce systematically?

We developed a strategy for empirical workforce enumeration based on EPHOs. In this part of the thesis we first define the essential public health operations for public health in the Netherlands. Subsequently we develop and test a new strategy based on EPHOs to assess the capacity of parts of the Dutch public health workforce. This part of the thesis addresses the following research questions:

   a. What are the scope and essential public health operations or EPHOs of public health in the Netherlands, based on international examples? (Chapter 3)

   b. What is the feasibility and validity of an EPHO based strategy to measure the size, composition and qualifications of the environmental public health workforce in the Netherlands? (Chapter 4)

   c. What is the quantity and quality of the preventive youth health care (“jeugdgezondheidszorg” in Dutch) workforce in the Netherlands and can regional differences in workforce be understood in terms of indicators of preventive youth health care need? (Chapter 5)

3. How are public health priorities affected by a new conceptualization of health?

In the third part of the thesis we used the EPHOs as a framework for analysis to assess the consequences of application of a new conceptualization of health in terms of adaptation and self-management for public health policy. We used qualitative analysis of existing data from group interviews with stakeholders in Dutch public health and health care. This part addresses the following research question:

   What are the implications of application of a new conceptualization of health for public health policy? (Chapter 6)

Finally, in chapter 7, the main findings of the thesis are summarized and discussed in the light of various methodological considerations and previous research. Furthermore, implications and recommendations for practice, research and policy are analysed.

OVERVIEW OF THE STUDIES PRESENTED IN THIS THESIS

<table>
<thead>
<tr>
<th>Ch</th>
<th>Topic</th>
<th>Study methods</th>
<th>Data/Study population</th>
<th>Focus of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current situation</td>
<td>2</td>
<td>Enumeration of the Dutch public health workforce</td>
<td>Document analysis</td>
<td>Existing data and reports on the Dutch public health workforce</td>
</tr>
<tr>
<td>Strategy development</td>
<td>3</td>
<td>Operationalisation of EPHOs for the Netherlands</td>
<td>Literature review</td>
<td>Articles and reports on public health essential operations</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Enumeration of the Dutch environmental public health workforce</td>
<td>National cross-sectional study with online questionnaires</td>
<td>Organisations that provide Environmental public health (n=24)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Enumeration of the Dutch Youth health care workforce</td>
<td>National cross-sectional study with online questionnaires</td>
<td>Organisations that provide Youth public health (n=443)</td>
</tr>
<tr>
<td>Future public health priorities</td>
<td>6</td>
<td>Assessing the implications of the new concept of health for public health</td>
<td>Secondary qualitative data-analysis of group-interviews</td>
<td>Group interviews (n=28), participants (n=277)</td>
</tr>
</tbody>
</table>

Chapter 1
REFERENCES


CHAPTER 2

Enumeration of the public health workforce in the Netherlands; insight in the size and composition is limited

Marielle Jambroes, Marie-Louise Essink-Bot, Thomas Plochg and Karien Stronks

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Capaciteit van de beroepsgroepen in de publieke gezondheidszorg: Beperkt inzicht in omvang en samenstelling.

[Enumeration of the public health workforce in the Netherlands; insight in the size and composition is limited]

NED TIJDSSCHR GENEESKD. 2012;156:A4529.
Chapter 2

ABSTRACT

Objective
To gain insight into the size and composition of the public health workforce in the Netherlands, to guide development and improve the future quality and provision of public health.

Design
Document analysis.

Method
Analysis of the estimates presented in 7 reports published between 2003 and 2010 in the Netherlands, presenting workforce descriptions, occupations and roles, definitions, and total numbers.

Results
Based on our comparison of the data in the reports, we estimated the total size of the Dutch public health workforce at 12,000 fte. However, this estimate is inaccurate because the definition of the workforce, the occupations selected and the methods of data collection differed between the reports. Moreover, definitions of the workforce ranged from all municipal health services to a broad selection of related facilities and organizations. The number of roles/occupations in each report ranged from 1-15. A registry exists only for public health physicians.

Conclusion
Despite 7 reports covering 7 years, we still have limited insight into the size and composition of the public health workforce in the Netherlands. Therefore, it is not possible to assess whether the capacity is sufficient now and in the future to fulfil the required quality and provision of public health services.

INTRODUCTION

In the Netherlands, preventive care as delivered by public health has provided an important contribution to population health. Examples include organised programs to prevent infectious diseases, preventive youth health care, municipal health policies, and programs for early detection of cancer. Bearing in mind the importance of public health for population health, it is noteworthy that important data are still lacking on this sector, e.g. how many people work in public health, and the types and levels of their competencies.

It is known that the Dutch registry of healthcare professionals in 2011 included 38,677 health care physicians, of whom 2122 were occupational health physicians, 1050 insurance physicians and 934 were public health physicians (in comparison: there were 11,870 registered general practitioners). Whether these public health physicians actually work in public health and which and how many other professionals (e.g. health promotion specialists and epidemiologists) are active in this sector is unknown.

This is remarkable because the workforce is one of the five relevant parts that define the quality of public health. (1) Insight into the size and composition of the public health workforce is necessary to support public health workforce planning and development and to improve the quality and appropriateness of public health services. For physicians such guidance has been available for some time: for example, the Advisory Committee on Medical Manpower Planning (‘Capaciteitsorgaan’) estimates the expected need for physicians and, based on this estimate, makes recommendations for the required training inflow of physicians. Unfortunately, other occupations in public health lack such systematic guidance.

In the Netherlands, the Public Health Act [‘Wet Publieke Gezondheid’] describes public health as ‘...the health protecting and health promoting measures for the population or specific groups thereof, including disease prevention and early detection of diseases’. (2) The focus on preventive measures through collective interventions distinguishes public and preventive care (public health) from providing medical care (curative sector).

The need to gain insight into the public health workforce (and their competencies) and what the future demand of public health professionals will be, has increased considerably over the last 10 years. This resulted in the production of 7 inventories, each from different parts of public health, for example a specific professional group such as health promotion specialists, or a specific organization, e.g. the municipal health service.

This study examines whether these inventories, when combined, provide sufficient insight into the size and composition of the public health workforce.
Table 1 | Characteristics of the 7 reports showing the size and composition of the occupational groups in public health care in the Netherlands in the period 2003-2009.

<table>
<thead>
<tr>
<th>Title</th>
<th>Organisation</th>
<th>Year</th>
<th>Description</th>
<th>Role or function</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge infrastructure public health</td>
<td>Advisory Council on Health Research (RGO)</td>
<td>2003</td>
<td>Inventory of the Dutch public health knowledge infrastructure</td>
<td>Researchers</td>
<td>Questionnaire study among universities, other research institutions and municipal health services</td>
</tr>
<tr>
<td>Workforce planning public health</td>
<td>Netherlands Public Health Federation (NPHF)</td>
<td>2007</td>
<td>Development of tool to assess the public health workforce to support public health workforce planning</td>
<td>Health promotion specialists, public health nurses, inspectorate child care, epidemiologists</td>
<td>Questionnaire study among organisations of public health professionals</td>
</tr>
<tr>
<td>Future developments health promotion and prevention</td>
<td>The Netherlands Institute for Health Promotion and Disease Prevention (NIGZ)</td>
<td>2008</td>
<td>Analysis of future developments for health promotion and prevention</td>
<td>Health promotion specialists</td>
<td>Online questionnaire distributed among health promotion specialists working within selected organisations</td>
</tr>
<tr>
<td>Benchmark data municipal health services</td>
<td>National Association of Local Public Health Services (GGD Nederland)</td>
<td>2008</td>
<td>Listing of all employees working at municipal health services in the Netherlands</td>
<td>Nurses, supporting staff, physicians, ambulance drivers, policy advisors, health promotion specialists, speech therapists, epidemiologists, social workers, ambulance staff, environmental public health specialists, medical technical workers, information officials, psychologists, quality officers, preventive dental care officers, occupational therapists, other roles</td>
<td>Questionnaire distributed among human resource departments of all municipal health services</td>
</tr>
</tbody>
</table>

The Netherlands organisation for health research and development: public health knowledge infrastructure (ZonMw)

The Netherlands organisation for health research and development (ZonMw) 2010 Assessment of the current public health knowledge infrastructure in order to support distribution and implementation of public health knowledge Public health nurses, physicians, social workers, psychiatric nurses, health promotion specialists, health scientists, epidemiologists, specialists in emergency care, preventive youth healthcare, environmental public health Existing data sources

Capaciteitsplan 2010, sub-report Social Medicine

The Advisory Committee on Medical Manpower Planning (Capaciteitsorgan) 2010 Estimation and advice on training, inflow of public health physicians, occupational health physicians and insurance physicians Profile-physicians of the Royal Dutch Medical Association, (KNMG), public health physicians, occupational health physicians, insurance physicians Compulsory registry of Profile-physicians of the Royal Dutch Medical Association, (KNMG), public health physicians, occupational health physicians, insurance physicians

Roles, occupations in training in public health

Board for the Professions and Training in Health Care (BOPG) 2010 List of current roles, occupations and educational programmes in public health, in order to explore future needs Profile-physicians of the Royal Dutch Medical Association, (KNMG), public health physicians, occupational health physicians, insurance physicians, public health nurses, Masters of Public Health, epidemiologists, health promotion specialists Existing data sources, organisations of professionals and websites
METHODS

Due to the lack of a central registration of all roles/occupations in the public health sector, we searched for inventories made during the last 10 years. We used (internet) search engines and also asked members of the Netherlands Public Health Federation for existing data. Inventories were selected that specifically addressed public health, or the areas of expertise mentioned in the Dutch Public Health Act, i.e. social medicine, epidemiology and health promotion. From the periodically updated inventories, the most recent data were selected. Of all available inventories we examined how the workforce was described, which definitions or descriptions of the roles/occupations were used, and the numbers of persons associated with each of these occupations. Subsequently, an estimate was made of the total size of each occupation recorded in full-time equivalents (fte). To do this, all data from all the available documents were pooled, grouped by role or occupation, and analyzed for accuracy and comparability.

In order for this research (and possible follow-up) to have adequate representation within the field of public health, the Public Health Federation assigned an advisory board consisting of representatives from the broad field of public health. Prior to starting this research, the advisory board evaluated and approved the study. It also contributed to evaluation of the available documents, and commented on the results.

RESULTS

The 7 available inventories compiled by different organizations were published between 2003 and 2010. Table 1 presents details of these documents and the methods by which their data were collected. The inventories differed in their selection of roles/occupations, ranging from 1 professional group up to 15 functions and/or occupations. Four of the 7 inventories included multiple occupations or roles and, in total, more than 40 different roles and occupations were reported.

Definition of the public health workforce

Table 2 presents an overview of the descriptions of the public health workforce, as used in the inventories. Of the 7 documents, 4 referred to the description of public health as stated in the Public Health Act. Two documents did not describe the workforce but, instead, described a specific occupational group (e.g. public health physicians) or a specific organization (e.g. municipal health organizations). The Netherlands Institute for Health Promotion and Disease Prevention [NIGZ] chose a selection of organizations which include employees that perform work that fits a job description that aims for health promotion.

Inclusion criteria

The Advisory Committee on Medical Manpower Planning [Capaciteitsorgaan] considered a registration in the registry of the Public Health Physicians Registration Commission, to be a criterion for inclusion in their public health workforce inventory. In contrast, the Institute for Health Promotion and Disease Prevention [NIGZ] used a combination of the job description, > 50% of the working hours working on health promotion, and a selection of organizations. In 5 of the 7 inventories, the occupations and roles were not defined beforehand.

Total Numbers

Table 3 presents an overview of the combined data from the reports in which the occupations/roles are shown for each report. The reports did not always result in numerical estimates of the quantities of the occupations and roles. The occupations/roles without numerical estimates of the quantities are not shown in Table 3. In general, each report provided a different estimate of the total public health workforce, ranging from 731 reported by the Advisory Council on Health Research [RGO] up to 9807 reported by the Board for the Professions and Training in Health Care [CBOG]. A combined estimate amounted to a total public health workforce of approximately 12,000 fte.
Table 3 | Overview of the size and composition of professionals included in seven reports

<table>
<thead>
<tr>
<th>Area</th>
<th>Public Health</th>
<th>Physicians</th>
<th>Researchers</th>
<th>Nurses</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention of youth health care</td>
<td>1990</td>
<td>192</td>
<td>1.2</td>
<td>405</td>
<td>54</td>
</tr>
<tr>
<td>Prevention of infectious disease control</td>
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<td>2</td>
<td>4.05</td>
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<td>Prevention of tuberculosis control</td>
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<td>54</td>
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<td>Indication &amp; advise</td>
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<td>47</td>
<td>47</td>
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<tr>
<td>Public health advice &amp; other</td>
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<td>43</td>
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<td>Public health physician*</td>
<td>914</td>
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<tr>
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<td>750</td>
<td>750</td>
<td>750</td>
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<tr>
<td>Health promotion policy &amp; advice</td>
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<td>100</td>
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<td>Medical Emergency Preparedness</td>
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<td>2400</td>
<td>2400</td>
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<td>Medical technical officer</td>
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<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Speech therapist</td>
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<td>100</td>
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<td>100</td>
<td>100</td>
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<tr>
<td>Information officer/ documentalist</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Miscellaneous</td>
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<td>100</td>
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<td>100</td>
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<td><strong>TOTAL</strong></td>
<td>731</td>
<td>731</td>
<td>731</td>
<td>731</td>
<td>731</td>
</tr>
</tbody>
</table>
We arrived at this estimate through the following steps:

1. The sum of all researchers (from the registry of the Advisory Council on Health Research, RGO), plus public health physicians (from the registry of the Advisory Committee on Medical Manpower Planning, Capaciteitsorgaan) plus health promotion specialists (from the registry of the Institute for Health Promotion and Disease Prevention, NIGZ);

2. The municipal health service benchmark, [GGD NL] mapped all their employees, including physicians and health promotion specialists. After subtraction of these latter two categories from the total number of employees in the municipal health services, the estimate of the number of municipal health workers was added to the result of step 1;

3. The Board for the Professions and Training in Health Care (CBOG) used the numbers of the above-mentioned registries, but also presented numbers of ‘masters of public health’; this latter group was added to the result of step 2.

Data from the Netherlands Organization for Health Research and Development (ZonMw) were not used in the calculations, as this inventory only made use of data derived from other documents.

The documents from the Advisory Committee on Medical Manpower Planning (Capaciteitsorgaan) and the Board for the Professions and Training in Health Care (CBOG) reported only absolute numbers instead of ftes; these absolute numbers were used to compile the total estimate.

DISCUSSION

By combining data from the 7 documents published between 2003 and 2010, we estimated the size of the public health workforce at 12,000 fte. However, this is an inaccurate estimate due to lack of similarities in: i) definition of the workforce, ii) the selection of occupations/roles and their descriptions, and iii) differences in the methods of data collection between the registries.

Definition of the work field

The considerable variation in registries illustrates the difficulty in defining the public health workforce. Of the 7 inventories, 4 used the Public Health Act to define the workforce. However, in this Act, the description of public health does not translate to specific occupation or roles, or to specific organizations. The ‘traditional’ working fields within public health (e.g. preventive youth healthcare, infectious disease control, and health promotion), and their roles and organizations, are another optional starting point for defining the workforce. Although some registries used this as a starting point, this resulted in insufficient insight, as some public health tasks are organized within the curative sector.

Examples of this include the preventive activities carried out by general practitioners, and the health counselling and screening of pregnant women by midwives. The roles and organizations outside the public health sector were not consistently included in the registries that took the ‘traditional’ working fields within public health as a starting point.

Many of the differences between the registries can be traced back to differences in definition of the public health work field. For example, the report of the Advisory Council on Health Research (RGO) was aimed at researchers and included researchers in the broad domain of public and occupational health, while other reports, such as that from the Netherlands Institute for Health Promotion and Disease Prevention (NIGZ), ignored medical care as a sector in which health promotion specialist may work.

Policy functions within local or national government, the Health Care Inspectorate and health insurers were not included in the registries, unless these employees are qualified and registered as public health physicians, a qualification that is not necessarily required for working in these roles.

Selection of occupations and roles

The registries differed in the selection of occupations and roles; a total of over 40 different roles and occupations were mentioned. Also, because for very few occupations where the definitions were specified beforehand, it is unclear whether the same names for certain roles were used and if they were used to describe the same roles and tasks. For example, it remains unclear whether the task description ‘epidemiologist’ in the registry of the municipal health services is the same as or similar to the ‘epidemiologist’ as used in the report of the Board for the Professions and Training in Health Care (CBOG). Also, several names of occupations and educational titles are used interchangeably, such as public health policy advisor and ‘Master of Public Health’. Without specific criteria or definitions it is impossible to establish whether the categories are in fact distinct or, to some extent, overlap each other.

Data collection

The lack of proper registration of occupations and roles in the public health care is another barrier to proper sizing of the public health workforce. A compulsory register is only available for physicians, public health physicians and so-called profile physicians of the Royal Dutch Medical Association (KNMG).

Limitations

A limitation of our approach is the selection of documents that are explicitly related to public health or specific areas of expertise mentioned in the Public Health Act. Therefore, it is possible that data of professionals working in, for example, occupational health, e.g. occupational health nurses or occupational health psychology have been missed. If this information was not included in the documents (although it was available) then our estimated 12,000 fte is probably an underestimation of the actual size of the public health workforce.
Our research shows that 7 existing reports (and all the data combined) do not provide sufficient insight into the capacity of the public health workforce. To assess the public health workforce properly, a clear definition of the public health work field is needed. A few Anglo-Saxon countries have defined the work field by identifying essential public health operations (or core functions) for public health. (10-15) Core functions are services that necessarily belong to public health and are essential to achieve the aims of public health. In the various countries involved, the idea of defining core functions was based on consensus among a relatively large group of professionals.

Core functions can be translated into core competencies; these can be applied for several purposes, such as assessing the quality of local health services and the development of public health education programs. American and English studies on the ‘public health workforce’ show that essential public health operations can also be used as basis for workforce assessment. (10,16)

**RECOMMENDATIONS**

In the Netherlands, essential public health operations have not yet been defined. Defining the essential public health operations, based on consensus of large groups of professionals from the workforce, will probably be a good starting point for assessing the public health workforce. In this way, the workforce will be defined based on content characteristics, i.e. separately from specific occupations or roles, and irrespective of the institute or organization in which they are performed.

**CONCLUSIONS**

Despite analysis of 7 reports covering 10 years, we have limited insight into the size and composition of the public health workforce in the Netherlands. Therefore, it is not possible to assess whether the current capacity, in relation to the required quality and performance of public health, will be sufficient now and in the future.

Therefore, we advise to take first steps to acquire this insight by clearly defining the scope and essential public health operations.

**REFERENCES**

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CHAPTER 3

What is public health? A definition and essential public health operations in the Netherlands

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ABSTRACT

Public health is an important part of any healthcare system. However, the boundaries of public health are indistinct. The current challenges to public health and medical care require a closer collaboration between public health and medical care. We present the working field of public health to health professionals according to international examples. Our study shows that a general consensus exists internationally on the overall role of public health in terms of scope and core functions. Public health aims at promoting health and reducing inequalities in health, through the organized efforts of society. Based on this aim, we defined the aim and ten essential public health operations (EPHOs) for the Netherlands. The EPHOs go beyond institutional and professional boundaries, are provided within and outside the healthcare system and can be translated into core competencies for public health professionals.

INTRODUCTION

Public health is an essential part of the healthcare system and focuses on the health of populations. Over the past 150 years, public health has made a significant contribution to population health in the Netherlands, and successful public health interventions include collective intervention programmes like the national child immunisation programme, anti-smoking measures, prevention of HIV/AIDS, safety belts in cars, and promotion of healthy workplaces. (1)

Nevertheless, the current state of population health in the Netherlands still presents major challenges for public health and the healthcare system. The future contribution of public health is underlined by several policy documents which advocate for a change in the focus of the healthcare system, i.e. from ‘care for disease and illness’ towards ‘health and healthy lifestyles’. (2,3,4) Recent policy documents on future health developments published by the association of medical specialists ‘The Medical Specialist 2015’ (‘De Medisch Specialist 2015’) and by the association of general practitioners ‘Future Vision for General Practice Care 2022’ (‘Toekomstvisie Huisartsenzorg 2022’) support this trend and advocate for more prevention in the medical sector, including primary care. (5,6)

Although public health and medical care are currently separate sectors, the above-mentioned policy documents suggest there could be a closer collaboration or even integration in the future.

