



Leopoldina
Nationale Akademie
der Wissenschaften



June 2015
Statement

Public Health in Germany

Structures, Developments and Global Challenges

German National Academy of Sciences Leopoldina | www.leopoldina.org

acatech – National Academy of Science and Engineering | www.acatech.de

Union of the German Academies of Sciences and Humanities | www.akademienunion.de

Imprint

Publishers

Deutsche Akademie der Naturforscher Leopoldina e. V.
– Nationale Akademie der Wissenschaften –
German National Academy of Sciences Leopoldina
Jägerberg 1, 06108 Halle (Saale)

acatech – Deutsche Akademie der Technikwissenschaften e. V.
acatech – National Academy of Science and Engineering
Residenz München, Hofgartenstraße 2, 80539 München

Union der deutschen Akademien der Wissenschaften e. V.
Union of the German Academies of Sciences and Humanities
Geschwister-Scholl-Straße 2, 55131 Mainz

Editing

Dr Kathrin Happe, German National Academy of Sciences Leopoldina
Contact: Department Science – Policy – Society (Head of department: Elmar König)
politikberatung@leopoldina.org

Design

unicommunication.de, Berlin

Print

druckhaus köthen GmbH & Co. KG
Friedrichstr. 11/12
06366 Köthen (Anhalt)
druckhaus@koethen.de

ISBN: 978-3-8047-3346-6

Please reference as:

German National Academy of Sciences Leopoldina, acatech – National Academy of Science and Engineering and Union of the German Academies of Sciences and Humanities (2015): Public Health in Germany – Structures, Developments and Global Challenges. Halle (Saale), 76 pages.

Public Health in Germany

Structures, Developments and Global Challenges

Foreword

We live in a world where threats to our health range from climate change, infectious diseases such as Ebola or HIV/AIDS to the current epidemic of noncommunicable diseases like obesity and diabetes. Demographic changes and dramatically aging societies all over the world add another dimension to the global health challenges. This makes the need for effective public health systems and universal health coverage one of the most critical issues of the 21st century.

Public health is much more than medicine. It has to offer more than a medical response, because it takes into account our biological condition and heritage, the complex environment we live in, including social determinants, our behaviour and it also has to consider individual and community-based actors. Effective public health systems require well-educated health practitioners who are trained in a broad range of disciplines, able to work in various settings, and engaged with a large variety of health-related activities. This in turn demands for excellent research and science, comprehensive teaching and education and an infrastructure on the basis of state of the art scientific institutions.

Given the key role of public health at the national and international level, the National Academy of Sciences Leopoldina, acatech – the German Academy of Science and Engineering and the Union of the German Academies of Sciences and Humanities asked themselves the question: “Is Germany fulfilling its potential in public health nationally and in view of the global challenges?”

An international working group consisting of high level scientists explored the existing basis and what is needed in the future for the support and further development of public health and for a new commitment to public health – in particular in terms of academic public health and global health research, the translation of scientific progress into better health of the population, as well as supporting institutions and structures. The working group also considered the diversity and quality of the public health workforce, research support and its translation into practice including an educated and empowered population. Special attention is also given to Germany’s role and responsibility to support global health initiatives.

The process leading up to this statement involved over 70 representatives from science, industry and society from 12 countries who participated in 7 workshops over a period of 2 years. We are particularly thankful to the members of the working group who took up this important task.

Halle (Saale) and Berlin, June 2015



Prof. Dr. Jörg Hacker
President of the
German National Academy of
Sciences Leopoldina



Prof. Dr. Reinhard F. Hüttl
President of the
acatech – National Academy of
Science and Engineering



Prof. Dr. Günter Stock
President of the
Union of the German Academies
of Sciences and Humanities