Public health in the Netherlands

During the past centuries, public health has evolved into a broad and diverse working field, focusing on the prevention of disease and health hazards, including the determinants of health both within and outside the healthcare sector. (7) Disciplines included in public health are, for example, preventive youth healthcare, infectious disease control, public health emergency control, environmental public health, and health promotion. The public health services are provided by many different professionals and a wide range of organizations, e.g. local public health services, local municipalities, occupational health services, and national knowledge institutes. Within the group of specifically trained and registered public health physicians different disciplines exist, e.g. occupational health physicians, insurance physicians (‘Verzekeringsgeneeskundigen’), and public health physicians (‘Artsen Maatschappij & Gezondheid’). The wide range of factors influencing health is reflected in the multidisciplinary nature of the public health workforce and is the main reason for the rather indistinct boundaries of the public health sector. A clearly distinguishable workforce for public health has not been defined or formally established, neither in the Netherlands nor in the majority of EU Member States. (8)

As a result, insight in the availability and distribution of the public health workforce in other countries and in the Netherlands is limited. Public health workforce governance is important to support future developments towards more integration of public health,
medical care and long-term care. Insufficient data on both the size and the composition of the public health workforce hampers evidence-based decision-making on public health workforce governance.

**Essential public health operations**

In addition to descriptions of public health in terms of definitions, some countries defined essential public health functions as a framework for public health activities that should be undertaken. The USA did so in 1994. In 2012, the World Health Organisation in Europe (WHO EUR) followed and defined 10 essential public health operations (EPHOs). EPHOs describe the main functions of public health. The EPHOs have successfully been used to monitor and evaluate the quality of public health services and to assess the public health workforce. (12,13,14)

In the Netherlands, EPHOs have not yet been defined. Therefore, we analysed international examples of EPHOs and subsequently propose the aims and 10 EPHOs for public health in the Netherlands. We expect that the Dutch EPHOs will contribute to the development of the sector and to the training of public health professionals in the Netherlands.

**METHODS**

We searched the websites of relevant international organisations (e.g. the World Health Organisation (WHO), the Association of Schools of Public Health in the European Region, the European Public Health Association, and national public health organisations) for definitions of public health and for descriptions of essential public health functions; we primarily aimed for white papers, or similar authoritative reports. The reference lists of the identified documents were also scrutinised and further searches were made in Medline, Google Scholar and the internet.

International definitions of public health and operations were then clustered, arranged according to common topics, and analysed with regard to differences and commonalities. Based on the outcomes, the generic set of public health operations that we developed was extrapolated to public health in the Netherlands. Whether or not the public health operations were actually delivered in the Netherlands was assessed according to the Dutch Public Health Act, existing professional profiles, policy documents and existing practice guidelines (e.g. the basic duties package (‘Basistakenpakket’) for preventive youth healthcare). (15,16,17,18,19)

**RESULTS**

**International documents**

The search yielded 7 international definitions of public health and associated descriptions of EPHOs (Table 1); three from the WHO and one each from Australia, New Zealand, the UK and the USA. In the USA some individual states defined their own public health operations, but we did not include these as they were derived from the overall USA document. The most recent set of public health operations was defined in 2012 by WHO Europe (WHO EUR). All documents consist of a definition or aim of public health and include a range of 5-11 public health operations.

Although the countries from which the selected documents originated have different healthcare systems, the definition of public health and the essential public health operations (EPHOs) were highly comparable (Table 1). Commonalities between the definitions of public health were: 1) focus on population health, 2) focus on prevention, and 3) a collective approach towards interventions to address risk factors and causes of disease.

The public health operations of the different documents could be divided into nine main topics, see Table 1, first column. Five of these topics could be clustered as core operations: monitoring health status, disease prevention and control, health promotion/empowering communities, health protection and public health emergency response. The remaining four could be clustered as enabler operations: healthy public policies, research and development, a competent workforce and quality assurance of public health services. The latter four operations more or less support the delivery of the core operations.

In some documents, some of the operations were not addressed as a specific operation. For example, ‘public health emergency response’ was defined as a separate operation in two of the documents, whereas in the USA this particular operation was part of ‘disease prevention and control’. The USA document was the only document that mentioned ‘Link people to needed personal health services and assure the provision of health care when otherwise unavailable’ as an EPHO, was mentioned as a public health operations. Therefore we did not label this operation as a generic operation.

In four of the international documents, reducing inequalities in health was explicitly addressed as an operation or integrated in the aim of public health. The UK addressed the topic ‘reduce inequalities’ in three of the EPHOs, and the WHO EUR in one of the operations. The WHO Western Pacific region and New Zealand included ‘reduction of inequalities in health/health disparities’ within the aim of public health.

To summarise, the aims and EPHOs reported in the seven international documents were very similar. In these seven examples, we used the commonalities, i.e. the generic EPHOs derived from the international examples, as a framework to propose the aims and public health operations for the Netherlands.
What is public health? A definition and essential services of public health in the Netherlands

Chapter 3

Table 1 International systems of definitions or aims of public health and essential public health operations

<table>
<thead>
<tr>
<th>System</th>
<th>Definition/Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA, 1994</td>
<td>Vision: what we, as a society, do collectively to ensure the conditions in which people can be healthy.</td>
</tr>
<tr>
<td>Australia, 2000</td>
<td>Mission: to promote physical and mental health and prevent disease, injury, and disability.</td>
</tr>
<tr>
<td>UK, 2001</td>
<td>The science and art of promoting health, preventing disease, prolonging life and improving quality of life through the organized efforts of society.</td>
</tr>
<tr>
<td>PAHO/WHO*, 2002</td>
<td>&quot;Public health is an organized effort by society, primarily through its public institutions, to improve, promote, protect and restore the health of the population through collective action.&quot;</td>
</tr>
<tr>
<td>WHO, WPRO**, 2003</td>
<td>The art of applying science in the context of politics so as to reduce inequalities in health while ensuring the best health for the greatest number.</td>
</tr>
<tr>
<td>New Zealand, 2011</td>
<td>The key principles of Public-Health are: a) focusing on the health of communities rather than individuals, b) influencing health determinants, c) prioritising improvements in Maori health, d) reducing health disparities, e) basing practice on the best available evidence, f) building effective partnerships across the health sector and other sectors, g) remaining responsive to new and emerging health threats.</td>
</tr>
<tr>
<td>WHO Europe, 2012</td>
<td>Public health is the science and art of preventing disease, prolonging life and promoting health through the organized efforts of society.</td>
</tr>
</tbody>
</table>

Generic operations

<table>
<thead>
<tr>
<th>Core functions for public health</th>
<th>Scope of a modern public health system</th>
<th>Core public health functions</th>
<th>Essential public health operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Monitor health status</td>
<td>Monitor health status to identify community health problems</td>
<td>Health surveillance, monitoring and analyses</td>
<td>Monitoring, evaluation, and analysis of health status</td>
</tr>
<tr>
<td>2. Disease prevention and control</td>
<td>Diagnose and investigate health problems and health hazards in the community</td>
<td>Prevent and control communicable and non-communicable diseases and injuries through risk factor reduction, education, screening, immunization and other interventions</td>
<td>Preventive interventions</td>
</tr>
<tr>
<td>3. Health promotion, empowering communities</td>
<td>Inform, educate, and empower people about health issues</td>
<td>Promote and support healthy lifestyles and behaviours through action with individuals, families, communities and wider society</td>
<td>Health promotion</td>
</tr>
<tr>
<td>Mobilize community partnerships to identify and solve health problems</td>
<td>Promote, develop, support and initiate actions which ensure safe and healthy environments</td>
<td>Social participation in health</td>
<td>Advocacy, communication and social mobilisation for health</td>
</tr>
<tr>
<td></td>
<td>Promote, develop and support healthy growth and development throughout all life stages</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>4. Healthy public policy</td>
<td>Develop policies and plans that support individual and community health efforts</td>
<td>Promote, develop and support healthy public policy, including legislation, regulation and fiscal measures</td>
<td>Creating and sustaining cross-governmental and inter-sectoral partnerships to improve health and reduce inequalities</td>
</tr>
<tr>
<td>5. Health protection</td>
<td>Enforce laws and regulations that protect health and ensure safety</td>
<td>Promote, develop and support healthy public policy, including legislation, regulation and fiscal measures</td>
<td>Ensuring compliance with regulations and laws to protect and promote health</td>
</tr>
<tr>
<td>6. Research and development</td>
<td>Research for new insights and innovative solutions to health problems</td>
<td>Research, development, evaluation and innovation</td>
<td>Research in public health</td>
</tr>
<tr>
<td>7. Competent workforce</td>
<td>Ensure a competent public health and personal health care workforce</td>
<td>Plan, fund, manage and evaluate health gain and capacity building programs designed to achieve measurable improvements in health status, and to strengthen skills, competencies, systems and infrastructure</td>
<td>Developing and maintaining a well-educated and trained, multi-disciplinary public health service</td>
</tr>
<tr>
<td>8. Quality assurance of public health services</td>
<td>Evaluate effectiveness, accessibility, and quality of personal and population-based health services</td>
<td>Plan, fund, manage and evaluate health gain and capacity building programs designed to achieve measurable improvements in health status, and to strengthen skills, competencies, systems and infrastructure</td>
<td>Quality assuring the public health function</td>
</tr>
</tbody>
</table>
The Netherlands

In Table 2, the first column presents the generic EPHOs that resulted from the comparison of the international examples; the second presents the proposal for EPHOs in the Netherlands, the third gives examples of these tasks in daily practice and the last column shows organisations that deliver those services.

We compared the generic EPHOs with the Dutch Public Health Act and the existing practice guidelines of preventive youth healthcare and infectious disease control, to assess the validity for the Netherlands. We also used existing professional profiles and the position paper of public health physicians that was published in 2012. [25] These comparisons showed that the generic EPHOs are also valid for the Netherlands. The main operations provided by Dutch public health professionals fitted within the framework of generic operations, as did the organisations that deliver these operations. However, one public health service did not fit within the framework, i.e. providing a ‘health safety net’ is an important operations of Dutch local public health services but did not appear in the generic operations that emerged from the comparison of the international examples. However, it does fit with the USA operation ‘Link people to needed personal health services and assure the provision of health care when otherwise unavailable’. ‘Providing a health safety net’ includes the care for vulnerable and fragile groups who are not reached by regular healthcare services or for whom regular health services are difficult or impossible to access; an example of this operation is the care for homeless people. Therefore, we extended the generic operations with the additional operation ‘providing a health safety net’.

Table 2 (fourth column) provides an overview of organisations that provide the public health operations. It is noteworthy that some operations are also provided by organisations outside public health: e.g. operation 2, ‘disease prevention’, is also carried out by general practitioners when, for example, they provide the yearly influenza vaccinations. EPHO 3, ‘health promotion’, is also provided by e.g. midwives who promote a healthy lifestyle among pregnant women. Some operations are delivered in collaboration with medical care, for example preparedness for a public health emergency. Although local public health services are basically responsible for this service, in case of emergencies there is close collaboration with, for example, general practitioners, ambulance services, and emergency departments of hospitals.

In view of these results, the question remains: what is the overall definition or aim of public health? The Dutch Public Health Act defines public health as: …health protection and health promotion activities addressing the population or parts of the population, including disease prevention. This definition contains two of the three common elements of the aim of public health that resulted from the international analysis: a population focus and disease prevention. However, because the collective approach is missing, we propose to add this element to the definition.
### Table 2: Public health in the Netherlands

<table>
<thead>
<tr>
<th>Generic EPHOs</th>
<th>Proposed EPHOs for the Netherlands</th>
<th>Examples in the Netherlands (1)</th>
<th>Organisations providing the EPHOs (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Monitor health status</td>
<td>Monitoring population health and wellbeing; to feed information to health needs assessments, health impact assessments and planning for health services</td>
<td>Surveillance systems and registries for (non) communicable diseases</td>
<td>Local public health services, occupational health services, youth health organisations, National institute for public health and the environment (RIVM)</td>
</tr>
<tr>
<td>2 Public health emergency response</td>
<td>Public health emergency response; in order to monitor health hazards so that risks can be assessed.</td>
<td>Preparing for emergencies like prevention of health effects of heat-waves</td>
<td>Local public health services, general practitioners, ambulance care, emergency care department hospitals</td>
</tr>
<tr>
<td>3 Health protection</td>
<td>Health protection; to protect health from diseases and environmental risks and hazards.</td>
<td>Legislation for assessing food safety</td>
<td>National government, Ministry of Health, Welfare and Sport, Ministry of Social Affairs and Employment, The Netherlands Food and Consumer Product Safety Authority</td>
</tr>
<tr>
<td>4 Health promotion, empowering communities</td>
<td>Health Promotion including empowering communities; to promote population health and well-being</td>
<td>The development, implementation and evaluation of policies to promote healthy diets and to prevent overweight and obesity, or improving health literacy and health status of individuals and populations.</td>
<td>Local public health services, occupational health services, health promoting institutes, midwives</td>
</tr>
<tr>
<td>5 Disease prevention and control</td>
<td>Disease prevention and control, including early detection of disease; to prevent disease through preventive actions.</td>
<td>Provide vaccination programmes, organised screening programmes</td>
<td>Local public health services, occupational health services, youth health care organisations, National institute for public health and the environment (RIVM), general practitioners, hospitals, screening organisations</td>
</tr>
<tr>
<td>6 Healthy public policy</td>
<td>Healthy public policies and to ensure that public health services are well governed and maintain accountability, quality and equity.</td>
<td>Mobilizing action for health and health equity in local policies</td>
<td>Local governments, national government, local public health services</td>
</tr>
<tr>
<td>7 Competent workforce</td>
<td>Assuring a sufficient and competent public health workforce; to ensure that there is a relevant and competent public health workforce sufficient for the needs of the population.</td>
<td>Education, training, development and evaluation of the public health workforce.</td>
<td>Universities, public health training institutes, associations of professionals, Capaciteitorgaan / VWS</td>
</tr>
<tr>
<td>8 Quality of health services</td>
<td>Enforcement of the quality of public health services and assuring sustainable organisational structures; to ensure sustainable organisations and financing for public health to provide effective, accessible, and qualitative services.</td>
<td>Effective enforcement of the quality of health services by the healthcare Inspectorate</td>
<td>Health care Inspectorate, associations of professionals, local organisations</td>
</tr>
<tr>
<td>9 Research and development</td>
<td>Advancing public health research to inform policy and practice; to ensure that research findings are used to improve evidence-informed policy and practice.</td>
<td>Development of new research methods or innovative solutions in public health</td>
<td>Universities, research institutes, local public health services</td>
</tr>
<tr>
<td>10 Added: health safety net</td>
<td>Providing a health safety net</td>
<td>Health care for homeless people</td>
<td>Local public health services</td>
</tr>
</tbody>
</table>

We also propose to add a focus on ‘inequalities in health’. Health inequalities have traditionally always been a major concern of public health. For example, in the 19th century Virchow (in Prussia) and Sarphati (in Amsterdam) were well-known public health figures who addressed the social determinants of health and the resulting health inequalities. (26,27) Although population health status has dramatically improved since then, large differences in health still exist between people with a high or a low educational level, which supports the need to add an extra focus on health inequalities, as in other international examples. (28,29) Therefore, we propose the following definition as the aim of public health in the Netherlands: ‘To promote health and an equal distribution of health through population-based interventions aimed at protecting and promoting health and preventing disease’.

**DISCUSSION**

The international comparison revealed many similarities between the aims and EPHOs in different countries. This implies that these core functions are largely independent of the health system or country in which they are performed. Therefore, we can use it to formulate a definition and core functions for public health in the Netherlands. Important principles of public health include the population-oriented, prevention-oriented and collective approach. The international framework was useful to describe public health in the Netherlands but we added the provision of a ‘health safety net’ function. In line with the international examples we also propose to include the aim ‘equal opportunities in health’ in the definition of public health in the Netherlands.

EPHOs are independent of the position of public health in the healthcare system, and of the professional who performs them and raises the question as to who may best perform these EPHOs. Our study showed that the answer to this question extends beyond the traditional boundaries of the field of public health and supports that there is an inherently strong association between public health and medical care physicians, i.e. their work aims at the realisation of (partly) the same tasks. (30) General practitioners who comply with the guidelines of cardiovascular risk management can serve as an example. Therefore we emphasise the importance of adequate attention being paid to public health during medical education, so that all healthcare professionals are sufficiently trained in the content and tasks of public health.

Our approach also had some limitations. For example, in the international comparison we may have missed some goals and/or examples of core tasks. However, due to the considerable degree of similarity between the different systems and the large number of countries represented in the WHO documents, this is not likely to have an important impact on our results.

Because of our background in the working field of public health physicians [artsen maatschappij & gezondheid], the examples provided in this paper were mainly derived from the working field of public health physicians, however, the definition and essential operations of public health are also applicable to the working field of insurance- and occupational health physicians. [Verzekerings- en Bedrijfsartsen]

**CONCLUSIONS**

We presented a definition of public health and of essential public health operations for The Netherlands. Public health focuses on promoting population health, an equal distribution of health, and is based on collective interventions. The EPHOs extend beyond the recognised institutions or professional domains, e.g. EPHOs are also provided by professionals working in medical care. EPHOs provide a basis for the development of public health in the Netherlands, and support the provision of adequate public health operations and the training of sufficient numbers of adequately trained professionals to deliver them.

**ACKNOWLEDGEMENTS**

The authors thank the professional workforce planning team of the Netherlands Public Health Federation for their contribution to the design of the analyses and interpretation of the results.
Chapter 3

What is public health? A definition and essential services of public health in the Netherlands

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CHAPTER 4
How to characterize the public health workforce based on essential public health operations?
Environmental public health workers in the Netherlands as an example

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How to characterize the public health workforce based on essential public health operations?

BACKGROUND

Recently, the review of the public health capacity in Europe in 2013 by the European Commission Directorate General for Health and Consumers showed uncertainty regarding the capacity of the public health workforce in Europe. (1) Adequate data on the size and composition of the actual workforce are needed to support workforce planning and policy development, in order to guarantee sufficient and competent workers in the future. (2-4) Measuring the public health capacity is hence an important but challenging task.

Strategies to enumerate the public health workforce have been subject of scientific debate for many years. (5-10) Efforts to develop information about the public health workforce encountered major obstacles, including uncertain boundaries of the field of public health, and the multidisciplinary workforce in combination with the absence of credential requirements for most of the disciplines involved. (1, 11, 12)

Until now, most efforts to enumerate the public health workforce are based on existing data sources, see for example the USA centers of excellence in public health workforce studies focusing on the governmental public health workforce, and the recently published study on characterization of the federal workforce at the Centers of Disease Control and Prevention. (13-16)

However, the limitations of using existing databases for public health workforce enumeration are known and have been emphasised. (1, 17, 18) For instance, disparate job titles of public health professionals are a drawback, because not all job titles are accurately labelled as ‘public health’ in the different data sources. (19) Also, registrations use different definitions of public health workers, different disciplines are often registered in different registries and not all disciplines or workplace settings are represented in the databases.

If existing data sources do not contain the necessary information, or apply to part of the workforce only, primary data collection is essential for accurate characterization of the workforce. To date, no standard strategy for this primary data collection exists.

Therefore we developed a strategy aiming to 1) assess the size and composition of the multidisciplinary public health workforce across different organisations, and 2) to assess the services provided. We applied our strategy to the environmental public health workforce in the Netherlands as an example.

Environmental public health focuses on the interactions with and effects of the environment on health, e.g. indoor and outdoor pollution and chemical safety. Environmental public health is a relatively small discipline within the public health working field in the Netherlands and is mainly but not exclusively performed through local public health services (see Textbox 1) by a very multi-disciplinary workforce, among which physicians. The total size

ABSTRACT

Background
Public health workforce planning and policy development require adequate data on the public health workforce and the services provided. If existing data sources do not contain the necessary information, or apply to part of the workforce only, primary data collection is required. The aim of this study was to develop a strategy to enumerate and characterize the public health workforce and the provision of essential public health operations (EPHOs), and apply this to the environmental public health workforce in the Netherlands as an example.

Methods
We specified WHO’s EPHOs for environmental public health and developed an online questionnaire to assess individual involvement in these. Recruitment was a two-layered process. Through organisations with potential involvement in environmental public health, we invited environmental public health workers (n=472) to participate in a national survey. Existing benchmark data and a group of national environmental public health experts provided opportunities for partial validity checks.

Results
The questionnaire was well accepted and available benchmark data on physicians supported the results of this study regarding the medical part of the workforce. Experts on environmental public health recognized the present results on the provision of EPHOs as a reasonable reflection of the actual situation in practice.

All EPHOs were provided by an experienced, highly educated and multidisciplinary workforce. 27% of the total full-time equivalents (FTEs) was spent on EPHO ‘assuring governance for health’. Only 4% was spent on ‘health protection’. The total FTEs were estimated as 0.66 /100,000 inhabitants.

Conclusions
Characterisation of the public health workforce is feasible by identification of relevant organisations and individual workers on the basis of EPHOs, and obtaining information from those individuals by questionnaire. Critical factors include the operationalization of the EPHOS into the field of study, the selection and recruitment of eligible organisations and the response rate within organisations. When existing professional registries are incomplete or do not exist, this strategy may provide a start to enumerate the quantity and quality of the public health within or across countries.
and composition of this workforce is unknown. However, there is a compulsory registry for physicians and the total number of environmental public health workers working at local public health services is known. Additional data relevant for workforce planning about age, educational background, job function and provision of services are not available.

The aim of the present study was to examine the feasibility and validity of our newly developed strategy to enumerate the public health workforce and the services provided, by applying it to environmental public health workforce as an example.

**METHODS**

**General study design**

A national cross-sectional survey was conducted using an online questionnaire.

To assess the services provided by the workforce we used the recently defined essential public health operations (EPHOs) by the World Health Organisation in Europe (WHO Eur). (20) The EPHOs describe the main tasks of public health and can be used as a unifying and guiding basis to monitor and evaluate policies, strategies and actions for reforms and improvement in public health.

The environmental public health workforce was defined as all workers who contribute to the delivery of environmental public health. We made this definition operational as: all those who consider environmental public health as part of their job and who are responsible for providing any of the EPHOs for (on average) ≥ 0.5 h/week. This small number of hours per week was chosen to capture all disciplines and services provided. For example, the work of the health care inspectorate includes promotion of public health and responsible care through effective enforcement of the quality of health services. For environmental public health these services are delivered only 2-3 weeks per year.

As the EPHOs are not yet implemented in public health practice in the Netherlands, we operationalized the EPHOs to environmental public health using existing policy documents, e.g. from the professional organisation of environmental public health physicians, guidelines on the size of the environmental public health workforce and the most recent advice of the Advisory Committee on Medical Manpower planning (‘Capaciteitsorgaan’) on the training inflow of environmental public health physicians. (21)

We also involved a group of 5 national environmental public health experts who agreed on the resulting specifications. Based on the documents and the expert opinions, we made some changes to the EPHOs: EPHO ‘advocacy communication and mobilisation for health’ was combined with EPHO ‘health promotion’. We decided to combine these two EPHOs as ‘advocacy communication and mobilisation for health’ according to WHO eur contains improving health literacy and enhancing population’s capacity to access, understand and use information to reduce risk or prevent disease. (22) These kind of activities are part of health promotion in the Netherlands. ‘Regional consultation and support’ was added as EPHO as some local public health services fulfill this specific role for other local public health services. A description of environmental public health and the EPHOs is presented in Table 1.

We took every effort to effectively inform the respondents and protect their privacy.

**Development of the questionnaire**

The questionnaire was developed based on a review of literature, interviews with public health experts and consultation with other researchers and contained 20 items divided into three parts:

1. Eligibility and socio-demographic variables: Is environmental public health part of your job and do you spend more than 0.5 hours per week on average on environmental public health tasks? The questionnaire ended if a respondent did not fulfil these criteria. Items on age, gender and educational background (level and discipline, specific training in environmental public health) completed this section.

2. Job characteristics: Type of organisation, job title, and number of years of work experience in the current job.

3. EPHOs: For each separate EPHO, respondents were asked to indicate explicitly if they delivered this operation, and if yes, the average time spent on each of them per week. To facilitate completing this part of the questionnaire examples of daily environmental public health practice were added to each of the EPHOs, see Table 1. Finally, respondents were asked whether they had enough time to perform these operations.

Testing of the practicality of the questionnaire among all employees of a local public health service (n=217) resulted in some modification of the wording and the order of some items. For the present study the adapted version was used. After some adaptations based on a pre-test of this questionnaire among 5 environmental public health workers, the questionnaire took about 10 min to complete.
### Table 1: Essential public health operations and environmental public health operations in the Netherlands

<table>
<thead>
<tr>
<th>Essential public health operations, WHO*</th>
<th>Essential environmental public health operations</th>
<th>Examples of daily practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Surveillance of population health and wellbeing</td>
<td>1 Surveillance, evaluation, and analysis of the determinants of environmental health and wellbeing</td>
<td>Monitor and register notifications and questions of citizens</td>
</tr>
<tr>
<td>2 Monitoring and response to health hazards and emergencies</td>
<td>2 Monitoring and response to environmental health hazards and emergencies</td>
<td>Add questions regarding environmental health to the national health monitor</td>
</tr>
<tr>
<td>3 Health protection including environmental occupational, food safety and others</td>
<td>3 Health protection, enforce laws and regulations that protect environmental health and ensure safety</td>
<td>Communication of health risks after small incidents</td>
</tr>
<tr>
<td>4 Health Promotion including action to address social determinants and health inequity</td>
<td>4 Health promotion including empowering communities; to promote population environmental health and well-being</td>
<td>Follow-up and monitoring of health complaints after a fire containing asbestos</td>
</tr>
<tr>
<td>5 Disease prevention, including early detection of illness</td>
<td>5 Disease prevention, diagnosis and investigation of environmental health problems and health hazards</td>
<td>Including health in the revised law on intensive farming</td>
</tr>
<tr>
<td>6 Assuring governance for health and wellbeing</td>
<td>6 Assuring governance for health, support environmental health public policy</td>
<td>Organise information sessions about health effects of atmospheric pollution</td>
</tr>
<tr>
<td>7 Advocacy communication and social mobilization for health</td>
<td>7 Advocacy communication and social mobilization for health</td>
<td>Campaigning for healthy climates inside buildings and houses</td>
</tr>
<tr>
<td>8 Assuring sustainable organisational structures and financing</td>
<td>8 Assuring sustainable organisational structures, enforcement of the quality of (public) health services</td>
<td>Active research on healthy environments within schools and learning outcomes</td>
</tr>
<tr>
<td>9 Disease prevention, including early detection of illness</td>
<td>9 Disease prevention, diagnosis and investigation of environmental health problems and health hazards</td>
<td>Enforce quality of health care (organisation and quality of environmental public health services)</td>
</tr>
<tr>
<td>10 Advancing public health research to inform policy and practice</td>
<td>9 Advancing research and development on environmental public health</td>
<td>Conducting scientific research on environmental public health</td>
</tr>
<tr>
<td>11 Regional consultation and support</td>
<td>10 Regional consultation and support</td>
<td>Advising neighbouring environmental public health services</td>
</tr>
</tbody>
</table>

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Recruitment of participants

Potential respondents were selected in a two-layered recruitment strategy. First we identified all organisations likely to conduct environmental public health tasks and second, within these, we invited all workers considered to be performing environmental public health.

To enhance recruitment across organisations and of as many employees and disciplines substantially involved in environmental public health, we composed two complementary mailing lists. In the first mailing list (core group; n=182), we included all workers of the departments of environmental public health of the local public health services. Then, we explored who might also be likely performing environmental public health EPHOs outside the department of environmental public health of the local public health services, and included those addresses in the second mailing list (peripheral group; n=290). For example, in order to recruit respondents involved in EPHOs ‘surveillance’ and ‘health promotion’ we approached all workers from the divisions of epidemiology and health promotion of the local public health services. Similarly, we approached direct network contacts, like employees of the Ministry of Health, Welfare and Sport, environmental public health workers from the National Institute for Public Health and the Environment and departments of public health of two universities in order to recruit workers involved in EPHO ‘advancing public health research’ and EPHO ‘governance for health’.

Both mailing lists were composed in collaboration with environmental public health experts and the national association organisation of all local public health services (GGDGHOR-Netherlands, textbox 1). This organisation supports environmental public health practice, policy and research from a national perspective and maintains a good overview of the national environmental public health network.

Data collection strategy

The survey was performed in March 2013. The invitation to participate in the survey was distributed by e-mail to 472 workers. The invitation emphasized voluntary participation and responses would be confidential. The e-mail contained a link to a secured website where they could complete the electronic questionnaire. (23) In the week after the invitation, two reminders were sent to the non-responders. After two weeks the database was closed, data were downloaded, and the analyses were performed with SPSS 14.0.

Analysis

Feasibility

The feasibility of the measurement strategy was assessed by:
- The complete response rate;
- The number of partial respondents (defined as respondents who started the questionnaire without completing it);
- Remarks added by respondents.

Validity checks

External data provided the opportunity to check aspects of the validity of the strategy.

a) Existing benchmark data for specific groups: environmental public health physicians and the total capacity of environmental public health workers at the local public health departments:
- The assessment of the capacity of environmental public health physicians in 2010 by the Advisory Committee on Medical Manpower Planning; the total capacity was 14 physicians. (21)
- The total capacity of environmental public health workers within local public health departments was enumerated in 2011; the total capacity was 75.5 FTEs.

b) Feedback on the results from national experts on environmental public health, as a test of face validity.

The group of 5 national experts consisted of representatives of the medical environmental public health professional organisations, the national association of all local public health services and two managers of departments of environmental public health from two local public health services. We organised a group session with the experts and after we presented the results we asked the experts to give feedback on:
- Whether they recognized the data on the size and composition of the workforce;
- Whether the EPHO profile was a reasonable reflection of the actual situation in practice.

Size, composition and services provided

Characteristics of the composition of the workforce included, gender, educational level and background, specific training in environmental public health, work setting, job title, and years of work experience in the current job title.

The size of the workforce was calculated in full-time equivalents (FTEs); in the Netherlands, 36 working hours/week constitutes 1 FTE.
For a tentative estimation of the total FTEs of the national environmental public health workforce, we assumed that:
- All non-responders from the peripheral group were not involved in environmental public health for more than 0.5 h/week
- The proportion of environmental public health workers among the respondents of the core group was the same as among the non-responders of the core group

Environmental public health workers among the non-responders of the core group spent a similar number of working hours on environmental essential public health operations as respondents of the core group. To gain insight into the services provided by the professionals, we assessed which of the EPHOs they provided and for how many hours per week. The distribution of FTEs over the EPHOs was calculated as the sum of all the hours spent per EPHO, divided by 36.

RESULTS

Feasibility
The response rate among the local public health services was 100%. Within the organisations, the response rate of individual workers was 70% (127/182) in the core group and 28% (81/290) in the peripheral group. After exclusion of respondents who reported not to be involved in environmental public health or who reported spending ≤ 0.5 h/week (n=59), and double (n=26) and partial respondents (n=14), 129 questionnaires were available for analysis: 112 from the core and 17 from the peripheral group. As the characteristics of both respondent groups were similar for educational background, job titles and involvement on EPHOs, we combined the data from these two groups.

Of all respondents, 26 added remarks to the questionnaire. Of these, 6 indicated that the number of hours spent per EPHO was difficult to estimate and 3 reported not to recognize the EPHOs as a reflection of their daily practice. The other comments were personal additions to the answers.

Validity checks
Existing benchmark data:
- Our data showed that 28 respondents were physicians, of which 10 had been trained and registered as environmental public health physicians. Data from the Advisory Committee on Medical Manpower Planning (‘Capaciteitsorgaan’) showed 14 registered environmental public health physicians in 2010. As all 14 environmental public health physicians were included and invited in the core group, we assumed that the difference was explained by non-response of 4 physicians in our survey, corresponding with the 70% response rate in the core group.

- Local public health services: The total number of 97 FTEs in our study exceeded the number of 75.5 FTEs from existing reference data. According to the expert group, this could partly be explained because the reference study focused on employees working at the environmental public health department of the local public health services only, whereas our study also included employees from other departments of the local public health services and other organisations. National experts in the field of environmental public health indicated that the data were recognizable as a reasonable reflection of the actual situation with regard to educational background, employment setting, task differentiation and the provision of EPHOs.
- The experts recognized that the majority of the workforce was trained at university level or higher.
- They also found that the amount of FTEs provided outside the local public health services was plausible. The finding that respondents with a lower educational background spent more time on the EPHOs ‘surveillance’, ‘disease prevention’ and ‘health promotion’, whereas physicians spent more time, e.g., on ‘assuring governance for health’ and ‘advancing research’ was, according to the experts a valid reflection of the situation in daily practice.
- Finally, the distribution pattern of the FTEs over the EPHOs was in line with the expectations of the experts. The results showed more capacity for the EPHOs focusing on daily environmental public health problem-solving, like ‘assuring governance for health’, ‘disease prevention’ and ‘health promotion’, than on the more supportive EPHOs like ‘assuring sustainable organisational structures’ and ‘assuring a competent workforce’. According to the experts this is in line with the actual situation, although the experts had expected more capacity spent on ‘assuring governance for health’.

Composition of the environmental public health workforce
Of all respondents, the mean age was 46 years (SD 10.2), 64% was female, 71% had special training for environmental public health, 59% had ≥ 5 years working experience in their current job, and 80% was educated at university level (or higher) with various disciplinary backgrounds (e.g. medicine, nursing, toxicology, biology, and environmental hygiene) (Table 2). Respondents had multiple different job titles. Of the primary job titles 79% could be classified in 5 main categories (policy advisor, environmental public health physician, environmental public health nurse, environmental public health advisor, and environmental public health emergency expert); the remaining 21% consisted of 22 different job titles.

28 Respondents were physician, 10 were trained as environmental public health physician, 10 were trained as public health physician and 8 were physicians ‘other’, of which 6 were in training for environmental public health physician.
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Of all respondents, 92% were working in local public health services, 13% worked outside the local public health services (e.g., university, Ministry, or research institute), some had multiple work settings, and 45% were working in environmental public health and in other domains (e.g., infectious disease control).

Table 2 | Characteristics of the environmental public health workforce in the Netherlands

<table>
<thead>
<tr>
<th>Total (n=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, female N (%)</td>
</tr>
<tr>
<td>Age, yrs (SD)</td>
</tr>
<tr>
<td>Number of years in current job (%)</td>
</tr>
<tr>
<td>&lt; 1 yr</td>
</tr>
<tr>
<td>1 - 5 yrs</td>
</tr>
<tr>
<td>6 - 10 yrs</td>
</tr>
<tr>
<td>&gt; 10 yrs</td>
</tr>
<tr>
<td>Working hours/week hrs (SD)</td>
</tr>
<tr>
<td>Working hours/week environmental public health hrs (SD)</td>
</tr>
<tr>
<td>Education N (%)</td>
</tr>
<tr>
<td>&lt;Senior secondary vocational education and training</td>
</tr>
<tr>
<td>Professional education, applied science</td>
</tr>
<tr>
<td>University level</td>
</tr>
<tr>
<td>Post university level</td>
</tr>
<tr>
<td>Physicians N (%)</td>
</tr>
<tr>
<td>Environmental public health physician</td>
</tr>
<tr>
<td>General public health physician</td>
</tr>
<tr>
<td>Physician</td>
</tr>
<tr>
<td>Organizational setting N (%)</td>
</tr>
<tr>
<td>Local public health service</td>
</tr>
<tr>
<td>National</td>
</tr>
<tr>
<td>Municipality</td>
</tr>
<tr>
<td>University</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Special training for Environmental Public Health n (%)</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Table 3 | Specification of percentage FTE-, time of physicians and nurses and, hours per week per essential environmental public health operation

<table>
<thead>
<tr>
<th></th>
<th>% total FTE</th>
<th>Average hrs/wk (SD)</th>
<th>% time physician</th>
<th>% time nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surveillances, evaluation, and analysis of (the determinants of) environmental health and wellbeing</td>
<td>15</td>
<td>4.4 (5.1)</td>
<td>8.8</td>
</tr>
<tr>
<td>2</td>
<td>Monitoring and response to environmental health hazards and emergencies</td>
<td>7</td>
<td>1.9 (2.7)</td>
<td>8.4</td>
</tr>
<tr>
<td>3</td>
<td>Health protection, enforce laws and regulations that protect environmental health and ensure safety</td>
<td>4</td>
<td>1.9 (2.5)</td>
<td>5.6</td>
</tr>
<tr>
<td>4</td>
<td>Health promotion, including action to address social determinants, health inequity and health literacy</td>
<td>6</td>
<td>1.8 (1.9)</td>
<td>4.8</td>
</tr>
<tr>
<td>5</td>
<td>Disease prevention, diagnosis and investigation of environmental health problems and health hazards</td>
<td>14</td>
<td>4.6 (5.7)</td>
<td>8.9</td>
</tr>
<tr>
<td>6</td>
<td>Assuring governance for health, support environmental health public policy</td>
<td>27</td>
<td>8.4 (4.5)</td>
<td>26.2</td>
</tr>
<tr>
<td>7</td>
<td>Assuring a sufficient and competent environmental public health workforce</td>
<td>6</td>
<td>1.8 (1.9)</td>
<td>9.6</td>
</tr>
<tr>
<td>8</td>
<td>Assuring sustainable organisational structures, enforcement of the quality of health services</td>
<td>4</td>
<td>1.3 (1.3)</td>
<td>2.8</td>
</tr>
<tr>
<td>9</td>
<td>Advancing research and development on environmental public health</td>
<td>9</td>
<td>3.5 (5.3)</td>
<td>11.4</td>
</tr>
<tr>
<td>10</td>
<td>Regional consultation and support</td>
<td>9</td>
<td>3.9 (5.0)</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Services provided by the environmental public health workforce

Figure 1 shows the distribution of the capacity across the 10 EPHOs. All EPHOs were provided; most FTEs were spent on the essential operations ‘Surveillances of (the determinants of) population (environmental) health and wellbeing’ and ‘assuring governance for health’ and the least FTEs were spent on the EPHOs ‘health protection’ and ‘assuring sustainable organisational structures’. See table 3 for the specific percentages and the average hours per week spent per EPHO.

Compared to environmental public health physicians, environmental public health nurses were less often involved in performing the EPHOs, ‘Advancing research’ and ‘regional consultation and support’ (table 3).
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1. Surveillance, evaluation, and analysis of (the determinants of) environmental health and wellbeing
2. Monitoring and response to environmental health hazards and emergencies
3. Health protection, enforce laws and regulations that protect environmental health and ensure safety
4. Health promotion including empowering communities
5. Disease prevention, diagnosis and investigation of environmental health problems and health hazards
6. Assuring governance for health, support environmental health public policy
7. Assuring a sufficient and competent environmental public health workforce
8. Assuring sustainable organisational structures, enforcement of the quality of (public) health services
9. Advancing research and development on environmental public health
10. Regional consultation and support

Total size of the environmental public health workforce

The total capacity of the environmental public health workforce was estimated at 110 FTEs (range 79-152 FTEs) or 0.66 FTE per 100,000 inhabitants. Of the total FTEs, 97% (96 FTEs) was provided through the local public health services and 13 FTEs through other organizations.

DISCUSSION

We developed and applied a strategy to enumerate the size and composition of the general public health workforce and the services provided, on the basis of actual involvement in EPHOs. Quantitative estimates of self-reported individual respondents’ actual involvement in EPHOs collected through an online survey proved to be a useable source for national estimates of the environmental public health workforce. The questionnaire was well accepted and available benchmark data on physicians and the total number of environmental public health professionals working at local public health services supported the validity of the results emerging from the present study. In the Netherlands, the total size of the environmental public health workforce was estimated at 0.66/100,000 inhabitants. The EPHOs were provided through different organizations and performed by an experienced, highly educated and multidisciplinary workforce.

Our strategy started by specifying the EPHOs to environmental public health, followed by identifying the organizations and individuals considered to be involved in delivery of environmental public health. Because this resulted in inclusion of workers outside local public health service and from other disciplines than environmental public health as well, the estimation of the total capacity for environmental public health was – as expected - higher than previously estimated on the basis of registries. Furthermore the reference data were from 2011, and might explain a difference in workforce size as well.

In addition, our strategy resulted not only in data on the number of workers, but also in additional data on the composition of the workforce, educational background and the provision of EPHOs. Our study clearly demonstrates the multi-disciplinarity of the workforce in terms of educational degree as well as in background. Only 22% of the respondents was physician and the remainder had various educational backgrounds. The current health human resource planning model used in the Netherlands by the Advisory Committee on Medical Manpower planning ('Capaciteitsorgaan') is a mono-professional model to estimate the training inflow of physicians, including environmental public health physicians. Taking our results into account, implies that central workforce planning is only targeting 22% of the total workforce. (21) To address the whole workforce health human resource planning should be integrated.

Our study also revealed data on the EPHOs provided, by whom and for how many hours. A next step to support workforce planning would be to examine whether corresponding competencies are sufficiently addressed in the different curricula. (24, 25)

Whereas we demonstrated the feasibility of this new strategy for enumerating public health workforce for one specific example - the environmental public health workforce – we believe that this strategy can be applied to other public health sectors as well. The universal applicability is the result of the fact that this strategy has been based on EPHOs. Our approach is therefore also applicable to assess the capacity of the total public health
workforce in the Netherlands or abroad, as WHO’s EPHOs were considered valid for all WHO Eur countries. (20)

Although the feasibility of our measurement strategy was demonstrated and resulted in more insight in the size and composition of the environmental public health workforce than was available before from registry data, this first application brought some limitations to light that need to be addressed in further development. These include the selection of the environmental public health organisations; workers who were not used to classify their work according to the EPHOs; and the response rates.

Our estimation of the total capacity was dependent on proper identification of organizations harbouring people belonging to the environmental public health workforce. We explored per EPHO who or which organizations potentially perform that service, and decided to compose a core group and a peripheral group. The core group was identified through organisations who were likely to be involved in delivering environmental public health EPHOs and the peripheral group of those who might be involved in environmental public health. It could be that our selection was incomplete and in that case the total available capacity estimated in this study may be an underestimation of the real capacity. However, overestimation is also possible.