Contents

Executive summary	6
1 Introduction.....	12
1.1 The societal aspects of health: health is more than medicine	12
1.2 Public health: achievements and challenges	13
1.3 Contributions by the academic sector to public health	13
1.4 Sustainable development and global health	15
2 Objectives and remit of the statement.....	17
3 The goals and functions of public health.....	19
3.1 Scoping workshop	19
3.2 Characterising and defining public health.....	20
3.3 Public health disciplines and competencies.....	21
3.4 Public health functions.....	22
4 Public health challenges, advances and prospects.....	24
4.1 Introduction	24
4.2 Living conditions and causality.....	24
4.3 Data protection and health research	26
4.4 Addressing public-private sector tensions	26
4.5 Prevention and health promotion.....	27
4.6 Understanding and tackling the interfaces	28
4.7 Incorporating new scientific understanding: the example of public health genomics and evolutionary medicine	29
5 Addressing global health challenges: good global health begins at home	32
5.1 Introduction	32
5.2 Infectious diseases	32
5.3 The need for global frameworks	35
5.4 National and global strategies.....	35
5.5 Addressing global health governance challenges	37
5.6 Responsibilities for academia.....	37
5.7 The options for increasing academic involvement in global health in Germany....	38

6	The history and current situation of public health in academia in Germany.....	39
6.1	Historical origins.....	39
6.2	Relationship between academic public health and public health service.....	40
6.2.1	Public health services in Germany.....	40
6.2.2	Academic public health	41
6.2.3	Research output	42
6.2.4	Concerns about academic public health in Germany	43
6.3	The public health workforce	44
7	The European background	46
7.1	Public Health and the EU	46
7.2	Comparison of Member State capacities	46
7.3	European Commission health and research strategies	47
7.4	WHO European Health Policy 2020.....	48
8	Conclusions and recommendations	49
8.1	Introduction	49
8.2	Redesigning academic public health in Germany: form follows function	49
8.3	International benchmarking.....	50
8.4	Education and training	52
8.4.1	Building the connection with the German Public Health Service (ÖGD)	52
8.4.2	Other issues for delivering education and training.....	53
8.5	Research.....	54
8.6	Translation of research outputs and public engagement: applying the information that already exists	56
8.7	Structural options for reform	57
9	References.....	61
10	Appendix	65
10.1	The Swiss School of Public Health.....	65
10.2	Selected results of the bibliometric analysis.....	66
10.3	List of boxes.....	67
10.4	List of tables	67
10.5	List of abbreviations	68
10.6	Methods.....	69
10.6.1	Members of the Working Group.....	69
10.6.2	Reviewers.....	70
10.6.3	Procedures.....	70
10.6.4	Additional material	70

Executive summary

It is time for a new effort to strengthen public and global health in Germany. Public health is the science and practice of preventing disease, prolonging life and promoting health through the integrated and organised efforts of society at all levels. Increasingly this includes not only national action but also cooperation at European and global levels. Examples of successful public health interventions include the following: the reduction of infectious diseases, notably human immunodeficiency virus (HIV), and cardiovascular disease, the protection of non-smokers, and advances in health and safety at work. There have been important breakthroughs in identifying risk factors (behavioural, biological and environmental), improving health system performance and developing sound health-relevant practices. Public health is more than medicine: its implementation requires action across sectors and involvement of the whole of society.

Public health is an important integrative science, translating basic research into better health of populations. Present academic structures for public health research and teaching in Germany are fragmented and, despite continuing efforts and progress, do not always meet national needs and international standards in either scope or scale. Although there are excellent individuals and institutions working in public and global health in Germany, as can be concluded from publication and citation analysis and other indicators, they need increased political support, improved structures and significant research investment.

At the national level, successful public health interventions in Germany have traditionally been built on advances in hygiene and communal welfare systems historically focused on reducing infectious disease. In recent decades this has shifted to action on HIV, and non-communicable diseases, particularly cardiovascular disease and the protection of non-smokers. Germany can be proud of its great public health tradition; however, after the disastrous approach to public health taken by the National Socialist regime, it required several decades for Germany to rebuild a public health commitment.

Today Germany can look back on some major accomplishments in public health. Nonetheless – as in all countries – there are continuing and new challenges from communicable and non-communicable diseases, an ageing population and increased pressures on health-care systems. These contribute not only to the rising costs of health care, but they also incur significant other costs for society. There is a growing need to promote healthy living, to create a supportive environment for individual- and community-based prevention and to address social determinants of health through integrated measures across traditional borders of responsibilities. “Health-in-all policies” has to become a priority in science, in politics and in civil society.