Workers were asked to classify their daily tasks according to the EPHOs and were asked to estimate the average time they spent on each of EPHOs per week. As the EPHOs were only recently introduced in Europe, workers are not yet familiar with linking their daily work to the EPHOs. This may have resulted in misclassification. For example some workers might have classified a specific task to a certain EPHO whereas it should have been classified to another EPHO. To prevent misclassification and to shape workers’ mental image of the tasks to be assessed, we added examples from daily practice to each of the EPHOs. As the group of environmental health experts recognized the overall results of the study as being in line with the provision of EPHOs in daily practice, we assume workers were able to classify their daily tasks to each of the EPHOs properly. However, further validation of the correctness of the classification and quantitative estimation of hours spent is required in further studies.

CONCLUSION

We developed and applied a novel strategy to enumerate the public health workforce based on assessment of individual workers’ involvement in EPHOs. We identified relevant organisations and individuals on the basis of EPHOs and obtained information from those individuals by using online questionnaires. Critical factors include the selection and recruitment of eligible organisation and the response rate. When existing professional registries are incomplete or do not exist, this strategy may provide a start to enumerate the quantity and quality of the public health within or across countries.

TEXTBOX 1

National Association of Local Public Health Services. ‘GGDGHOR Nederland’ is the national Association of Local Public Health Services (‘GGD’en’) and GHOR(Regional Medical Emergency Preparedness and Planning) offices in the Netherlands. By law, all Dutch municipalities have the obligation to protect, control and promote the health of their inhabitants. Each municipality is associated with a local public health service to carry out these tasks. There are about 400 municipalities in the Netherlands and they are served by 25 local public health services. This means that one local public health service is often jointly directed by several municipalities. Local public health services are responsible for preventive health care. All local public health services have a number of uniform tasks, as specified in the law: the Public Health Act. Examples of those tasks are Youth health, Infectious disease control, Health promotion and Environmental public health. Environmental public health focuses on the interactions with and effects of the environment on health, e.g. indoor and outdoor pollution and chemical safety.
REFERENCES


CHAPTER 5
Enumerating the preventive youth health care workforce: size, composition and regional variation in the Netherlands

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ABSTRACT

Objectives
The progress in workforce planning in preventive youth health care (YHC) is hampered by a lack of data on the current workforce. This study aimed to enumerate the Dutch YHC workforce. To understand regional variations in workforce capacity we compared these with the workforce capacity and the number of children and indicators of YHC need per region.

Methods
A national survey was conducted using online questionnaires based on WHO essential public health operations among all YHC workers. Respondents (n=3220) were recruited through organisations involved in YHC (participation: 88%).

Results
The YHC workforce is multi-disciplinary, 62% had > 10 years working experience within YHC and only small regional variations in composition existed. The number of children per YHC professional varied between regions (range 688-1007). All essential public health operations were provided and could be clustered in an operational or policy profile. The operational profile prevailed in all regions. Regional differences in the number of children per YHC professional were unrelated to the indicators of YHC need.

Conclusion
The essential public health operations provided by the YHC workforce and the regional variations in children per YHC professional were not in line with indicators of YHC need, indicating room for improvement of YHC workforce planning. The methodology applied in this study is probably relevant for use in other countries.

INTRODUCTION
The services provided by the preventive youth health care (YHC) workforce are pivotal to current youth and future population health. (1, 2) A recent study reported an inverse association between public health staffing and provision of preventive services to women and children on the one hand and infant mortality rates on the other; this finding confirmed similar results from earlier research. (4, 5) Insight into the capacity of the YHC workforce, and the services provided in relation to youth health needs, is required to support health human resource planning and to maintain and/or improve youth health. This also applies to countries with relatively good youth health. Although the health of youth in the Netherlands is among the best in Western Europe, promoting youth health remains a continuous challenge for the YHC workforce. Adverse trends over time in behavioural risk factors (e.g. overweight, and an uneven distribution of health across socioeconomic groups) may affect youth health and warrant continuous attention. (6) YHC is preventive care focusing on the growth and development of the child to prevent severe health problems, and is the largest discipline within the public health field in countries in Western Europe. (7)

Workforce planning, or health human resource planning, consists of activities to bring the quantity and/or quality of the health human resources to a desired level. (8, 9) Most countries in the WHO European region (WHO Eur), except for Albania, Spain and the Netherlands, make use of guidelines on the size of the YHC workforce in terms of a desired ratio between the numbers of children per YHC professional: ranging from e.g. 1 nurse per 350 children in Armenia to 1 nurse per 2000 children in Cyprus. (10) However, standards on the appropriate size and composition of the YHC workforce in relation to youth health needs are absent in WHO Eur countries. Also lacking is adequate insight into the size and composition of the YHC workforce and the services provided, also in the Netherlands.

It is essential to fill this gap in knowledge to support YHC health human resource planning and policy development. Therefore, this study enumerates the YHC workforce and services provided in the Netherlands. In the absence of standards on the appropriate size of the YHC workforce, we examine whether regional variations in the workforce capacity can be understood in terms of the number of children per region and variations in indicators of youth health care need. We assumed to find more YHC workers in regions with more children and more YHC workers in regions with e.g. a higher prevalence of children with overweight, as indicator of youth health care need.
METHODS

General study design
In 2013 we assessed the environmental public health workforce in the Netherlands using a newly developed strategy. This strategy showed that characterisation of the public health workforce and the services provided is feasible by 1. identification of relevant organisations and individual workers, and 2. obtaining information from those individuals via a questionnaire addressing the essential services provided. As this 2-step approach earlier appeared to be feasible and valid, we used this same strategy to assess the YHC workforce. (11)

For the essential services we used the 10 essential public health operations (EPHOs) as defined by WHO Eur in 2012. (12)

For the present study, a national cross-sectional survey was performed. The YHC workforce was defined as all workers who contribute to the delivery of YHC. This definition was operationalised as all those who consider YHC as part of their job and who are responsible for providing any of the EPHOs. We specified the WHO’s EPHOs for YHC and assessed the individual respondent’s involvement in these by means of an online questionnaire.

Every effort was made to adequately inform all participants and to protect their privacy. According to Dutch law, formal ethical approval was not required for this study.

Development of the questionnaire
For specification of the EPHOs to YHC existing policy documents were used, e.g. from the professional organisation of YHC physicians and documentation on the basic duties package which municipalities have to fulfil according the Public Health Act.(13) We also involved a group of 7 national YHC experts who agreed on the resulting specifications. Based on the documents and the expert opinions, we added two services: ‘management and team leadership’ and ‘providing a youth health safety net’ as this is a specific public health operation in the Netherlands.

Table 1 presents a description of youth public health and the related EPHOs in the Netherlands. The YHC questionnaire contained 20 items divided into three sections: i) Eligibility and socio-demographic variables, ii) job characteristics, and iii) EPHOs.

After some adaptations based on a pre-test of this questionnaire among 30 YHC workers, the questionnaire took about 10 min to complete.
Recruitment of participants
All organisations likely to conduct YHC tasks were identified, i.e. all local public health services, other local YHC organisations, national public health organisations, and universities. Within these, we invited all workers considered to be involved in youth EPHOs.

To enhance recruitment of as many employees substantially involved in YHC, e.g. to recruit respondents involved in EPHOs ‘monitoring’ and ‘health promotion’ outside the departments of YHC, all workers from the divisions of epidemiology and health promotion of the local public health services were approached. Similarly, all workers from specific research institutes and departments of public health of universities were approached to recruit workers involved in EPHO ‘advancing public health research’ and ‘assuring a sufficient and competent public health workforce’.

The mailing list was composed in collaboration with YHC experts and with support from the national association of organisations of the local public health services and one other national YHC organisation. This latter organisation supports YHC practice, policy and research from a national perspective and maintains a good overview of the national YHC networks.

Data collection strategy
The survey was performed in May 2014. The invitation to participate in the survey was distributed by e-mail to all organisations that agreed to participate, i.e. all local public health services (n=26) and 73% of the other YHC organisations (n=16) and, within these organisations, to >7000 workers. The invitation emphasised voluntary participation and confidentiality. The e-mail contained a link to a secured website where participants could complete the electronic questionnaire. In the week after the invitation, two reminders were sent to the non-responders. After two weeks the database was closed, data were downloaded, and the analyses were performed with SPSS 14.0.

Analysis
1. Composition and size of the YHC workforce
We characterised the composition of the workforce in terms of age, gender, educational level and medical or non-medical training, years of working experience in the current job title, and skills mix. The skills mix was expressed by the ratio physicians/nurses per region. This was calculated based on the educational background of the respondents (medical or nursing training completed).

The size of the workforce was characterised as the absolute number of full-time equivalents (FTEs), number of children to be treated per YHC professional, and the number of children aged < 5 years per YHC professional.

For a tentative estimation of the total FTEs of the national and regional YHC workforce, we assumed that YHC workers among the non-responders spent a similar number of working hours on youth EPHOs as the respondents. In the Netherlands, 36 working hours/week constitutes 1 FTE.

To assess regional differences in size and composition of the workforce, the country was divided in 4 regions to assure the anonymity of individual organisations: North (provinces of Groningen, Friesland, Drenthe; approx. 1.7 million inhabitants), East (provinces of Flevoland, Gelderland, Overijssel; approx. 3.5 million inhabitants), South (provinces of Noord-Brabant, Limburg; approx. 3.5 million inhabitants) and West (provinces of N-Holland, Z-Holland, Utrecht, Zeeland; approx. 7.9 million inhabitants). Each YHC organisation was assigned to one of the regions. When organisations provided services in two or more regions, the organisation was assigned to the dominant service region (this was the case for only one organisation).

For analysis of regional variations in the size and composition of the YHC workforce, we selected the workforce of the local YHC organisations and excluded the workforce in national institutions (n=29 respondents or 0.9% of the total number of respondents), as these institutions are located in one specific region but support the total workforce. The total FTE per region was calculated as the sum of the estimated FTEs per youth health organisation allocated to that region.

2. Essential Public Health operations provided
To gain insight into the services provided by the professionals, we assessed which EPHOs they provided and for how many hours per week. The distribution of FTEs over the EPHOs per region was calculated as the sum of all the hours spent per EPHO, per region, divided by 36.

Principal component analysis (PCA) was used to identify EPHO patterns among the respondents. PCA was performed with 11 components (EPHOs) and we used a Kaiser-Meyer-Olkin measure of 0.8, an eigenvalue >1 and orthogonal rotation (varimax).

Distribution of EPHO profiles per region was calculated based on the outcomes of the PCA analysis.

3. Association between the size of the workforce, services provided and indicators of youth health care needs
Dutch YHC professional guidelines recommend frequent scheduled contacts with the YHC organization, and routine screenings and vaccinations for all children aged < 5 years. For children aged 5-19 years, much less frequent visits are scheduled. Therefore, the number of children aged <5 years can be considered a need indicator for YHC. Our hypothesis was that there would be an association between regional variations in the numbers of children aged < 5 years and the size of the YHC workforce, expressed in the number of children aged < 5 years per YHC professional. (13)
Reducing inequalities in the distribution of determinants of health and child health is one of the tasks of the YHC workforce. Therefore, the percentages of children 1) living in deprived areas, 2) being referred to youth care, 3) living in poverty, 4) lagging behind at school and 5) with overweight, can be considered as need indicators for YHC. An association was assumed between indicators of YHC need per region and the size of the workforce expressed as the number of children per YHC professional.

We examined whether regional variation in indicators of need are in concordance with regional variations in workforce size.

RESULTS
Of the 48 YHC organisations throughout the Netherlands, 42 (88%) participated in this study. Within the organisations, the response rate was 51%. In total, data from 3220 YHC employees could be used for the analysis, of which 29 were from national institutions.

Size and composition of the workforce
Table 2 shows the composition and the size of the workforce. About 2/3 of the workers had > 10 years of working experience within YHC. Workers had different educational backgrounds. 19% had secondary school or intermediate vocational education, 44% were trained as a professional nurse, and 24% were university trained as physician. In the North workers were older and the percentage of workers with education to secondary school or intermediate vocational education was higher. For all other characteristics, no or only small differences were found between the regions. The number of nurses is about two times the number of physicians, reflecting the skills mix.

The total size of the workforce was estimated at 7000 YHC workers, corresponding to 4934 FTEs. The absolute number of YHC workers ranged from 524-2649 per region. The number of children per professional ranged from 688-1007. The absolute and relative workforce size was highest in the West of the Netherlands. Similar to the pattern of the number of children per professional, the number of children aged < 5 years per professional ranged between regions from 163-223, with the lowest number of children aged < 5 years per professional in the North (Table 2).

Table 2 | Characteristics, composition and size of the YHC workforce

<table>
<thead>
<tr>
<th>Total (respondents = 3191)</th>
<th>North (respondents = 328)</th>
<th>East (respondents = 1667)</th>
<th>West (respondents = 1557)</th>
<th>South (respondents = 639)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, female (%)</td>
<td>3074 (96)</td>
<td>308 (94)</td>
<td>642 (96)</td>
<td>1502 (97)</td>
</tr>
<tr>
<td>Age, years (SD)</td>
<td>48 (10.2)</td>
<td>50.3 (9.6)</td>
<td>47.5 (10.2)</td>
<td>46.9 (10.2)</td>
</tr>
<tr>
<td>&gt;10 years in same job (%)</td>
<td>1969 (62)</td>
<td>234 (71)</td>
<td>420 (63)</td>
<td>322 (57)</td>
</tr>
<tr>
<td>Working hours/week (SD)</td>
<td>23.7 (7.3)</td>
<td>23.4 (7.1)</td>
<td>23.2 (7.0)</td>
<td>23.0 (7.2)</td>
</tr>
<tr>
<td>Educational level (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary school/intermediate vocational education</td>
<td>621 (19)</td>
<td>89 (27)</td>
<td>124 (19)</td>
<td>265 (17)</td>
</tr>
<tr>
<td>Professional education other</td>
<td>220 (7)</td>
<td>27 (8)</td>
<td>59 (9)</td>
<td>117 (7)</td>
</tr>
<tr>
<td>Professional education: nurse</td>
<td>1418 (44)</td>
<td>129 (39)</td>
<td>309 (46)</td>
<td>681 (44)</td>
</tr>
<tr>
<td>University education other</td>
<td>200 (6)</td>
<td>20 (6)</td>
<td>431 (4)</td>
<td>118 (8)</td>
</tr>
<tr>
<td>University education: physician</td>
<td>731 (24)</td>
<td>328 (19)</td>
<td>144 (22)</td>
<td>375 (24)</td>
</tr>
<tr>
<td>Physician/nurse ratio</td>
<td>0.48</td>
<td>0.44</td>
<td>0.43</td>
<td>0.52</td>
</tr>
<tr>
<td>Type of EPHO profile, percentage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy profile</td>
<td>27.4</td>
<td>26.5</td>
<td>26.1</td>
<td>27.8</td>
</tr>
<tr>
<td>Practice profile</td>
<td>51</td>
<td>47.6</td>
<td>53.1</td>
<td>50.7</td>
</tr>
<tr>
<td>No specific profile</td>
<td>21.6</td>
<td>25.9</td>
<td>20.8</td>
<td>21.5</td>
</tr>
<tr>
<td>Estimated total FTE</td>
<td>4934.4</td>
<td>523.8</td>
<td>991.4</td>
<td>2649</td>
</tr>
<tr>
<td>Estimated no. of children per professional*</td>
<td>779.4</td>
<td>742.3</td>
<td>666.3</td>
<td>688.1</td>
</tr>
<tr>
<td>Estimated no. of children aged &lt;5 years per professional*</td>
<td>181.9</td>
<td>162.5</td>
<td>194.9</td>
<td>168.9</td>
</tr>
</tbody>
</table>

YHC=preventive youth health care  FTE= full-time equivalent

* CBS – Statistics Netherlands, 2013
Services provided

Figure 1 shows the distribution of the total FTEs across the different EPHOs. All EPHOs were provided; most FTEs were spent on the essential operations ‘Surveillance’, ‘Health promotion’ and ‘Disease prevention’ and the least FTEs were spent on the EPHOs ‘Health protection’ and ‘Psycho-social health incidents’. As the EPHO patterns were almost the same in all regions, only the overall picture is presented here.

Figure 1 | Percentage of full time equivalents per YHC essential public health operation

1. Surveillance of youth health and wellbeing
2. Monitoring and response to psycho-social incidents and emergencies
3. Youth health protection
4. Youth health promotion, addressing social determinants, health inequity and including advocacy communication and social mobilisation for health
5. Disease prevention, including early detection of illness
6. Promote, develop and support youth health public policy
7. Assuring a sufficient and competent YHC workforce
8. Assuring access to YHC and quality of YHC
9. Advancing YHC research to inform policy and practice
10. Assuring a YHC safety net
11. Management and team leadership

PCA identified two EPHO profiles (Table 3). The first indicates involvement in preventive and other operational services (EPHO 1 monitoring, 4 health promotion, 5 prevention, 7 assuring a competent workforce, and 10 health safety care net). The second profile is characterised by employees involved in governance for health and management (EPHO 6 governance for health, 9 research and development, 8 assuring access and quality, 11 management and team leadership, 3 health protection). Of all respondents, 78% could be assigned to either one of the EPHO profiles, about 50% to the prevention or ‘operational’ profile, about 25% to the governance for health or ‘policy profile’; nearly 25% could not be assigned to a specific profile, with only small variations between regions. The operational profile was slightly more prevalent in the East, corresponding to the higher percentage of nurses in the East.

Table 3 | Principal component analysis (Varimax rotation) - components and factor loadings of Essential Public Health Services

<table>
<thead>
<tr>
<th>Practice profile</th>
<th>Policy profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Disease prevention</td>
<td>0.83</td>
</tr>
<tr>
<td>4 Health promotion, advocacy communication</td>
<td>0.73</td>
</tr>
<tr>
<td>5 Health safety net</td>
<td>0.72</td>
</tr>
<tr>
<td>7 Assuring competent workforce</td>
<td>0.70</td>
</tr>
<tr>
<td>10 Surveillance, monitoring of youth health</td>
<td>0.58</td>
</tr>
<tr>
<td>6 Promote, develop public policy</td>
<td>0.74</td>
</tr>
<tr>
<td>2 Advancing Research &amp; Development</td>
<td>0.70</td>
</tr>
<tr>
<td>3 Assuring access to and quality of YHC</td>
<td>0.59</td>
</tr>
<tr>
<td>9 Management and team leadership</td>
<td>0.54</td>
</tr>
<tr>
<td>11 Health protection</td>
<td>0.46</td>
</tr>
<tr>
<td>8 Psycho-social incidents</td>
<td>-</td>
</tr>
</tbody>
</table>

YHC= preventive youth health care

Variation in indicators of preventive youth health care needs

The regional variation in the proportion of children with overweight was small. Because the other indicators of YHC need also showed small regional variation (children in deprived areas, referral to youth care, lagging behind at school), the regional variations in workforce size were not reflected in regional variations in need. However, in the North, the percentage of children living in poverty was high and the workforce size relatively low.
and hours spent per EPHO of respondents and non-respondents is recommended. The second limitation is that the data are self-reported; therefore, it is unknown whether the outcomes, e.g., the average time spent per EPHOs, reflect the actual time spent on EPHOs at individual level.

Third, classification into four regions might have diluted a possible association between higher YHC needs in the larger cities, e.g., due to more ethnic diversity, and the services delivered. Unfortunately it was not possible to perform the analysis on smaller regions as we had to guarantee the anonymity of individual organisations. We recommend to analyse possible associations between workforce capacity and indicators of youth health care needs in smaller regions, for example at the level of YHC organisations.

Finally, our results did not provide evidence for an explanation of regional differences in YHC workforce by corresponding differences in YHC needs, but the internal validity of this finding is limited by uncertainty about the quality of the data on indicators of need. To improve the validity of this analysis, we strongly recommend implementing a standardized national data collection with epidemiologic data on youth health, for example by pooling the standardized data collected by YHC organisations. Furthermore, empirical evidence on the relation between health needs and requirements of the workforce is lacking and also needs further study. However, the indicators used are relevant determinants for population health needs. Moreover, the epidemiological and socio-cultural factors we used are elements of the health human resource planning model applied in the Netherlands to estimate the training inflow of YHC physicians. (15-17)

**DISCUSSION**

Preventive YHC in the Netherlands is performed by a multi-disciplinary workforce with many years of experience in YHC. Overall, regional variations in the composition of the workforce were small. All EPHOs were provided and could be clustered into an operational profile and a policy profile. We found regional variations in the size of the YHC workforce, as indicated by the number of children per professional, ranging from 688-1007. These variations in the size of the YHC workforce were not in concordance with regional variations in the indicators of YHC need, because there was little variation in indicators of YHC need.

**Strengths/limitations**

This is the first study in the Netherlands to provide insight into the size and composition of the YHC workforce, as well as in the operations provided. We conducted a national study and invited all organisations involved in YHC to participate, with a high response rate (88%) among the organisations. However, the study has some limitations. The response rate among organisations was high but the response rate among the workers was lower (51%). Such a response rate is a well-known limitation of online questionnaire studies. (14) We did not conduct a non-response analysis, but we do know that time-restrictions were an important reason for non-participation for organisations as well as workers. If the participating YHC organisations cannot be regarded as representative for all the YHC organisations that we a priori selected for participation, the estimate of the totally available capacity in this study may be an underestimation of the real capacity. We cannot assess if the respondents within YHC organisations differed with respect to the variables of interest from the non-responders. Selective non-response within YHC organisations may have resulted in under- or overestimation of total workforce capacity. We statistically adjusted the total number of workers in YHC according to the participation rates, assuming that the non-participation at organisational and workers level was not selective. However, further study, comparing age-, sex and educational profiles of respondents and non-respondents per organisation, or preferably comparing the profiles of EPHOs provided

**Table 4 | Indicators of youth health care needs per region**

<table>
<thead>
<tr>
<th>Region</th>
<th>North</th>
<th>East</th>
<th>West</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Overweight (child 4-20 years)*</td>
<td>12.3</td>
<td>13.4</td>
<td>13.8</td>
<td>12.3</td>
</tr>
<tr>
<td>% Children in deprived areas (child 0-18 years)**</td>
<td>38.3</td>
<td>33.9</td>
<td>13.4</td>
<td>19.3</td>
</tr>
<tr>
<td>% Children referred to youth care (child 0-18 years)**</td>
<td>1.6</td>
<td>1.4</td>
<td>1.4</td>
<td>2.6</td>
</tr>
<tr>
<td>% Children in poverty (child 0-18 years)**</td>
<td>5.8</td>
<td>5.1</td>
<td>5.5</td>
<td>5.3</td>
</tr>
<tr>
<td>% Children lagging behind at school (child 4-12 years)**</td>
<td>9.1</td>
<td>10.5</td>
<td>12.1</td>
<td>11.3</td>
</tr>
</tbody>
</table>

* CBS – Statistics Netherlands, percentage children with overweight per region, 2008-2011

The current health human resource planning model used in the Netherlands by the Advisory Committee on Medical Manpower planning (‘Capaciteitsorgan’) is a mono-professional model to estimate the training inflow of physicians, including YHC physicians. (17) Taking our results into account, implies that central workforce planning is only targeting 25% of the total YHC workforce. To address the whole workforce and to include the dynamics of e.g. task-shifting policies, health human resource planning should be integrated and, at least, include YPH nurses in the workforce planning. (9)

**Interpretation**

Our study clearly demonstrates the multi-disciplinarity of the workforce. About half of the workforce consisted of YHC nurses, about a quarter was YHC physician and the remainder had various educational backgrounds, such as dieticians, medical assistants, and speech therapists. The current health human resource planning model used in the Netherlands is only targeting 25% of the total YHC workforce. To address the whole workforce and to include the dynamics of e.g. task-shifting policies, health human resource planning should be integrated and, at least, include YPH nurses in the workforce planning. (9) No regional variations were found in the EPHO patterns. This could be a reflection of the existing practice guidelines for YHC, i.e. the basic duties package. This package is offered to all children and includes schedules on the number of YHC visits and health checks that should be performed (13). We observed regional variations in the size of the workforce that could not be explained by regional variations in the indicators of YHC need. Wide variations in staffing levels across local public health systems have
been reported and might be explained by differences in the size of the public health organisation. (18, 19) However, our data do not support a relationship between YHC organisational size and workforce size, as three large YHC organisations are located in the West where the highest workforce size was found. Ideally, we would expect the levels of YHC need in the youth population to be congruent with the YHC workforce in terms of size, composition and services provided. (8, 20, 21) However, our study does not support this expectation, which suggests that some youth populations are under-served or over-served, indicating room for improving YHC workforce planning. The present study used a strategy that was previously developed and tested. Despite some limitations, we think the use of this strategy to enumerate the public health workforce is an improvement on current practice and can support YHC workforce planning. Central and structured workforce planning in the Netherlands is limited to the estimation of training inflow of qualified public health physicians, including YHC physicians. However, our results on the YHC workforce revealed that about a quarter of the YHC workforce consists of YHC physicians. Examples of other disciplines within the workforce were public health nurses, speech therapists, health promotion specialists and policy makers. For these disciplines no registers and no central workforce planning exist. Previous work on human resource planning in health care, addressed the shortcomings of mono professional planning. (8) Integration of different occupations into health workforce planning was mentioned as a need to improve health human resource planning. A change from mono-professional public health workforce planning to planning of the whole workforce, is necessary to optimize the contribution to population health. A first step towards integrated workforce planning and development is the assessment of the whole public health workforce in terms of size, composition and services provided. Our strategy for empirical enumeration of the public health workforce supports this, but requires further development and implementation.

Because of obvious differences in (public) health systems between EU member states, the results on the size and composition of the preventive youth health care workforce cannot just be extrapolated to other EU member states. However, as our strategy is based on EPHOs, and WHO’s EPHOs are considered valid for all WHO Eur member states, the strategy we developed for public health workforce assessment might also be applicable in other EU member states. Nevertheless, further research is required to develop the international applicability of our strategy. A strength of this strategy is that it allows enumeration across different organisations and among different professional disciplines. (7, 10) Another strength is that the strategy allows to assess not only the size and composition of the workforce but also the services provided. However, as YHC is organised differently within the EU countries, existing standards on the required children-to-provider ratio are difficult to compare.

CONCLUSIONS

This study provides insight into the national YHC workforce and regional variations in the size, composition and services provided. The essential public health operations provided by the YHC workforce and the regional variations in children per YHC professional were not in line with indicators of YHC needs, indicating room for improvement of YHC workforce planning. Insight in the public health workforce is an important condition for improvement of public health workforce planning. Our strategy, based on essential public health services offers promising results to enumerate the public health workforce in general, as a starting point to improve the empirical basis for workforce planning and development. However further development and validation of our strategy to characterize the public health workforce are needed. Additional research is needed to elucidate the associations between workforce size, composition and YHC needs, to support workforce planning to optimally promote, prevent and protect youth health.
Chapter 5

REFERENCES


CHAPTER 6

Implications of health as ‘the ability to adapt and self-manage’ for public health policy: a qualitative study

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Implications of health as ‘the ability to adapt and self-manage’ for public health policy: a qualitative study

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Implications of health as ‘the ability to adapt and self-manage’ for public health policy

ABSTRACT

Background
To explore the implications for public health policy of a new conceptualisation of health as ‘The ability to adapt and to self-manage, in the face of social, physical and emotional challenges’.

Methods
Secondary qualitative data analysis of 28 focus group interviews, with 277 participants involved in public health and health care, on the future of the Dutch healthcare system. WHO's essential public health operations (EPHOs) were used as a framework for analysis.

Results
Starting from the new concept of health, participants perceived health as an individual asset, requiring an active approach in the Dutch population towards health promotion and adaptation to a healthy lifestyle. Sectors outside health care and public health were considered as resources to support individual lifestyle improvement. Integrating prevention and health promotion in healthcare is also expected to stimulate individuals to comply with a healthy lifestyle. Attention should be paid to persons less skilled to self-manage their own health, as this group may require a healthcare safety net. The relationship between individual and population health was not addressed, resulting in little focus on collective prevention to achieve health.

Conclusions
The new concept of health as a basis for changes in the healthcare system offers opportunities to create a health-promoting societal context. However, inequalities in health within the general population may increase when using the new concept as an operationalisation of health. For public health the main challenge is to maintain focus on the collective socioeconomic and environmental determinants of health and disease and, thereby, preserve collective prevention.

INTRODUCTION

In 2011 Huber and colleagues challenged the WHO definition of health, formulated in 1948 as “A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” by introducing a new concept of health as “The ability to adapt and to self-manage, in the face of social, physical and emotional challenges” (1, 2). The WHO definition has been criticised with regard to: 1) the static nature of the definition, i.e. health as a state, 2) the changing patterns of morbidity, and 3) the operationalisation of the definition. Operationalisation of health as a state of ‘complete physical, mental and social well-being’ is difficult because it is not easy to either define or measure ‘complete’. Moreover, critics said, the requirement of complete well-being has contributed to the medicalisation of society (3-6). Patterns of population morbidity have changed since 1948 and the numbers of persons living with one or more chronic diseases has increased worldwide (7-9). According to WHO’s definition all these individuals are considered to be ‘ill’, without taking into account their level of functioning or well-being.

The new conceptualisation may meet some limitations of the WHO definition, as it is more dynamic and emphasises the resilience and capacity of people to cope with chronic disease. From the point of view of the new concept, people can be ‘healthy’ while living with chronic disease; therefore, compared to the WHO definition of health, more people can be considered to be ‘healthy’. Moreover, the new concept addresses the opportunities available to the individual, rather than focusing on their disabilities (10, 11).

The new concept has also received criticism, some related to public health. Public health is defined as the science and art of preventing disease, prolonging life and promoting health, through the organised efforts of society (9). The critical comments focused on the risk of reactive instead of proactive actions for health by individuals and professionals, since challenges to be faced in life are unknown until they occur. Others mentioned that the new concept is only applicable in circumstances that are within one’s control, whereas some social determinants of health may preclude the ability of individuals and communities to adapt to their circumstances (12-14).

We conducted a qualitative directed content analysis of data from group interviews with stakeholders in Dutch public health and healthcare to analyse the implications of the new conceptualisation of health as the ability to adapt and self-manage for public health policy.
METHODS

Study design
The new conceptualisation of health is one of the pillars supporting the recent formal advice to the Dutch Minister of Health intended to prepare healthcare professions and health education to effectively cope with future challenges in healthcare (15). The pros and cons of the new concept of health were the subject of a qualitative study based on focus group interviews with stakeholders in Dutch public health and healthcare. We used these data for a secondary data analysis.

Sample
A purposive sampling strategy was used to recruit focus group participants representing different stakeholder groups in the public health and healthcare sectors, as well as different organisations in the field of practice, research, education and policy (Attachment 1).

The 28 group interviews included 8 persons on average (277 participants in total) and each group session lasted ± 1.5 h.

Table 1 | The WHO’s essential public health operations (EPHOs).

<table>
<thead>
<tr>
<th>Essential public health operations</th>
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<tbody>
<tr>
<td>1 Surveillance of population health and wellbeing</td>
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<tr>
<td>2 Monitoring and response to health hazards and emergencies</td>
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<tr>
<td>3 Health protection including environmental occupational, food safety and others</td>
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<tr>
<td>4 Health promotion including action to address social determinants and health inequity</td>
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<tr>
<td>5 Disease prevention, including early detection of illness</td>
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<tr>
<td>6 Assuring governance for health and wellbeing</td>
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<tr>
<td>7 Assuring a sufficient and competent public health workforce</td>
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<tr>
<td>8 Assuring sustainable organisational structures and financing</td>
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<tr>
<td>9 Advocacy communication and social mobilisation for health</td>
</tr>
<tr>
<td>10 Advancing public health research to inform policy and practice</td>
</tr>
</tbody>
</table>

Data collection
Data were collected during September through November 2013. Focus groups discussed four open-ended questions: 1) Reflect on the new concept of health, 2) What does a future healthcare system based on the new concept of health mean for citizens and their networks, 3) What support do citizens need in such a system, and 4) What should be done to achieve such a system?

The focus groups were moderated by skilled facilitators with a background in public health or healthcare. An additional person was present to take notes. All discussions were tape-recorded, anonymised and transcribed into summary reports. Later, the reports were sent to the participants to be checked for accuracy.

Ethics Statement
Every effort was made to effectively inform the participants and protect their privacy. According to Dutch law, no formal ethical approval was required for this study.

Framework for analysis
For the analysis, we operationalized public health according to the aim of our study to assess the implications of a new conceptualisation of health for public health policy as well as according to 10 essential public health operations (EPHOs) WHO Europe (WHO EUR) defined in 2012. (16) A systematic direct content analysis was conducted, using WHO EUR EPHOs as initial coding categories (Attachment 1). We added ‘health safety net’ as a category as this is a specific public health operation in the Netherlands (17).

This analysis involves a systematic process of sifting, charting and sorting material according to the EPHOs, going through the following stages: familiarisation with the data, identification of the thematic framework, indexing, charting and mapping, and interpreting (18, 19).

The familiarisation stage provided an overview of the richness and diversity of the data. Notes on the responses on EPHOs and on additional and recurrent public health themes and issues that appeared to be important to participants were used to develop a thematic framework of the EPHOs extended with key public health themes.

Subsequently the framework was systematically applied to the material and all data were re-read and annotated accordingly. The coding was done manually by MJ and checked by TN, who organised the focus group discussions.

Finally, the tables with headings and subheadings for each theme of the framework were used to describe patterns and connections through an iterative, comparative process of searching, reviewing, and comparing the data. Potential discrepancies were identified and solved in discussions among MJ, DR, MLEB and TN.
Also, there is such a thing as a hierarchy in the possibilities of being able to take responsibility for restoring health. The premise is that people are able to take control. However, not everyone can participate according to the ideal of the new concept: for example, people aged 85+, the frail elderly, and those with mild intellectual disabilities. Not everyone can get involved and we as a society have a responsibility to support these people.

1. Health as an individual asset

Overall, participants supported the new concept of health. Four key patterns emerged regarding implications for public health: 1) health as an individual asset, 2) health as a healthy lifestyle, 3) health as focus of the healthcare system, and 4) health in the context of social support.

### 1. Health as an individual asset

Starting from the new concept of health, participants perceived health as an individual asset. According to the participants the new concept places emphasis on people’s own responsibility for health and implies an individual and active approach towards health and a healthy lifestyle, Table 2, quotation 1.

Respondents also pointed out potential side-effects of the new concept, including i) the inability of certain groups to adapt and self-manage, ii) the risk of ‘blaming the victim’, and iii) the neglect of certain public health services.

#### 1.1 Ability to adapt and to self-manage across the population

In the new conceptualisation, adaptation and self-management are considered prerequisites to be healthy. Participants indicated that several groups might be unable to fulfil these requirements as individuals differ in their inherent capacity to adapt and to self-manage. For example, frail older people, or persons with mild mental disorders, are less able to manage their own health. People who are less advantaged in terms of education, income, or social position, might have lower health literacy skills which may also impair their ability to adapt and self-manage. In terms of the new concept of health, these persons would be labelled as ‘unhealthy’ and would probably never be able to achieve the status ‘healthy’.

When applying the new concept of health some participants expected that the above-mentioned groups would become more vulnerable, possibly leading to an increase in inequalities in health. As a result, more people would need help from the healthcare safety net. One focus group indicated that supporting the health of less skilled persons should be considered a societal responsibility, Table 2, quotation 2.

#### 1.2 Blaming the victim

Several respondents indicated the risk of ‘blaming the victim’ as an inherent side-effect when individuals are considered to be responsible for their own health. When health problems occur these might be seen as a result of their own choice for unhealthy behaviour.

Vice versa, people with sufficient ability to adapt and self-manage their health may be less willing to pay for the healthcare costs of people who ‘chose’ for an unhealthy lifestyle. In turn, this may affect the financial solidarity of our healthcare system. Table 2, quotation 3, 4.
1.3 Public health services
Some participants acknowledged that the emphasis on individual responsibility to adapt and self-manage could lead to neglect of important population-based public health services that contribute to our current population health status. Preventive youth healthcare was proposed as a representative example, see Table 2, quotation 5, 6.

2. Health as a healthy lifestyle
Participants interpreted being responsible for your own health as adopting a healthy lifestyle. They considered choosing for healthy behaviour to be the best option to take this responsibility and to prevent health problems. Participants stressed that people would need support to adapt to a healthy lifestyle and suggested that such support should also come from sectors outside healthcare. Several strategies were mentioned that might increase a person’s adaptability, including education, health protection and (within healthcare) health promotion.

2.1 Education
Participants believed that people need health education to become more health literate and health education should start early in life.; primary schools could play an important role in educating children in health literacy and self-control. Also secondary schools and sports clubs could contribute to teaching children about health promotion. Table 2, quotation 7.

2.2 Health protection
Respondents indicated that authorities need to be supportive in creating a healthy (i.e. an adapting and self-managing) population. They mentioned various health protective options that might help, such as rules, regulations and legislation. For example, legislation on age restrictions for buying cigarettes, or regulations on the use of salt in food products.

2.3 Health promotion
Participants indicated that health promotion within the healthcare sector, offered by healthcare providers, could play a role in supporting people to adapt and self-manage. For example, care providers should not restrict consultations to treatment alone, but should also address options for health promotion and prevention to support people in making responsible and informed choices about their health. According to the participants, health promotion should be a key competence for all health professionals, as illustrated with the following example, Table 2, quotation 8.

3. Health as focus of the healthcare system
Some participants indicated that health as the ability to adapt and to self-manage requires a change in the focus of the healthcare system: health as the ability to adapt and self-manage should become the outcome measure. Adapting the current financial model of health care was mentioned as a strategy to change incentives in the direction of the desired outcome of the healthcare system: prevention of disease and maintenance of good health should be reimbursed instead of solely treatment of diseases. Table 2, quotation 9, 10.

4. Health in the context of social support
Although participants approached prevention mainly as health promotion and measures to support adaptation to a healthy lifestyle, other aspects to support individual health were also discussed. Social mobilisation for health (through social and community care networks) was suggested as an aspect of prevention that would become increasingly important, i.e. participants believed that social support through community networks would help individuals to take responsibility for their own health and to support others in this aim. Table 2, quotation 11, 12.

DISCUSSION
Our findings reveal that a new conceptualisation of health as ‘the ability to adapt and self-manage’ may stimulate an active approach of individuals towards health promotion and adaptation to a healthy lifestyle. The new concept also provides support for creating a health-promoting society that helps individuals to adapt and self-manage. Health promotion should become a competence of all healthcare providers. Our findings did not show that the new conceptualisation encourages a focus on the relationship between individual and population health; this resulted in a low priority among the participants for collective prevention to achieve health. Moreover, the results show the new conceptualisation may result in an increase of socio-economic inequalities in health because not all individuals are equally capable of taking care of their own health.

Interpretation of the findings
The results show that a different conceptualisation of health may result in a change of priorities for public health operations and thus in the EPHOs to be delivered. The observation that focus group participants perceived health as an individual asset requiring an active approach in the population towards health promotion and adaptation to a healthy lifestyle will lead to an increase in the need and delivery of EPHO ‘health promotion’, which may impact training needs. Furthermore, an increase of health promotion within the curative sector offered by medical care providers, implies that health promotion must be a key competence for all physicians, including medical specialists and general practitioners. With regard to public health policy and training needs, this implies an extension of public health training needs towards professionals in the curative sector as well. The need for incorporation of health promotion and public health competencies within the curricula of all physicians has been advocated before, by the Lancet committee on Education of health professionals for the 21st century and also by Levy and Wegman, Plochg and Essink-Bot. (20, 23). Layers 2 and 3 were clearly addressed by the participants of the focus groups. Our outcomes suggest that innovations in the healthcare system starting
The fact that ‘health as an individual asset’ and ‘health as a healthy lifestyle’ were addressed in more detail than ‘health as focus of the healthcare system’ and ‘health in the context of social support’ may be a result of the methodology. It might be that participants of the focus groups address issues regarding a personal level easier than on a social- or healthcare system level. However, this requires further research.

Earlier comments, that the new conceptualisation of health would stimulate a reactive attitude towards health, were not confirmed in this study. This unexpected finding might be explained by the context of the health policy in the Netherlands. The current national government strongly advocates holding people responsible for their own health. As part of this policy, and during the period in which the focus group interviews took place, the government was preparing the decentralisation of several national healthcare and public health services to local governments. However, participants in the focus groups were explicitly asked to provide their views on the future healthcare system in 2030, starting from the new concept of health. Whether the new conceptualisation of health would stimulate an active approach towards health in other European countries as well requires further research, as public health systems are different among the European member states.

Our study also revealed some potentially serious threats for public health. The most important is the possible neglect of socio-economic, cultural and environmental determinants of health. The WHO definition also fails to address these determinants, and our findings suggest that this is not likely to improve when using the new concept of health. Ignoring those determinants and, thus, collective prevention programs for health, will not only negatively affect population health but may lead to increasing health inequalities which in turn negatively influence individual health.

Known causes of persisting inequalities in health include inequalities in education, income and social position. The creation of equal opportunities of health requires action within the healthcare system, as well as on the conditions in which people are born, develop, work and age, and on the drivers of these conditions. Interventions to improve these conditions not only need strong governance for health through the collective effort of society, but also need support from society itself.