The requirement to strengthen national public health is linked to tackling the challenges of global health. Germany can make an increasing contribution to international cooperation, especially in those areas in which it has significant

experience, for example in research, innovation, universal health coverage and social protection. Implementing what we already know from the evidence base can make a dramatic improvement in global health and benefit all countries.

Considering the previous significant contributions of Germany to medicine, health, humanitarian causes and social policy, a more proactive policy of international commitment of Germany is timely. In the area of global health in 2013, the German Government published a statement on its intentions to take up the challenges and make global health a priority of German policy. This was pronounced by the Federal Minister for Health at the World Health Summit 2013 and was highly applauded by the international community. The World Health Summit itself is a testimony to these intentions, since it was supported from the beginning by the German Government and is being held under the patronage of the Chancellor of Germany and the President of the French Republic.

The starting point for this statement is: “Is Germany fulfilling its potential in public health and responding to the global challenges?”.

Analysis based on international comparisons indicates there are current gaps and opportunities: in health promotion and disease prevention, infectious disease outbreak management, analysis of large health data sets, in global health leadership and in responding to advances in science and technology. There is also insufficient communication between policy-makers and academia and there are greater opportunities to use robust evidence to inform policy options. Moreover, German public health research and successful experiences in public health practice have not found their reflection in the global health debate to the extent that they deserve.

We focus our statement therefore on two areas:

- a) how to improve the contribution of academia to strengthen public health outcomes in Germany and
- b) how reformed academic public health capacities in Germany could contribute to a strengthened role at national, European and international levels.

Our messages are directed to academia and its funders and other research institutions, public health professionals, policy-makers across sectors at the federal, *Länder*, county and municipal levels, other parts of the health economy including insurance, pharmaceutical and other commercial sectors, and international partners in the European Union (EU) and global organisations.

Our statement draws on an extensive, very open, broad and in parts controversial public discussion, especially on the outputs of seven workshops organised in 2013.

Our recommendations cover major areas of public and global health and are summarised as follows.

1 Education and training

1.1 Building better connections between academic public health, public health practitioners and society in Germany. Academies can play an important role in initiating and supporting public health programmes at various levels and promoting a spirit of public discussion, for example with respect to new technologies, ethics and strategic orientation. A strong public health service (*Öffentlicher Gesundheitsdienst* [ÖGD]) and adequate training are important factors for a functioning public health system.

Among the actions needed to improve training are the following:

- a) agreeing on coordinated and joint career development objectives,
- b) sharing evidence, expertise and perspectives,
- c) incorporating interdisciplinary and inter-sectoral thinking to encompass a broad range of disciplines together with teaching skills for research methodologies and
- d) supporting learning for leadership and advocacy.

These activities should also help to raise the esteem of the profession and ensure that careers in public health become more attractive.

1.2 Opening new career paths and providing diversity in the public health workforce at national, European and global levels.

1.3 Organising coherent national provision of education programmes in public and global health with an inventory of quality-assured courses, together with strong commitment to continuing professional development and distance learning including massive open online courses (MOOCs) (in European or international partnership).

1.4 Including public and global health components in the curriculum of all health professionals and other sectors, particularly in the social and environmental sectors and foreign policy. The concept of “health-in-all policies” needs to be included as early as possible in education and training.

2 Research

2.1 There must be new emphasis on interdisciplinary research, while maintaining standards of excellence. This has implications for funding agencies in evaluating research proposals and peer review as well as for the structure of university departments. Public health will need to

be developed as a truly interdisciplinary science, and the respective structures to support this need to be established and linked to other relevant German research strengths (for example, the study of climate change). This must be achieved independently of existing faculty boundaries and must avoid fragmentation of research objectives and outputs.

2.2 One major priority is to develop an innovative global health research agenda that reflects the changing burden of disease. Such research should bring together different sectors, areas of expertise and countries to develop effective policies, programmes and strategies to improve health through non-health sector interventions and strengthen health systems.

2.3 There must be a coordinated effort to employ the significant unused potential of randomised trials, cohort and observational studies to answer public health questions.

2.4 There must be more investment in new research areas in public and global health programmes in addition to classical epidemiology and population-based data sets, and in the social and behavioural sciences, for example genomics and other Omics on a population basis.

2.5 More research effort is required to understand cross-cutting issues including the broad field of inequality and social determinants that influence health.

2.6 Current EU legislative efforts to protect personal data and enhance privacy are of considerable importance, but it is also important to set the balance between protection of the individual and the public good of health research and health of society. It is critically important to ensure that EU legislative measures to regulate personal data protection do not introduce new obstacles to health research and improved health.

3 Translation of research outputs and public engagement

3.1 Commitment to translation is essential if research results are not to be wasted. Academia has the role and responsibility not only to generate fundamental and applied knowledge but also to identify and to advise on ways to implement that knowledge for health, policy development, public dialogue and international collaboration, and to evaluate the consequences of new health interventions and policy measures. Academia also has an important role to be a voice of social critique and advocacy for public health.

3.2 Translation in public and global health requires open dialogue and strategic relationships between academic public health, policy, the private sector, the health industry and civil society in Germany, across the EU and globally.

3.3 We strongly recommend increased public engagement in the health debate at all levels, finding new ways for the citizen to access health information and services, and to be actively involved in research. The academies are well placed and have a responsibility to participate in this process because of their structural interdisciplinarity and their independence.

3.4 Germany must also take an active role in the debate on what should be covered by the EU mandate for public health. The academies of sciences and the major research organisations must continue their leading role to mobilise the scientific community to provide the sound evidence base to advise policy makers in Germany, the EU and at a global level.

4 Structural options for reform

There is consensus that academic public and global health in Germany is at a high scientific level but it is too fragmented. To

live up to international standards and to reach a further qualitative leap, academic public and global health needs to be independent. Developing a strategy for coordination must build on and further develop the excellence in disciplines already found in the universities and in other institutions, and on the experience in public health practice. The strategy must also capitalise on current developments in the science base in Germany, on regional strengths in research and teaching and on international experiences and examples of best practice.

Whatever the structural option chosen, it will need to be of high quality, supported by sustained funding and accompanied by a continuous commitment to monitor the impact of reform and to assist the public health community in developing joint responsibility for the important national needs and global challenges. Whatever path will be followed, universities will need to play a strong role. The status quo is not an option.

Among the options for new structures are the following:

4.1 “Public and Global Health Network Germany”

Such a network would strengthen current structures and improve coordination, collaboration, and national and international networking. There would be great value in developing a strategic national competitive funding programme to support this in a competitive merit-based manner. This could be initiated by funding bodies in Germany and should be open to established funding mechanisms including individual grants, special research grants and “clusters”. This competitive funding scheme could be supplemented by grants from the Federal Ministries and from the *Länder*.

Such a competitive process and a detailed strategic analysis of existing or emerging centres may well result in the

establishment of three or four major Public Health Centres situated at universities in Germany, bringing together relevant disciplines such as epidemiology, health system sciences, biostatistics, social sciences or medicine. This would certainly provide a new stimulus for the field but it would need an element of coherence and continuity.

The network's structure could also take advantage of the already existing competences and experience at universities and at established German Centres for Health Research (*Deutsche Zentren der Gesundheitsforschung* [DZG]) with disease orientation by German universities and Helmholtz Centres, as well as the Robert Koch Institute (RKI), and must link with other public health services to create critical mass. It has to be clear that the universities are important partners; otherwise it will not be possible to obtain one of the main objectives, namely to strengthen public health education and teaching. It will also be crucial to involve from the very beginning the respective planning and advisory institutions at the level of the state and federal governments. In practical terms, it may be feasible to capitalise on the Helmholtz Association of National Research Centres in medical disciplines as well as the Leibniz Institutes, Max Planck Institutes, the Fraunhofer Institutes, federal agencies such as the RKI and others who already have activities and programmes in public health, to provide new partnerships, funding opportunities, coordination and critical mass.

4.2 “German Virtual Institute for Public and Global Health”

This would start with a central virtual coordinating structure including the actors mentioned in item 4.1 to catalyse developments and, in addition, to explore what can be added by EU networking. It may also be desirable to combine elements from the different options: individual centres to lead on particular topics, with a

coordinating centre to provide coherence to the framework overall.

4.3 “Institute for Public and Global Health”

An already existing or a newly founded institute takes on responsibility to promote and support public and global health research, teaching and policy in Germany. Other institutions in this field could and should collaborate and network with this institute. Elements from 4.1 and 4.2 can be integrated here.