Persons with lower health literacy skills are more likely to have a lower health status than individuals with good health literacy skills. Our results suggest that health conceptualised in terms of adaptation and self-management challenges equal opportunities for health even more, because several groups may lack sufficient ability to adapt and self-manage. In a society and a healthcare system of increasing complexity, these groups may become even more vulnerable. Therefore, the new conceptualisation of health may lead to an increase of health inequalities.

### Implications for public health policy

In making changes in the healthcare system based on the new concept of health, we recommend to integrate support of adaptation and self-management of individuals into the whole healthcare system. Second, at a population level, we strongly recommend to nurture, maintain and improve collective prevention. Finally, we recommend to combat health inequalities and promote the health of disadvantaged groups by integrated approaches that reach beyond the healthcare sector.

Future research on the conceptualisation of health as adaptation and self-management should focus on monitoring the effects on population health, and on further exploration of how to increase the opportunities for public health and how to integrate public health and health care.
CONCLUSIONS

The new concept of health offers opportunities to create a health-promoting societal context; however, some inequalities in health within the population may increase. For public health, the main challenge is to maintain the focus on the collective socioeconomic and environmental determinants of health and disease and, thereby, preserve collective prevention. Individuals who are less able to take care of their own health will need our continuous support and the presence of an effective healthcare safety net.

ACKNOWLEDGEMENTS

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ATTACHMENTS

Attachment Table 1 | Overview groups of participants in the focus groups

<table>
<thead>
<tr>
<th>Focus groups</th>
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<tbody>
<tr>
<td>Institutions for health care education and training</td>
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<tr>
<td>University medical centres 1</td>
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<tr>
<td>University medical centres 2</td>
</tr>
<tr>
<td>Life Long Learning, post-graduate education</td>
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<tr>
<td>Inspectorate of Health Care</td>
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<tr>
<td>Pharmacy</td>
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<tr>
<td>Municipal Health Services</td>
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<tr>
<td>Healthcare entrepreneurs</td>
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<tr>
<td>Professionals mental health care</td>
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<tr>
<td>Social workers</td>
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<tr>
<td>Physiotherapists</td>
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<tr>
<td>Nursing</td>
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<tr>
<td>Midwifery care</td>
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<tr>
<td>Primary care</td>
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<tr>
<td>Medical specialists</td>
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<tr>
<td>Institutes for Research and Development</td>
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<tr>
<td>Dental hygienists</td>
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<tr>
<td>Patients 1</td>
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<tr>
<td>Patients 2</td>
</tr>
<tr>
<td>Patients 3</td>
</tr>
<tr>
<td>Professional organisations</td>
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<tr>
<td>Ministry of Health, Welfare and Sports</td>
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<tr>
<td>Dutch organization of volunteer work</td>
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<tr>
<td>Representatives from patient, educational and health care organisations in Amsterdam</td>
</tr>
<tr>
<td>Representatives from patient, educational and health care organisations in province Friesland</td>
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<tr>
<td>Care for disabled persons</td>
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<tr>
<td>Institutions of Mental Healthcare</td>
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<tr>
<td>Welfare organisations</td>
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</table>
REFERENCES

CHAPTER 7
General Discussion
INTRODUCTION

In this chapter the results of the studies presented in this thesis will be summarised by answering the research questions (paragraph 7.1), followed by a discussion of methodological issues (paragraph 7.2) and a discussion of the results in light of findings from other studies and of public health practice (paragraph 7.3). The chapter ends with a general conclusion (paragraph 7.4) and implications and recommendations for future research, policy and practice (paragraph 7.5).

ANSWERS TO THE RESEARCH QUESTIONS

Here we summarize the contribution of the main findings of the studies presented in this thesis to the answers to the research questions of this thesis.

What is the quantity and quality of the Dutch public health workforce, using existing data sources?

Pooling the available workforce data from 7 reports resulted in a ‘best estimate’ of the total Dutch public health workforce of 12,000 FTE. The point estimate of 12,000 FTE is inaccurate, mainly because of the different definitions of the public health work field that were used in the various documents. For example, in one report the public health work field was defined as “all municipal health services”, whereas in another report it was defined as “a diverse mix of organizations”. Moreover, the number of functions or roles assessed in the different reports varied between 1 and 15. We concluded that insight in the quantity and quality of the current Dutch public health force is limited and that planning future workforce numbers and educational needs based on the current capacity of the public health workforce in the Netherlands is not possible using the currently existing data.

What are the scope and Essential Public Health Operations of public health in the Netherlands, based on international examples?

Analysis of several authoritative international examples of defined essential public health operations (EHPOs) on country level showed general consensus on the overall role of public health in terms of scope and core functions. This consensus justified definition of the scope of public health in the Netherlands in accordance with the international examples as: ‘To promote health and an equal distribution of health through population based interventions aiming at protecting and promoting health and preventing disease’.

Based on the international consensus on nine core functions of public health we adopted essential public health operations for the Netherlands and added ‘providing a health safety net’ as a typically Dutch EPHO. The ten proposed EPHOs for the Netherlands are: 1. monitoring population health, 2. disease prevention and control, 3. health promotion, 4. health protection, 5. public health emergency response, 6. health safety net, 7. healthy public policies, 8. public health research and development, 9. competent workforce, 10. sustainable organisational structures, quality of (public) health services.

These specifications of the scope of public health and of essential public health operations were the basis to develop a strategy to empirically enumerate the public health workforce. This strategy consists of 1. selection of organisations that provide public health; 2. within these organisations, assessment of educational qualifications and the hours spent on EPHOs by individual workers using an online questionnaire. The online questionnaire was developed based on a review of the literature on workforce enumeration, interviews with public health experts and consultation with other researchers.

What is the feasibility and validity of an EPHO-based strategy to measure the size, composition and qualifications of environmental public health workforce in the Netherlands?

The environmental public health workforce was defined as all workers who contribute to the delivery of environmental public health. We identified organisations involved in providing environmental public health. The questionnaire was distributed among all potential environmental public health workers within the selected organisations in the Netherlands and resulted in data on the environmental public health workforce.

The questionnaire was well accepted and available benchmark data on environmental public health physicians supported the results of this study regarding the medical part of the workforce. Experts on environmental public health recognized the present results on the provision of EPHOs as a reasonable reflection of the actual situation in practice. All EPHOs were provided by an experienced, highly educated and multidisciplinary workforce. 27% of the total full-time equivalents (FTEs) was spent on EPHO ‘assuring governance for health’. Only 4% was spent on ‘health protection’. The total FTEs were estimated as 0.66 /100,000 inhabitants.

We concluded that characterisation of the public health workforce was feasible by identification of relevant organisations and individual workers on the basis of EPHOs, and obtaining information from those individuals by questionnaire. Critical factors include the operationalization of the EPHOS into the field of study, the selection and recruitment of eligible organisations and the response rate within organisations.

What is the quantity and quality of the preventive youth health care [jeugdgezondheidszorg] workforce in the Netherlands and can regional differences in workforce be understood in terms of indicators of youth health care need?

The questionnaire we developed to assess the environmental public health workforce was adapted to preventive youth health care, which basically means that we adapted the accompanying examples of daily practice of each EPHO to preventive youth health care. Distribution among all potential youth health care professionals in the Netherlands resulted in data on the youth health care workforce in total and per region. The preventive
youth health care workforce is multi-disciplinary, 62% had > 10 years working experience within preventive youth health care and only small regional variations in composition existed. The number of children per youth health care professional varied between regions (range 688-1,007). All EPHOs were provided and could be clustered in an operational or policy profile. The operational profile prevailed in all regions. Regional differences in the number of children per preventive youth health care professional were unrelated to the percentage of children with overweight, living in poverty, referred to youth care or living in deprived areas. The regional differences in size of the preventive youth health care workforce were thus not in line with indicators for preventive youth health care needs.

**What are the implications of application of a new conceptualization of health for public health policy?**

We performed a secondary qualitative data analysis of 28 focus group interviews with 277 participants involved in public health and healthcare on the future of the Dutch healthcare system. Starting from the conceptualisation of health in terms of adaptation and self-management, participants perceived health as an individual asset, requiring an active approach in the Dutch population towards health promotion and adaptation to a healthy lifestyle. Sectors outside healthcare and public health were considered as resources to support individual lifestyle improvement. Integrating prevention and health promotion in healthcare is also expected to stimulate individuals to comply with a healthy lifestyle. Attention should be paid to persons less skilled to self-manage their own health, as this group may require a healthcare safety net. We conclude that a new concept of health as a basis for changes in the healthcare system offers opportunities to create a health-promoting societal context. However, inequalities in health within the general population may increase when using the new concept as an operationalisation of health. For public health the main challenge is to maintain focus on the collective socioeconomic and environmental determinants of health and disease and, thereby, preserve collective prevention.

**METHODOLOGICAL ISSUES**

This section offers an overview of the main strengths and limitations of these studies for the internal and external validity of our findings.

A strength of this thesis is the combination of methods used in the various studies. We used quantitative as well as qualitative research methods, which resulted in numbers on the public health workforce as well as in qualitative perspectives on future public health needs. Another strength is that we conducted nationwide studies, which offered the opportunity not only to study the total public health workforce within environmental public health and preventive youth health care, respectively, but also to assess regional variations in capacity for preventive youth health care. A third strong point is the high participation rate of the public health organisations in the enumeration studies (chapter 4 and 5) and the large number of focus groups in the qualitative study (chapter 6).

**Internal validity**

Enumeration strategy

As existing data sources appeared to be incomplete and did not cover the whole public health workforce, we developed a strategy to collect primary data on the public health workforce. Although these provide more insight in the workforce and the services provided by that workforce than was available before, the internal validity of the proposed strategy may be affected by 1. the selection of organisations, 2. the response rates within organisations, 3. the use of EPHOs and 4. the self-report character of the data.

First the selection of public health organisations. Our estimation of the total capacity was dependent on proper identification of organisations harbouring workers belonging to the public health workforce. In the studies presented in chapters 4 and 5, we explored per EPHO who or which organizations potentially perform that service. If, as an example, the selection of preventive youth health care organisations in Chapter 5 was incomplete, or if the participating organisations cannot be regarded as representative for all the preventive youth health care organisations that we a priori selected for participation, the estimate of the totally available capacity estimated in this study may be an underestimation of the real capacity. However, in de environmental public health study (Chapter 4) we showed that the results on the estimated number of workers were in line with available benchmark data, a finding that supports the validity of our estimate. The number of organisations involved in preventive youth health care (chapter 5) was much higher than in environmental public health (chapter 4). We did our utmost best to include all the preventive youth health care organisations, for example by ensuring support for the study of the professional associations for preventive youth health care physicians, nurses and assistants, which resulted in participation of almost 90% of the organisations. We corrected the total number of workers in environmental public health and preventive youth health care according to the participation rates, assuming that the non-participation at organisational level was
not selective and we assume this has not resulted in significant under- or overestimation. However, further research is needed to confirm if our assumption is correct, for example by verifying the actual number of preventive youth health care employees in the missing organisations.

Second, non-response within organisations. The two enumeration studies we performed showed non-response (30-50%). Non-response is a well-known limitation of questionnaire studies. We cannot assess if the responders within preventive youth health care or environmental public health organisations significantly differed with respect to the variables of interest from the non-responders, e.g. selective non-response. Selective non-response within preventive youth health care or environmental public health organisations may have resulted in under- or overestimation of total workforce capacity. Further study, for example comparing age-, sex and educational profiles of respondents and non-respondents per organisation, or preferably comparing the profiles of EPHOs provided and hours spent per EPHO of respondents and non-respondents is recommended.

Third, we used public health domain specific EPHOs as the basis of our questionnaires. We asked workers to classify their daily tasks according to these EPHOs and to estimate the average time spent on each of these EPHOs per week. Misclassification of tasks by individual workers may have occurred, because of unfamiliarity of public health workers with EPHOs. The EPHOs were only recently introduced in Europe, and not yet in the Netherlands, so workers were not familiar with linking their daily work to the EPHOs yet. Some workers may have classified a specific task to a certain EPHO whereas others classified it to another EPHO. To prevent misclassification at individual level and to shape workers’ mental image of the tasks to be assessed, we added domain-specific examples from daily practice to each of the EPHOs. Eligible examples were selected with help of domain-specific experts and professionals organisations for environmental public health and preventive youth health care. As the EPHO profiles resulting in Chapters 4 and 5 were recognized as reflections of daily practice in environmental public health as well as in preventive youth health care by experts, we assume that significant misclassification was not present at group level. We conducted a pilot study in which we assessed among a small group (n=30) of preventive youth health care workers whether a list of frequently provided tasks within this sector was classified similarly by all the participants. The results showed no substantial misclassification at group level, but the numbers were too small to allow for meaningful statistical analysis. Further study, for example by repeating the pilot study with more participants is required.

Fourth, the data on delivery of EPHOs and the time spent per EPHO were based on self-report. Self-reported data are relatively easy to obtain, however, the disadvantage is that we cannot check whether the reported average time spent per EPHO reflects the actual time spent on this EPHO at individual level. Checks of the total number of working hours reported as spent on separate EPHOs with the total number of working hours per week for individual respondents did not show large discrepancies. Therefore we assume the self-reported data to reflect the actual time spent per EPHO quite accurately at aggregate level. However, validation by empirical evaluations is recommended.

The analysis of preventive youth health care needs

The assessment of the associations of regional differences in preventive youth health care needs and regional differences in the number of preventive youth health care workers was based on available national data on youth health indicators with regional specification. Data on youth health indicators were scarce and insufficient, which may have influenced the internal validity of the results of this analysis. Our results did not provide evidence for an explanation of regional differences in the preventive youth health care workforce by corresponding differences in preventive youth health needs, but the internal validity of this finding is limited by uncertainty about the quality of the data on indicators of need. To improve the validity of this analysis, we strongly recommend to implement a standardized national data collection with epidemiological data on youth health, for example by pooling the standardized data that are collected by youth health care organisations (‘Basis Data set JGZ’).

Public health consequences of a new conceptualisation of health (Chapter 6)

We used focus group data to assess the implications of the new conceptualisation of health for public health. A limitation of this study was that we performed secondary data analysis; the implications of the new concept of health for public health were not the primary focus of the interviews. That may partly explain why some aspects of public health were not addressed during the interviews. However, by means of the various items included in the topic list, respondents were invited to mention the relevance of collective prevention and the wider determinants of health as part of the future health system.

External validity

Generalizability of the results of the enumeration studies to the whole public health workforce Although we studied different public health domains, i.e. environmental public health and preventive youth health care, the total picture of the public health workforce in the Netherlands is still patchy. In other words, our studies did not provide complete insight in the total public health workforce. The results of the studies into environmental public health and preventive youth health care showed that the workforce in both domains is assessable by using the same strategy. However, the outcomes in terms of training qualifications or EPHO profiles are really different, suggesting that the results of the studies presented in this thesis cannot be extrapolated to estimate the total Dutch public
health workforce capacity. As the first studies showed promising results with regard to the application of the strategy, we first recommend further development and validation of this strategy, including the studies recommended in the internal validity section. Subsequently the other parts of the public health workforce can be assessed using our strategy to complete the national public health workforce picture.

Generalizability of our strategy to the health care workforce

The use of EPHOs has proven to allow for workforce enumeration across different organisations and among different professional disciplines within public health. However, the medical care or curative sector also provides public health services. Our strategy offers the opportunity to assess contributions from other healthcare sectors to public health, for example primary care. However, we have not yet applied the methodology to other healthcare sectors. We recommend to start with a pilot study, for example among a group of general practitioners. A first step would be to adjust the examples of daily practice per EPHO to examples of daily practice of general practitioners, as general practitioners are probably less acquainted with the essential operations of public health.

Generalizability of the results to other countries

Because of obvious differences in (public) health systems between EU member states, the results on the size and composition of the environmental public health and preventive youth health care workforce cannot automatically be extrapolated to other EU member states. However, as our strategy is based on EPHOs, and WHO’s EPHOs are considered valid for all WHO European member states, the strategy we developed for public health workforce assessment can also be used in other EU member states. WHO Europe launched an action plan for strengthening public health capacities and services in 2012.[1] This action plan proposed the ten EPHOs as unifying and guiding framework for any European health authority to set up, monitor and evaluate policies, strategies and actions for reforms and improvement in public health. The Association of School of Public Health in the European Region (ASPHER), that assessed the exit competences of public health graduates across a diverse European landscape in 2011, used the EPHOs as a framework to group the competencies.[2] Both projects illustrate the applicability of the EPHOs at different levels; for policy as well as training purposes across Europe. Further research is required to develop the international applicability of our strategy. We recommend to start assessing the use of the strategy in a pilot study before applying it to the country wide public health workforce. First, the selection of organisations providing public health services might be different from that in the Netherlands because public health systems differ between member states. Second, it may be that several questions in the questionnaire need some adjustment in wording in order to align with country specific circumstances. An internationally applicable strategy for public health workforce enumeration provides a basis for cross-national comparison of workforce data.

Sustainability of EPHOs over time

We proposed EPHOs for the Netherlands on the basis of international examples and by assessing the international examples with the Dutch public health system. EPHOs describe the main tasks of current public health. Whether the EPHOs are sustainable and are still valid when future changes in the health care system are implemented, e.g. a new conceptualisation of health, we do not know. We recommend to evaluate the validity of the EPHOs every several years, for example by assessing the EPHOs with timely policy documents, literature review and interviews with public health and health care professionals.

REFLECTION ON AND DISCUSSION OF THE RESULTS

In the following paragraph we reflect on the current public health workforce and public health workforce governance in the Netherlands in the light of our research findings and we discuss the implications of the findings for improving public health workforce governance. We will first give a short overview of the governance of public health workforce in the Netherlands.

Public health workforce planning in the Netherlands: a short overview

Public health workers deliver services that contribute to the overall aim and goals of public health. As argued in the introductory chapter of this thesis, a knowledgeable, competent and prepared workforce is essential to achieve the aim and goals.(3-6) Workforce planning, in this case public health human resource planning, tries to anticipate how many and what type of human resources will be necessary in order to maintain and improve the quality, quantity, availability and effectiveness of the public health services provided.(7-9)

Public health workforce planning and development in the Netherlands is governed at different levels: a. the organisations providing public health services, b. the public health physicians, organised within organisations of professionals for physicians [e.g. KAMG] and c. the National government through the Advisory Committee on Medical Manpower planning [Capaciteitsorgaan].

In the Netherlands, the Ministry of Health, Welfare and Sports is responsible for public health. Many public health tasks are decentralized to local governments and provided through local public health services (GGD’en). (10) Besides local public health services, also other local and national organizations provide public health tasks, like academic research groups and the National Institute for Public Health and Environment (RIVM). The delivery of public health services is legally founded in the Public Health Act, but there is no central human resource policy regarding the provision of public health services. (10) In addition, in the Netherlands but also internationally, hardly any standards or guidelines
are available on the appropriate public health workforce size and composition with regard to public health needs and population health outcomes. In The Netherlands, each local public health organisation is responsible for its own human resource management.

The public health physicians, organised in the organisation of professionals for public health physicians [KAMG] are involved in workforce governance regarding the quality and quantity of the group of public health physicians. Examples of tasks of this governance by professionals include to maintain and develop professional practice standards, to contribute to the training of new public health physicians by development of general education plans and to advise the Ministry of Health, Welfare and Sports on the national distribution of training positions for public health physicians.

By government order, the Advisory Committee on Medical Manpower planning [Capaciteitsorgaan], assesses the required training inflow of public health physicians at a national level, every four years. The Advisory Committee on Medical Manpower planning uses a simulation model that basically uses the current number of trained public health physicians within a specific domain as input, and produces estimations on the required inflow of public health physicians within that same domain as output. One of the determinants of the required inflow within the model is the expected public health need. The public health need is operationalized in this model by several indicators, like projected demographic and epidemiological changes in the Dutch general population, task-shifting policies and socio-economic developments in the general population. After confirmation of the estimated training inflow by the Ministry of Health, Welfare and Sports, financial resources are made available for the professional training of public health physicians. However, there is no instrument to ensure that sufficient training positions become available to fulfill the required training inflow of public health physicians. In 2013 the actual training inflow was 37% lower than the advised inflow by the Advisory Committee.

Reflections on public health workforce governance in the Netherlands from the perspective of our results on the environmental and preventive youth health care workforce

Reflection on public health workforce governance from the perspective of our results of the two enumeration studies illustrate three main problems of the current system of public health workforce governance in the Netherlands; 1. the mono-disciplinary approach, 2. lack of insight into the number of physicians working in public health, and 3. lack of insight in the background of the distribution of the workforce across the country.