4.4 “German Centre (or Foundation) for Public and Global Health”

This option would be based on a new, strong central institute, a hub, which would have the important task to support and coordinate an affiliated national network and thereby ensure that support of excellence in research and teaching is assured in all qualifying centres throughout the country, especially in the universities but also involving non-university institutions. Such a structure could and would have to provide more stability than a loose network, special funding programmes or a virtual institute. It should be aimed at a close cooperation of universities, universities of applied sciences, research institutes and the public health service in order to achieve an efficient transfer of the results and encourage research on public relevant topics. This structure could take advantage of the competences and experience in the science, coordination and governance at universities and at the DZG as well as the RKI. In any case, the universities are important partners to ensure that public health education and teaching are strengthened. It can be envisaged that university departments, working groups or other institutions, even outside Germany, become formal external members of the new centre, including participation in its governance. The different legal structures of the different DZGs as well as that of the Berlin Institute of Health (BIH) should be studied as possible models of governance and funding for such a Centre.

5 Next steps

The strategy to be devised must be sufficiently flexible to cope with rapid advances in science and technology as well as new and growing public health and global health challenges. It must embrace all stakeholders and must ensure that the structural options to be pursued satisfy the criteria and goals set out in our statement. We therefore do not recommend one single option to be pursued but rather aim to initiate a concrete and goal-oriented process that will lead to a widely accepted, new and efficient structure for public and global health.

To reach this goal we recommend the establishment of a national “Public and Global Health Initiative (PGH Initiative)” and immediately to create a PGH Initiative Founding Committee to make the best use of these recommendations. This is urgent in view of the new challenges that will arise from the adoption of the sustainable development goals at the United Nations in 2015. The PGH Initiative Founding Committee should have a broad national and international representation. It should steer forceful action on the basis of the above recommendations within an agreed timetable.

1 Introduction

1.1 The societal aspects of health: health is more than medicine

At the beginning of the 20th century in Germany, the life expectancy at birth was 48 years for women and 45 years for men. Today it is 82 and 77 years respectively (Leopoldina & acatech, 2010). The gain in life expectancy was achieved initially by overcoming infant and childhood mortality but now also extends to the later years of the lifespan (Klenk et al., 2007). Falls in mortality are associated with many different causes of death and show the combined effects of economic growth, improved health care and successful health policies (for example, tobacco control, better working conditions and road traffic safety) (Mackenbach et al., 2013). This high, and probably still growing (Oeppen & Vaupel, 2002) longevity is a novelty in human history.

However, the odds of living longer are not equally distributed in Germany (Leopoldina & acatech, 2010)¹ and life and health expectancy are reduced in groups with lower income, educational attainment or occupational status, with poorer access to health services or with different unhealthy behaviours (in particular, smoking, alcohol, diet, substance abuse and lack of physical exercise). Risk behaviour is often related to socio-economic status. As the primary determinants of disease are economic and social, so then its remedies must also be economic

and social (Rose, 1992; UCL Institute of Health Equity, 2013; European Portal for Action on Health Inequalities²). Inequality in income is itself an independent and important factor explaining health inequality although it is also the case that poor health can induce downward social mobility, especially when linked with weaknesses in welfare provision. Men from the lowest quintile in the social gradient have a life expectancy more than 10 years shorter than men from the highest quintile (Lampert and Kroll 2006) and the onset of morbidity begins, on average, 4 years earlier (Leopoldina & acatech, 2010). These socially induced health inequalities continue to grow in many parts of the world (Olshansky et al., 2012).

Public health is more than medicine but all of the disciplines and functions contributing to public health share a common, essential feature in requiring a strong evidence base to inform action. This statement is based on

1. the premise that public health is an integrative science, which takes a systemic view of all the health-related fields encompassing policy and practice, for the health of the population, exploring the determinants of health, interventions and their outcomes (“new public health”, “one health”), and
2. the assessment that in aggregate, present academic structures, in research and teaching in Germany, despite major efforts and considerable progress at all levels in academia and politics, leave

¹ Demographic challenges are also discussed in a recent statement focusing on demographic change in Europe – examining the current transitions, their causes, consequences and implications for policy (Austrian Academy of Sciences et al., 2014).