First, estimations on the required expertise or training inflow for public health professionals, as executed by the Advisory Committee of Medical Manpower Planning, are restricted to public health physicians. Our data in Chapter 4 and 5 show that about 22% of the environmental public health workforce and 24% of the preventive youth care workforce consists of public health physicians. The other professionals are a very multi-disciplinary group, including, among others, public health nurses, speech therapists, toxicologists and policy makers. These disciplines are not included in the estimations of required training inflow. The shortcomings of mono-professional workforce governance have been addressed in previous studies on health human resource planning. We therefore recommend to extend public health workforce governance and integrate all occupations or disciplines into the forecasts of required public health expertise. Broadening this focus is especially relevant when the consequences of recent health policies and changes in the health care system are included in the workforce governance. For example, task shifting from public health physicians to nurses, the shift of specific (public) health care services to local governments, or the other way around, the shift from local services to a national level, e.g. for tuberculosis control. A first step towards integrated workforce planning and development is assessment of the whole public health workforce in terms of size, composition and services provided. Our strategy for empirical enumeration of the public health workforce (Chapter 4 and 5) provides an initial step and can be of great value towards this goal. However, the strategy requires further development and implementation, as described in section 7.2. Important issues that need further study are the operationalization of EPHOs and possible misclassification, and the use of our strategy to assess the contribution of other sectors within the health system to public health.

Second, our data elucidate that only part of the physicians working in public health are formally trained and registered as public health physician within their discipline: about 60% of the physicians who are professionally active in environmental public health and preventive youth health care. Part of the services are currently provided by formally unqualified public health physicians (‘basisartsen’). The numbers of unqualified public health physicians working in public health were previously unknown; our strategy delivered insight in the numbers and we also showed that these positions are being held for many years.

The presence of unqualified public health physicians is not exclusive for public health and happens in medical care as well, but in medical care physicians without a registration as medical specialist or general practitioner can by law only work under supervision of a registered medical specialist / general practitioner, and these positions are usually temporary. In public health it is legally allowed to deliver public health services as a non-trained public health physician without supervision. Whether this situation guarantees a high quality medical contribution to public health is questionable. Despite the general fact that competencies may develop ‘on the job’, unqualified public health physicians have only limited basic knowledge on public health, also because public health is an underrepresented topic in the basic training of physicians at Dutch universities.
Our findings underpin the second shortcoming of the current system of public health workforce governance. The estimation of the training inflow of public health physicians is restricted to formally qualified public health physicians, and does not take into account the delivery of services by formally unqualified physicians (‘basisartsen’). Without data on the contribution of all physicians working in public health, workforce governance on the required quality and quality of medical contribution to public health is insufficient. We therefore recommend to enumerate the public health workforce beyond the existing registries for qualified public health physicians, as a basis for public health workforce governance. Our strategy for empirical enumeration of the public health workforce (Chapter 4 and 5) can be used to assess the whole public health workforce, including training qualifications.

Third, with regard to the distribution of the total capacity of the public health workforce (physicians and other disciplines) across the country, our preventive youth health care study revealed regional differences in workforce capacity across the country (north, east, south, west). These differences were not related to regional differences in population size. In addition, these results did not provide evidence for an explanation of regional differences in the preventive youth health care workforce by corresponding differences in preventive youth health care needs. Regional differences may occur as a result of the governance structure. Each public health organisation is responsible for its own health human resource management. No guidelines exist on the minimum level of FTEs (or competency or profession) required to deliver all services. So, local governments can decide what the population health priorities in their region are and have the possibility to align the public health workforce capacity with local health needs. It might be that for example other health problems than youth health are more pronounced in their region, which may result in relatively less capacity for youth health, compared to other regions with equal youth health status. However, assessing whether regional variations in public health workforce capacity are in line with regional variations in public health needs is not possible without proper data on the public health workforce. Our data provided the opportunity for such comparisons. The so far unexplained regional variations in youth health care workforce (chapter 4) suggest that the regional governance on the preventive youth health care workforce may result in under-serving or over-serving of some youth health populations, however this is a finding that deserves further exploration. Under-serving is difficult to accept from an equity point of view, as preventive youth health care should aim for providing equal chances of optimal health to all children in the Netherlands. Overcapacity is also difficult to accept because of opportunity costs and potential waste of resources. To monitor the background of the distribution of the public health workforce across the country, we recommend to first enumerate the national public health workforce. Our strategy showed to be useful for such enumeration. And second to assess whether regional difference in public health workforce capacity can be justified by regional differences in public health need.

Whether regional differences in capacity also occur in other public health domains is not known, however for some domains, like infectious disease control, guidelines exist on the advisable number of public health physicians and nurses. Whether these guidelines result in regional comparable workforce numbers for infectious disease control requires further study. A recently conducted European study revealed regional differences in the overall quality of public health service delivery in various countries, which was linked to the inadequate availability of public health workforce capacity in general. (16) Another European study showed differences in the capacity for preventive youth health care between the different countries. (17) We recommend to develop national guidelines with regional specifications on the required quality and quantity of the public health workforce. Evaluating the existing guidelines on infectious disease control for general use would be a first step.

Reflection on workforce governance from the perspective of the implications of a new concept of health for public health.

We analysed the implications of a new conceptualisation of health as the ability to adapt and self-manage for public health policy, as an example of assessing future public health priorities. We used the EPHOs as a predefined thematic framework for analysis.

The results in Chapter 6 show that a different conceptualisation of health may result in a change of priorities for public health services and thus in the EPHOs to be delivered. The observation that focus group participants perceived health as an individual asset requiring an active approach in the population towards health promotion and adaptation to a healthy lifestyle will lead to an increase in the need and delivery of EPHO ‘health promotion’, which may impact training needs. Furthermore, an increase of health promotion within the curative sector offered by medical care providers, implies that health promotion must be a key competence for all physicians, including medical specialists and general practitioners. With regard to workforce governance and training needs, this implies an extension of public health training needs towards professionals in the curative sector as well. The need for incorporation of health promotion and public health competencies within the curricula of all physicians has been advocated before, by the Lancet committee on Education of health professionals for the 21st century and also by Levy and Wegman, Plochg and Essink-Bot. (18-21) We recommend to bring public health training for all physicians into practice at universities and follow-up training. We also recommend to include changing public health needs, for example as a result of a new conceptualisation of health, into the public health workforce planning process as this provides important information regarding priorities for public health services and subsequently public health training needs. (9, 22-24) To translate these changes into training needs, the translation of EPHOs into public health competencies would be an important step to support public health workforce planning and training.
The largest burden of disease expressed in years lived with disability in the coming years in the Western world will be attributable to elderly having one or more chronic illnesses. (25-28) The results in Chapter 6 illustrate that these changes may impact the need for public health operations and the corresponding expertise regarding elderly and chronic diseases. However, elderly or chronic diseases are currently not addressed in the existing public health physician domains and the current model for estimating the training inflow for public health physicians addresses only the existing domains (e.g. physician infectious disease control, physician environmental public health). For ‘new’ domains in public health, it is up to the organisations delivering public health services whether they develop new expertise or invest in new domains. We recommend to investigate how future ‘new’ public health needs can be translated into required public health expertise and public health operations, to better support workforce planning for the total public health workforce.

Reflections on public health workforce governance in the Netherlands from the perspective of our results in general

The studies described in this thesis are among the first scientific studies into public health workforce enumeration in the Netherlands and the results contribute to an empirical base for public health workforce planning and development. These studies supported the importance of insight in the quantity and quality of the public health workforce and trends in this workforce in order to improve public health workforce governance to contribute to maintaining and improving population health. However, public health workforce research is not a common research area in the Netherlands. Therefore we emphasize the need for structural research into the development and innovation of the public health workforce in general. Quite some public health research is performed on how to improve population health with regard to specific health topics, like overweight, infectious disease control or socioeconomic inequalities in health. Other groups focus on improving public health practice, for instance by innovations in public health service delivery (‘academische werkplaatsen’). However, research into the more supporting services like ‘assuring a competent workforce’ or health services research of the public health sector is lagging behind and needs further development. Research priorities include further development and validation of our strategy to characterize the public health workforce, and studies into the relationship between public health workforce interventions and population health. These and other studies are needed for providing the evidence on which to base planning and policy decision making both for workforce development and for addressing uncertainties regarding organizing, financing, and delivering effective public health strategies.

CONCLUSION

Insight in the public health workforce in the Netherlands is limited. Increasing insight is an important condition for improvement of public health workforce governance. We showed that multidisciplinary enumeration of the public health workforce is feasible, and that a new concept of health may lead to changes in public health priorities.

Based on our results we identified three recommendations for improvement of the current public health workforce governance in the Netherlands. First, to extend workforce governance from the mono-disciplinary estimation of required public health physicians into workforce governance of the whole multidisciplinary public health workforce. Second, to include public health needs into workforce governance. And third, to develop public health workforce research as an area of scientific research to contribute to the empirical basis for workforce planning and development and thus to population health.
REFERENCES


SUMMARY
The public health workforce; An assessment in the Netherlands
INTRODUCTION

Public health is often defined as 'the science and art of preventing disease, prolonging life, and promoting health through the organised efforts of society'. (1) The focus on preventive measures through collective interventions distinguishes public and preventive care (public health) from providing medical care (curative sector). Public health is an essential part of the healthcare system and concentrates on the health of the population as a whole. As all patients are part of the population, medical care occurs in fact within the context of public health. (2, 3)

To deliver effective public health services, a qualified public health workforce and appropriate allocation of that workforce are necessary. Therefore there is a need to understand the composition and trends in the public health workforce.

Data on the availability and distribution of the public health workforce in Europe are limited because a clearly distinguishable workforce for public health has neither been defined nor formally established in the vast majority of the EU Member States. This is partly due to the often indistinct boundaries of the public health sector. The multidisciplinary nature of the public health workforce constitutes another factor that contributes to limited data on the public health workforce. For most disciplines working in the public health no registries exists.

Like in other countries, total size and composition of the public health workforce in the Netherlands are unknown and a standardized system for regularly and systematically collecting public health workforce data is lacking.

THE STUDIES IN THIS THESIS

The main aim of the research in this thesis was to provide insight in the quantity and quality of the public health workforce in the Netherlands, in order to support public health workforce planning and development. We used the Netherlands as a case study to develop and test methodologies that are also internationally applicable to collect public health workforce data. The three central themes were: the current situation, strategy development to enumerate the public health workforce and future public health priorities.

1. The current situation in the Netherlands

In the first part of the thesis we assessed the public health workforce in the Netherlands using existing data sources and identified potential data gaps. Pooling the available workforce data from 7 reports resulted in the total sum of the Dutch public health workforce of 12,000 FTE (estimates in the separate reports ranged from 731 – 9807). This estimation was inaccurate due to the different definitions of the public health work field that were used in the various documents. The reports yielded different functions or roles and used different methods of data collection. For example, in one report the public health work field was defined as “all municipal health services”, whereas in another report it was defined as “a diverse mix of organizations”. Moreover, the number of functions or roles assessed in the different reports varied between 1 and 15. We concluded that planning future workforce numbers and educational needs according to the current capacity of the public health workforce is not possible using the currently existing data.

2. Strategy development to enumerate the PH workforce

In the second part of this thesis we developed a strategy for empirical workforce enumeration based on essential public health operations (EPHOs). The scope and main public health services have been defined by the World Health Organisation Europe into ten EPHOs, in 2012. We first proposed essential public health operations for public health in the Netherlands. Subsequently we applied the new strategy to assess the capacity of parts of the Dutch public health workforce.

We assessed the scope and essential public health operations or EPHOs of public health in the Netherlands, based on international examples. The international examples showed a general consensus on the overall role of public health in terms of scope and core functions. Therefore we defined the aim of public health in the Netherlands as: ‘To promote health and an equal distribution of health through population based interventions aiming at protecting and promoting health and preventing disease’. Based on the international consensus on core functions and assessment of the validity of the outcomes for public health in the Netherlands, we formulated essential public health operations for the Netherlands and we added ‘providing a health safety net’ as a function. The ten proposed essential public health operations for the Netherlands include: 1. monitoring health status, 2. disease prevention and control, 3. health promotion, 4. health protection, 5. public health emergency response, 6. healthcare safety net, 7. healthy public policies, 8. research and development, 9. competent workforce, 10. sustainable organisational structures, quality of (public) health services.

This scope and essential public health operations were the basis for our new strategy to enumerate the public health workforce. This strategy consists of 1. selection of organisations that provide public health; 2. within these organisations, assessment of educational qualifications and the hours spent on EPHOs by individual workers using an online questionnaire. We tested the feasibility and validity of our EPHO based strategy to measure the size, composition and qualifications of the public health workforce, by applying it to environmental public health workforce in the Netherlands.

The environmental public health workforce was defined as all workers who contribute to the delivery of environmental public health. The questionnaire was distributed among
all potential environmental public health workers in the Netherlands and resulted in data on the environmental public health workforce. The questionnaire was well accepted and available benchmark data on physicians supported the results of this study regarding the medical part of the workforce. Experts on environmental public health recognized the present results on the provision of EPHOs as a reasonable reflection of the actual situation in practice. All EPHOs were provided by an experienced, highly educated and multidisciplinary workforce. The total FTEs were estimated as 0.66 /100,000 inhabitants.

We concluded that characterisation of the public health workforce is feasible by identification of relevant organisations and obtaining information from individual workers on the EPHOs provided by questionnaire. Critical factors include the operationalization of the EPHOS into the field of study, the selection and recruitment of eligible organisations and the response rate within organisations.

In the next study we built on the results of the previous study and we enumerated the preventive youth health care workforce. The questionnaire we developed to assess the environmental public health workforce was adapted to preventive youth health care, which basically means that we adapted the examples of daily practice of each EPHO to preventive youth health care. Distribution of the questionnaire among all potential youth health care professionals in the Netherlands resulted in data on the youth health care workforce. The preventive youth health care workforce is multi-disciplinary, 62% had > 10 years working experience within youth health care and only small regional variations in composition existed. The number of children per youth health care professional varied between regions (range 688-1007). All EPHOs were provided and could be clustered in an operational or policy profile. The operational profile prevailed in all regions. Regional differences in the number of children per preventive youth health care professional were unrelated to the percentage of children with overweight, living in poverty, referred to youth care or living in deprived areas and thus not in line with youth health needs.

3. Future public health priorities
In the final study we used the EPHOs as a framework for analysis to assess the consequences of application of a new conceptualization of health in terms of adaptation and self-management for public health policy. We used qualitative data analysis of 28 focus group interviews, with 277 participants, on the future situation in practice. All EPHOs were provided by an experienced, highly educated and multidisciplinary workforce. The total FTEs were estimated as 0.66 /100,000 inhabitants.

In Chapter 7, the general discussion, we discussed the main results and the strengths and limitations of the studies. We placed the findings in perspective and we end with implications for research, practice and policy with regard to improving public health workforce governance.

Public health workforce planning and development in the Netherlands is governed at different levels: a. the organisations providing public health services, b. the public health physicians, organised within organisations of professionals for public health physicians [e.g. KAMG] and c. the National government through the Advisory Committee on Medical Manpower planning (Capaciteitsorgaan).

Our data provide insight in some parts of the public health workforce and supported the importance of this insight for workforce planning and development.

Reflection on public health workforce governance from the perspective of the results of the two enumeration studies illustrates three main problems of the current system of public health workforce governance in the Netherlands; 1. the mono-disciplinary approach, 2. lack of insight into the number of physicians working in public health, and 3. lack of insight in the background of the distribution of the workforce across the country.

- The central workforce planning as executed through the Advisory Committee on Medical Manpower planning (Capaciteitsorgaan) addresses only part of the public health workforce, i.e. the qualified public health physicians. Our data showed that the public health workforce is very multidisciplinary and that more than half of the workforce consists of other professionals, including, among others, public health nurses, speech therapists, toxicologists and policy makers. These disciplines are not included in the Capaciteitsorgaan’s estimations of required training inflow.
We showed that only part of the physicians working in public health are formally trained and registered as public health physician within their discipline. Part of the services are currently provided by formally unqualified public health physicians ('basisartsen'). The estimation of the training inflow of public health physicians is restricted to formally qualified public health physicians, and does not take into account the delivery of services by formally unqualified public health physicians ('basisartsen'). Without data on the contribution of all physicians working in public health, workforce governance on the required quality and quality of medical contribution to public health is insufficient.

With regard to the distribution of the total capacity of the public health workforce (physicians and other disciplines) across the country, our preventive youth health care study revealed regional differences in workforce capacity across the country (north, east, south, west). These differences could not be understood in terms of regional differences in population size nor in regional differences in preventive youth health care needs. Regional differences may occur as a result of the governance structure. Local governments can decide what the population health priorities in their region are and have the possibility to align the public health workforce capacity with local health needs. Verifying whether regional variations in public health workforce capacity are in line with regional variations in public health needs is not possible without proper data on the public health workforce. The strategy we developed allows for collecting such data.

Reflection on workforce governance from the perspective of the implications of a new concept of health for public health showed that a different conceptualisation of health may result in a change of priorities for public health services and thus in the EPHOs to be delivered. Including public health needs into the public health workforce planning process provides information regarding the need for public health services and subsequently public health training needs.

Overall reflection on our results revealed that better insight in the public health workforce in the Netherlands is an important condition for improvement of public health workforce governance. We end with three main recommendations for improving public health workforce governance:

1. **To address the whole public health workforce (multidisciplinary) in workforce governance.**
A change from mono-professional public health workforce planning to workforce planning of the whole workforce, integrated planning, is necessary to optimize the contribution to population health. A first step towards integrated workforce planning and development is assessment of the whole public health workforce in terms of size, composition and services provided. Our strategy for empirical enumeration of the public health workforce shows promising results, but requires further development and implementation.

2. **To include public health needs into public health workforce governance.**
A change in the priorities for public health services results in a change in the delivery of EPHOs (for example a change in the way EPHOs are delivered), or in the need for a specific EPHO, or in delivery by other professionals. To translate these changes into training needs, the translation of EPHOs into public health competencies would be an important step to support public health workforce planning and training.

3. **To develop public health workforce research as an area of scientific research.**
Research into the supporting EPHOs like ‘assuring a competent workforce’ or ‘health services research of the public health sector’ is lagging behind and needs further development. The same holds for studies into the relationship between public health workforce interventions and population health outcomes. These studies are needed for providing the evidence on which to base planning and policy decision making both for workforce development and for addressing uncertainties regarding organizing, financing, and delivering effective public health strategies.
SAMENVATTING
INTRODUCTIE

Publieke gezondheidszorg, internationaal synoniem met public health, beoogt het bevorderen van volksgezondheid en gelijke kansen op gezondheid door collectieve maatregelen gericht op gezondheidsbescherming, gezondheidsbevordering en ziektepreventie. De focus op preventieve maatregelen en collectieve interventies onderscheidt het vakgebied van de curatieve zorg. De publieke gezondheidszorg is een belangrijk onderdeel van het gezondheidszorgsysteem en richt zich op de gezondheid van de Nederlandse bevolking. Omdat patiënten onderdeel zijn van de bevolking vindt de curatieve zorg in feite plaats in de context van de publieke gezondheidszorg.

Om de taken van de publieke gezondheidszorg goed uit te voeren zijn voldoende en goed gekwalificeerde professionals noodzakelijk. Vanwege de breedte en diversiteit in activiteiten en beroepen is de publieke gezondheidszorg in de meeste EU lidstaten een slecht afgebakend werkveld. Het ontbreken van een heldere afbakening van het werkveld heeft onder meer tot gevolg dat er onvoldoende inzicht is in de beschikbare expertise voor publieke gezondheidszorg. Gerichte sturing op de ontwikkeling van de beroepsgroepen en daarmee op de kwaliteit en doelmatigheid van publieke gezondheidszorg is hierdoor onvoldoende mogelijk.

Net als in de meeste EU lidstaten is ook in Nederland onvoldoende inzicht in de omvang en samenstelling van de groep beroepsbeoefenaren werkzaam in de publieke gezondheidszorg. Bovendien ontbreekt een methode om deze gegevens systematisch te verzamelen.

DIT PROEFSCHRIFT

De belangrijkste doelen van het onderzoek dat in dit proefschrift wordt beschreven zijn om inzicht te verkrijgen in de beschikbare expertise voor de publieke gezondheidszorg in Nederland en om sturing op de benodigde expertise te bevorderen. We gebruikten Nederland als casus voor het ontwikkelen en testen van een methode die ook internationaal toegepast kan worden. De beschreven onderzoeken adresseren drie thema’s: de huidige situatie, methode ontwikkeling om het werkveld in kaart te brengen, en de toekomstige behoefté aan expertise voor de publieke gezondheidszorg.

1. De huidige situatie in Nederland

In het eerste deel van dit proefschrift beschrijven wij aan de hand van bestaande rapporten wat er bekend is over de omvang en samenstelling van de groep beroepsbeoefenaren in de publieke gezondheidszorg in Nederland. Door gegevens van zeven rapporten te combineren konden wij de totale omvang van de beroepsgroepen in de publieke gezondheidszorg schatten op 12.000 FTE (tellingen in de afzonderlijke rapporten varieerden van 731 – 9807). Dit is een onnauwkeurige schatting omdat de afbakening van het werkveld, de geselecteerde beroepen en functies en de methoden van dataverzameling in de inventarisaties niet overeenkomen. De afbakening van het werkveld liep per inventarisatie uiteen van “alle GGD’en” tot een brede selectie van instellingen en organisaties. Het aantal functies dat geïncludeerd werd varieerde van 1 tot meer dan 15. Wij concludeerden dat er beperkt inzicht is in de omvang en samenstelling van de beroepsgroepen in de publieke gezondheidszorg. De beschikbare gegevens zijn onvoldoende voor een bruikbare inschatting van de benodigde expertise en opleidingsbehoefté voor de publieke gezondheidszorg in Nederland.

2. Methode ontwikkeling om het werkveld in kaart te brengen

In het tweede deel van dit proefschrift ontwikkelden wij een methode voor de empirische inventarisatie van beroepsbeoefenaren werkzaam in de publieke gezondheidszorg, gebaseerd op de internationale kerntaken van public health. Een aantal Angelsaksische landen en recent ook de Wereldgezondheidsorganisatie – Europa, hebben public health omschreven in een de doelstelling en kerntaken. Wij deden eerst een voorstel voor kerntaken voor de publieke gezondheidszorg in Nederland. Vervolgens hebben wij onze strategie toegepast om onderdelen van het werkveld van de publieke gezondheidszorg in Nederland in kaart te brengen.

Wij analyseerden de doelstelling en kerntaken van publieke gezondheidszorg in Nederland aan de hand van internationale voorbeelden. De doelstelling van publieke gezondheidszorg komt in verschillende landen grotendeels overeen, en kan voor Nederland geformuleerd worden als: ‘Bevorderen van volksgezondheid en gelijke kansen op gezondheid door collectieve interventies gericht op gezondheidsbescherming, gezondheidsbevordering of ziektepreventie’.


Het doel en de kerntaken vormden de basis voor een nieuwe empirische methode om in kaart te brengen hoeveel en wat voor mensen er werkzaam zijn in de publieke gezondheidszorg en welke taken zij uitvoeren. Onze methode bestaat uit: 1. Selectie van organisaties die een bijdrage leveren aan de publieke gezondheidszorg en 2.
Binnen deze organisaties individuele medewerkers bevragen over hun opleidingsniveau en werkzaamheden (hoeveel tijd besteden zij aan welke kerntaken), met behulp van een digitale vragenlijst. Wij hebben de toepassbaarheid en validiteit van deze methode onderzocht door het werkveld van de medische milieukunde in Nederland in kaart te brengen (hoofdstuk 5).

Het werkveld van medische milieukunde definieerden wij als alle organisaties en medewerkers die een bijdrage leveren aan de medische milieukunde. De vragenlijst werd verspreid onder alle potentiële werkers in de medische milieukunde. Het onderzoek resulteerde in gegevens over de beroepsbeoefenaren in de medische milieukunde. De vragenlijst werd goed ingevuld en de resultaten met betrekking tot de artsen in de medische milieukunde kwamen overeen met bestaande referentiegegevens. De resultaten met betrekking tot het uitvoeren van kerntaken was volgens een groep medisch milieukundige experts een goede reflectie van de situatie in de dagelijkse praktijk. Alle kerntaken werden uitgevoerd door een ervaren en hoogopgeleide multidisciplinaire groep professionals. Het totaal aantal FTE voor medische milieukunde in Nederland kon geschat worden op 0,66 / 100.000 inwoners.

Wij concludeerden dat het in kaart brengen van de capaciteit voor publieke gezondheidszorg mogelijk is door het identificeren van organisaties die een bijdrage leveren aan de publieke gezondheidszorg en het verzamelen van informatie van medewerkers die binnen deze organisaties kerntaken van publieke gezondheidszorg uitvoeren. Kritische factoren hierbij zijn het operationaliseren van de kerntaken voor het betreffende werkveld, de selectie van de juiste organisaties en de bereidheid van medewerkers binnen deze organisaties om de vragenlijst in te vullen.

In de studie daarna brachten wij het werkveld van de jeugdgezondheidszorg in kaart (hoofdstuk 5). Wij pasten de vragenlijst aan voor jeugdgezondheidszorg, wat betekende dat wij bij elke van de kerntaken voorbeelden uit de dagelijkse praktijk van de jeugdgezondheidszorg toevoegden. Verspreiding van de vragenlijst onder alle potentiële beroepsbeoefenaren in de jeugdgezondheidszorg in Nederland resulteerden in gegevens over professionals werkzaam in de jeugdgezondheidszorg. De jeugdgezondheidszorg is een heel multidisciplinair werkveld. Een meerderheid (62%) van de respondenten had meer dan 10 jaar werkervaring binnen de jeugdgezondheidszorg. Er bestonden slechts kleine regionale verschillen in leeftijd en opleidingsniveau van de werkers in jeugdgezondheidszorg. Het aantal kinderen per beroepsbeoefenaar varieerde tussen regio’s van 688 tot 1007 kinderen per beroepsbeoefenaar. Alle kerntaken werden uitgevoerd en konden geclusterd worden in een uitvoerend of een beleidsprofiel. Het uitvoerende profiel kwam in alle regio’s het meest voor. Regionale verschillen in het aantal kinderen per beroepsbeoefenaar waren niet gerelateerd aan het percentage kinderen met overgewicht, die in armoede leven, die doorverwezen zijn naar jeugdzorg of die woonachtig zijn achterstandswijken, en konden dus niet toegeschreven worden aan verschillen in indicatoren voor de behoefte aan preventieve zorg.

3. Toekomstige behoefte aan expertise voor de publieke gezondheidszorg

In de laatste studie gebruikten we de kerntaken als een kader voor analyse van de consequenties van het gebruik van een nieuw concept van gezondheid voor de publieke gezondheidszorg (hoofdstuk 6). Het nieuwe concept van gezondheid luidt: ‘het vermogen van mensen zich aan te passen en eigen regie te voeren, in het licht van fysieke, emotionele en sociale uitdagingen van het leven’. We analyseerden 28 groepsinterviews over de toekomst van het Nederlandse zorgstelsel, met in totaal 277 deelnemers werkzaam in de publieke of de curatieve gezondheidszorg. Het doel van onze analyse was om de toekomstige prioriteiten voor de publieke gezondheidszorg te onderzoeken ten behoeve van sturing op de benodigde expertise voor de publieke gezondheidszorg.

Uitgaande van gezondheid in termen van het vermogen van mensen om zich aan te passen en eigen regie te voeren, beoordeelden de deelnemers aan de groepsinterviews gezondheid als een individuele verantwoordelijkheid. Die visie impliceert een actieve houding van mensen ten aanzien van gezondheidsbevordering en een keuze voor gezond gedrag. Sectoren buiten de gezondheidszorg, zoals het onderwijs of het bedrijfsleven kunnen in de visie van de deelnemers aan de groepsinterviews bijdragen aan het bevorderen van gezond gedrag. Meer aandacht voor preventie en gezondheidsbevordering in de curatieve gezondheidszorg werd ook genoemd als mogelijkheid om een gezonde levensstijl te stimuleren. Extra aandacht is nodig voor mensen die minder goed in staat zijn tot aanpassen en het voeren van eigen regie ten aanzien van hun gezondheid. Voor deze groep is een vangnet nodig. Het nieuwe concept van gezondheid als basis voor veranderingen in de gezondheidszorg biedt mogelijkheden voor het creëren van een maatschappij die meer dan nu gericht is op gezondheidsbevordering. Echter, het is zeer wel denkbaar dat gezondheidsverschillen in de bevolking toenemen als gevolg van veranderingen in de gezondheidszorg. Voor publieke gezondheidszorg zijn de belangrijkste uitdagingen om effectief aandacht te behouden voor de sociaal-economische en omgevings determinanten van gezondheid en ziekte, en daarnaast voor het behoud collectieve preventie.
Samenvatting

ALGEMENE DISCUSSIE

In hoofdstuk 7, de algemene discussie, bespreken we de belangrijkste resultaten, de sterke punten en de beperkingen van onze studies. We plaatsen de bevindingen in perspectief en we eindigen met implicaties voor onderzoek, beleid en praktijk, ten behoeve van het verbeteren van de sturing op de benodigde expertise voor de publieke gezondheidszorg.

Sturing op de omvang en samenstelling van beroepsgroepen in de publieke gezondheidszorg in Nederland vindt plaats op verschillende niveaus: a. de organisaties in de publieke gezondheidszorg, b. de artsen, georganiseerd in de beroepsverenigingen; bijvoorbeeld de Koepel Artsen Maatschappij en Gezondheid (KAMG) en c. de nationale overheid via het Capaciteitsorgaan.

Reflectie op de sturing op de omvang en samenstelling van beroepsbefoeften in de publieke gezondheidszorg vanuit het perspectief van de resultaten van de twee studies naar de medische milieukunde en de jeugdgezondheidszorg illustreer drie belangrijke problemen in de huidige beroepskrachtenplanning: 1. de monodisciplinaire aanpak, 2. gebrek aan inzicht in het aantal artsen dat werkzaam is in de publieke gezondheidszorg en 3. gebrek aan inzicht in de achtergrond van de spreiding van beroepsbefoeften over het land.

- De capaciteitsramingen zoals uitgevoerd door het Capaciteitsorgaan hebben alleen betrekking op de artsen werkzaam in de publieke gezondheidszorg. Ons onderzoek laat zien dat het werkveld van de publieke gezondheidszorg heel multidisciplinair is en voor meer dan de helft bestaat uit andere beroepsbefoeften dan artsen, waaronder verpleegkundigen, logopedisten, toxicologen en beleidsmakers. Voor deze disciplines bestaat geen raming van de benodigde expertise.

- We lieten zien dat slechts een deel van de artsen die werkzaam zijn in de publieke gezondheidszorg is opgeleid en geregistreerd als arts maatschappij & gezondheid of profielarts. Een deel van de werkzaamheden wordt uitgevoerd door basisartsen. De schatting van de benodigde opleidingsbehoefte voor artsen beperkt zich tot de geregistreerde artsen maatschappij & gezondheid en profielartsen en houdt geen rekening met de werkzaamheden die door basisartsen worden uitgevoerd. Zonder gegevens over de bijdrage van alle artsen die werkzaam zijn in de publieke gezondheidszorg, is sturing op de benodigde kwantiteit en kwaliteit van medische expertise voor goede publieke gezondheidszorg inadequaat.

- De resultaten van het jeugdgezondheidszorg onderzoek toonden aan dat regionale verschillen in de capaciteit v van beroepsbefoeften niet verklaard konden worden door regionale verschillen in het aantal kinderen of door regionale verschillen in de behoefte aan jeugdgezondheidszorg. Regionale verschillen kunnen optreden als gevolg van de bestuursstructuur. Lokale overheden kunnen hun beleid ten aanzien van jeugdgezondheidszorg en daarmee de capaciteit voor jeugdgezondheidszorg afstemmen op de lokale zorgbehoefte. Of regionale verschillen in de capaciteit voor jeugdgezondheidszorg in lijn zijn met de regionale verschillen in de behoefte aan jeugdgezondheidszorg wordt niet op nationaal niveau gemonitord. De methode die wij ontwikkeld hebben om omvang en samenstelling van de beroepsgroepen in de publieke gezondheidszorg in kaart te brengen maakt het mogelijk om de gegevens te verzamelen die noodzakelijk zijn voor dergelijke monitor.

Reflectie op de sturing op de omvang en samenstelling van de groep beroepsbefoeften in de publieke gezondheidszorg vanuit het perspectief van een nieuw concept van de gezondheid liet zien dat een andere conceptualisering van gezondheid kan leiden tot een verandering van prioriteiten voor de publieke gezondheidszorg.

Beter inzicht in de capaciteit voor de publieke gezondheidszorg in Nederland is een belangrijke voorwaarde voor het verbeteren van sturing op de benodigde capaciteit. We eindigen met drie belangrijke aanbevelingen voor de verbetering van de sturing op de omvang en samenstelling van de totale capaciteit aan beroepsbefoeften in de publieke gezondheidszorg in Nederland:

1. **Betrek alle beroepsbefoeften in de publieke gezondheidszorg in de raming van de toekomstige behoefte aan capaciteit voor de publieke gezondheidszorg (van mono- naar multidisciplinair)**

Sturing op de omvang en de ontwikkeling van alle beroepsgroepen in de publieke gezondheidszorg is nodzakelijk voor een optimale kwaliteit en doelmatigheid van publieke gezondheidszorg. Een eerste stap in de richting van multidisciplinaire sturing op de capaciteit is het in kaart brengen van de van omvang en samenstelling van de beroepsgroepen werkzaam in de publieke gezondheidszorg en de taken die zij uitvoeren. Onze strategie voor het empirisch in kaart brengen van de capaciteit voor publieke gezondheidszorg is hiervoor in principe bruikbaar en veelbelovend, maar vereist verdere ontwikkeling en implementatie.

2. **Incluider de behoefte aan publieke gezondheidszorg in het bepalen van de benodigde capaciteit voor de publieke gezondheidszorg**

Een verandering in de prioriteiten van de publieke gezondheidszorg kan leiden tot een verandering in het uitvoeren van kerntaken (bijvoorbeeld een verandering in de manier waarop kerntaken uitgevoerd worden), of de behoefte aan een specifieke kerntaak, of het uitvoeren van kerntaken door andere professionals. De vertaling van kerntaken in competenties is een noodzakelijke stap om deze veranderingen in opleidingsbehoeften vertalen.
3. Faciliteer wetenschappelijk onderzoek gericht op het ontwikkelen van de evidence voor evidence-based arbeidsmarktbepaling in de publieke gezondheidszorg

Onderzoek naar de ondersteunende kerntaken zoals ‘het waarborgen van voldoende competentie professionals voor de publieke gezondheidszorg’ en ‘gezondheidszorgonderzoek binnen de publieke gezondheidszorg’ blijft achter en moet verder worden ontwikkeld. Hetzelfde geldt voor studies naar de relatie tussen interventies in de capaciteit voor de publieke gezondheidszorg en de effecten op de volksgezondheid. Dergelijke studies zijn nodig voor het onderbouwen van beslissingen ten aanzien van sturing op de omvang en samenstelling van beroepsgroepen in de publieke gezondheidszorg, maar ook beleid met betrekking tot het organiseren, financieren, en het implementeren van effectieve strategieën voor het bevorderen van volksgezondheid.
DANKWOORD
Dankwoord

LAST BUT NOT LEAST....

Het dankwoord van mijn proefschrift. Lang heb ik gedacht: als de laatste studie maar afgerond is, dan komt het wel goed met mijn proefschrift. Maar dan volgt er nog een inleiding, discussie, Engelse en Nederlandse samenvatting en tot slot het dankwoord; het allerlaatste maar zeer belangrijke stuk van dit proefschrift. Zonder de medewerking van heel veel mensen was dit proefschrift niet tot stand gekomen. Ik wil in het bijzonder bedanken:

Allereerst mijn promotoren, professor Stronks en professor Essink-Bot. Beste Karien, jij was mijn promotor vanaf de start en hebt mij gestimuleerd om aan een proefschrift te beginnen. Dank voor je geduld, je betrokkenheid en vooral je kritische opmerkingen die mij uitaagden om harder na te denken en het onderzoek beter op te schrijven. Nu kan de hele wereld ons werk lezen en er zijn voordeel mee doen.

Beste Marie-Louise, mijn promotor én opleider. Dat maakt jouw rol heel bijzonder en ik wil je bedanken dat je mij in beide rollen hebt willen begeleiden. Samen hebben we het terrein van de publieke gezondheidszorg, beroepskrachten planning en opleidingen onderzocht. Dat was inspirerend en ik heb veel van je geleerd, niet alleen op het terrein van onderzoek doen maar ook van onze discussies over de rol van publieke gezondheidszorg in de gezondheidszorg. Ik hoop dat er nog veel AIOS-en de opleiding arts maatschappij & gezondheid gaan volgen en dat meer hoogerlaren jouw voorbeeld volgen. Dat is een verrijking voor de publieke gezondheidszorg.


Mijn kamergenoot, Ines. Wat was het gezellig om samen te reflecteren op ons werk en onze gezinnen. Ik mis je nu al. Gelukkig komen we elkaar in het IOSG nog regelmatig tegen.

Thomas Plochg, ex-collega. Dank voor je bijdrage als mede-auteur, maar vooral ook voor de vele gesprekken die wij hebben gevoerd over de publieke gezondheidszorg in Nederland en hoe die te verbeteren.

Dhr. Sjaak de Gouw, ik wil je bedanken voor het vertrouwen en de mogelijkheid die je me hebt gegeven om de aller eerste pilot in jouw GGD in Leiden uit te voeren. Die studie heeft veel betekend voor de studies in dit proefschrift.

Alle organisaties en medewerkers in de publieke gezondheidszorg die meegewerkt hebben aan de onderzoeken. Zonder alle medewerking van de organisaties én de medewerkers was er geen proefschrift geweest.

Mijn collega’s van de afdeling sociale geneeskunde en in het bijzonder met ex-kamergenoten: Mirjam, Conny en Majda, Boukje en het secretariaat: Noor, Nita en Henriette.

De collega’s van de NSPOH. Bij de NSPOH is de inspiratie ontstaan voor het onderzoeken van de public health workforce.

De leden van de NPHF werkgroep Beroepskrachtenplanning, voor de feedback op de onderzoeksresultaten en input vanuit de praktijk.

Het Zorginstituut Nederland, in het bijzonder Marian Kaljouw, Katja van Vliet en Mary van der Linde. Wat als stage begon groeide uit tot een twee jaar lange samenwerking die verzilverd is in een mooi artikel.

Dhr. Victor Slenter, ik wil je bedanken voor de jaarlijkse reflectie op de tussentijdse resultaten van de onderzoeken en het delen van je kennis over beroepskrachtenplanning.

Mijn zwager Ruud Emous, voor de tips en adviezen over de communicatie.

Mijn PHned intervisie groep, voor alle goede tips tijdens mijn promotiedips.

Corine de Kruijk en Diana Hell van de Huisartsenopleiding in het AMC, het proefschrift is af en de katoenen lap is inmiddels een wol/zijden promotiejurk geworden.

Mijn ouders en broer, voor jullie betrokkenheid, steun en bijdrage aan dit werk. Tijs, ik kijk ernaar uit jouw promotie!

Thuis: Arnoud, Janne en Else. Arnoud, voor het trouwe meelezen. Er zijn weinig huisartsen die zoveel van public health weten als jij. Jij bent nu al de huisarts van de toekomst. Janne en Else, wat was het bijzonder dat wij vaak samen aan tafel zaten te werken. Daardoor was het werken in de avond en het weekend nog gezellig ook. Wat een luxe dat jullie straks bij de verdediging op de eerste rij zitten.

En nu is mijn proefschrift klaar!
CURRICULUM VITAE
Marielle Jambroes, geboren 1 maart 1970, te Amsterdam

Opleiding:
PhD: Start maart 2011
Arts M&G io: Start augustus 2013, vrije richting.
Verwachte einddatum 31 december 2015
Basisarts: Geneeskunde aan de Universiteit van Amsterdam (1989 – 1997)

Werkervaring
2015 - Assistant professor, afdeling Public Health, Julius Centrum, Universitair Medische Centrum Utrecht
2009 – Senior beleidsmedewerker Academische Opleidings Werkplaats Arbeid, Maatschappij & Gezondheid (AMC/NSPOH), Academisch Medisch Centrum, Universiteit van Amsterdam.
2006 – 2009 Teamleider en research physician Unilever R&D Vlaardingen (Nutrition intervention studies)
2001 – 2006 Projectmedewerker Infectieziektebestrijding, GGD Nederland, Utrecht
**PORTFOLIO**

**PhD candidate:** Marielle Jambroes  
**PhD period:** 2011 - 2015  
**PhD supervisors:** Prof. dr. M.L. Essink-Bot, Prof. dr. K. Stronks

### 1. Courses, master classes, and training

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### 2. Teaching and education

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<tr>
<td>Evaluation of nursing internship (BSc Medicine, UvA)</td>
<td>2009 - 2012</td>
<td>0.5</td>
</tr>
<tr>
<td>Assessment nursing internship reports</td>
<td>2009 - 2012</td>
<td>0.5</td>
</tr>
<tr>
<td>Practical ‘Health literacy in medical practice’ (BSc Medicine, UvA)</td>
<td>2012 - 2015</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total (Recommended no of ECTS = 20 - 30)**

- **Lecturing**
  - EPHOs NSPOH (4x)
    - **Year:** 2014 - 2015  
    - **Workload:** 0.3
  - Education development
    - **Year:** 2010 - 2013  
    - **Workload:** 3
  - Programme development and preparing accreditation process, Master of Public Health programme NSPOH
    - **Year:** 2010 - 2013  
    - **Workload:** 3
  - Supervising
    - **Year:** 2013 - 2014  
    - **Workload:** 2
  - Supervisor paper-writing, 2 years
    - **Year:** 2012 - 2013  
    - **Workload:** 0.5

- **Total:** 27.9