² Cf. http://www.health-inequalities.eu/HEALTHEQUALITY/EN/about_hi/marmot_reviews (accessed 7 August 2014).

room for significant improvement as they do not always meet national needs and international standards in either scope, structure or scale.

1.2 Public health: achievements and challenges

Public health encompasses the organised efforts to improve the health of the population. Much has been accomplished in public health in Germany in recent decades, to educate public health professionals for work in both the public and private sectors, and with substantial achievements in health services, research and epidemiology. Examples of successful public health interventions include the reduction of infectious disease, notably HIV, and cardiovascular disease, the protection of non-smokers, and advances in health and safety at work. There have been important breakthroughs in identifying risk factors (behavioural, biological and environmental), improving health system performance and developing sound health-relevant practices.

There has been a shift in the burden of diseases from communicable to non-communicable³, and it is very important to continue to build on current knowledge and generate new knowledge in tackling risk factors (such as smoking) and preventable diseases such as coronary heart disease, stroke, cancers, diabetes, allergy and mental disorders, as well as infections.

The health improvements can be attributed to improved living conditions, social innovation and reform as well as to medical advances. Nonetheless, there are continuing and new challenges from communicable and non-communicable diseases, an ageing population, increased pressures on health-care systems, and the need to promote healthy living, create supportive environments and decrease health inequities. The challenges are compounded by a lack of coherent structure for public health education in Germany, and resources have declined. At the same time, there are new opportunities to tackle public health challenges by capitalising on scientific advances, for example in genomics. However, new technologies may bring new or revived ethical questions and the rapid pace of advance in the health sciences can often be contrasted with the conservatism of health systems.

Health targets have been developed for Germany, for example by the Advisory Board of the Health Ministry (*Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen*) and the Health Targets Cooperative.⁴ However, the political commitment to these policy recommendations has not been strong and there is continuing need to reinforce the setting of health goals for society, based on sound empirical evidence. Better mechanisms for the dialogue between academia and policy-makers could provide new impetus for action.

1.3 Contributions by the academic sector to public health

Health is a fundamental human right and governments have considered it an important goal to assure the health of the public. But they cannot do this alone. The academic sector must help to drive the

³ Detailed discussion of estimates of the burden of disease, globally and in Europe, can be found in the work of the World Health Organization (WHO) (http://www.who.int/topics/global_burden_of_disease/en/, accessed 18 November 2014) and the Institute for Health Metrics and Evaluation (<http://www.healthdata.org/results/topics>, accessed 18 November 2014) and in the scientific literature, for example “Global Burden of Disease Study 2010, published in the special issue of *The Lancet*, 13 December 2012 (<http://www.thelancet.com/themed/global-burden-of-disease>, accessed 18 November 2014).

⁴ Cf. <http://www.gesundheitsziele.de> (accessed 18 November 2014).

inter-sectoral engagements and partnerships with government and inform economically sustainable policy development in all sectors to attain health goals. There have been some developments in schools of public health in Germany over the past years but they are not yet in a position to capitalise fully on their strong history nor effectively to play the international research and training role to which they should aspire and which is expected from Germany in terms of its international role and engagement. Improvement requires synergy between the different academic institutions to reform infrastructure and build better links between academia, public health services, the private sector, the policy-making community and civil society, to be described in subsequent chapters of this statement. Given the increased expectations of public health, greater investment in public health sciences is crucial (Wellcome Trust, 2004), with renewed emphasis on the prevention of disease and promotion of good health rather than focusing on treating ill health.

Academic institutions can and must play a bigger role in the generation and dissemination of fundamental knowledge for improving public health: creating knowledge to solve problems, rather than simply investigating them. Academic institutions have additional responsibilities: to educate the health work force; to evaluate the success and sustainability of health outcomes; to advocate and enable policy and practice to be evidence-based whenever possible; and to evaluate whether resources are allocated effectively and efficiently. To fulfil these roles, strong academic expertise in public health is indispensable; this necessitates the integration of public health with a wide range of disciplines from basic biological research, medicine, social, environmental and political sciences, economics and law. A strong and stable institutional interaction of the public domain with the private sector and civil society is also crucial for the

success of this approach. It is essential to ensure that the outputs from public health research are communicated and used to inform policy-making. This requires optimising mechanisms – building on the models of good practice already available – to implement and sustain connections between the academic and policy-making communities.

It is also vital to combine teaching and research but now, more than 20 years after public health was relaunched in German universities with federal funding according to international models (see chapter 6 for further discussion), public health teaching is still strongly influenced by research from outside Germany. Public health research in Germany in many institutions is at a high academic level, but frequently is fragmented, and clear federal public health research aims or mechanisms are still to be defined. Most public health practice – which could serve as the basis for research – is conducted in Germany decentralised at the state level (*Länder*). Neither public health needs, nor public health research needs, are yet guided by a long-term strategy and policy from central federal level (*Bundesebene*). There are interdisciplinary approaches already successfully integrating important academic functions, for example the Helmholtz Centre in Munich and the German Centres for Health Research (*Deutsche Zentren der Gesundheitsforschung* [DZG]) with their public information services, as well as educational institutions such as the Pettenkofer School of Public Health and other leading research centres such as the Robert Koch Institute (RKI). However, there is room to do much more to develop a range of structures to deliver and integrate research and teaching, underpin the translation of knowledge to practice (Vignola-Gagne et al., 2013) and vice versa.

1.4 Sustainable development and global health

Improvement in public health is additionally important because of the economic consequences.⁵ There is a well-established impact of better health on labour productivity and gross domestic product. Moreover, public health policy, health economics and health technology assessment (HTA) are particularly important, given the limitation of scarce resources, at a time of increasing technological possibilities, because they can direct effort to support population health and diminish or preclude the need for other, more costly and potentially less effective, interventions (McKee et al., 2010). However, the earlier focus on improving health to support economic development is now being shifted towards a broader emphasis on sustainable development (Anon., 2012) where the health sector has a new vital role to play. The core priorities for health in the post-2015 sustainable development agenda have been discussed by the World Health Organization (WHO) and others (Berkley et al., 2013), and the InterAcademy Partnership (IAP) global network of academies published a statement focusing on the importance of health for the post-2015 strategy (IAP, 2013).

National actions in public health can only be regarded as sustainable if they are considered in their international context. Strengthening research, teaching and policy formulation in national public health capacities will enable Germany to make a growing contribution to tackling the challenges in global health that transcend national borders, for example those relating to climate change. In support of global objectives, governments around the world have to ensure good governance of health systems, to provide equity

of access to health care and to ensure that a basic health infrastructure, accompanied by good quality practice, is present. There is increasing debate about the extent of the responsibilities of individuals, intergovernmental and non-governmental organisations (NGOs), academia and industry regarding the promotion and protection of global health. These responsibilities have to be carefully defined. A strong case can be made that global health problems require a cross-sectoral approach and can best be tackled in an integrated way across a broad policy front with strong support from academia. Initiatives in global health policy must be accompanied by attention to social, educational, employment and economic policy, and by action on, for example, agricultural systems (such as improved crop breeding) and on the environment (addressing climate change and clean-up of toxic waste) (Hacker, 2010).

The recent strategy statement (2013) from the Federal Government, “Shaping Global Health, Taking Joint Action, Embracing Responsibility” sets out a comprehensive agenda for global roles for Germany, based on three principles:

- protect and improve the health of the population in Germany through global action,
- enhance global responsibility by providing German experience, expertise and funds,
- strengthen international institutions for global health.

These principles underpin much of the analysis and discussion in the present statement, emphasising that many dimensions of public health are now global and that it must be a shared objective to ensure that German health policy is speaking with one voice across sectors and across national and global goals to provide an integrated and coherent strategy, and to maximise impact.

⁵ Cf. Commission on Macroeconomics and Health (2001), progress reviewed in the report *Global Health 2035* (<http://www.globalhealth2035.org>, accessed 18 November 2014).

Our statement focuses on academic structures and their essential functions but makes its analysis and recommendations within the broader context of national, regional and global public health development objectives and achievements, which, of course, require the involvement of many professionals from outside academia, particularly from the public health service.

The following chapters describe some of the opportunities and challenges, and the implications for reforming academic public health, in more detail. This is a critical time to consider the issues, because *“There is a need for public health professionals to proclaim what they have achieved, what more they can achieve in the future, and the dangers of failing to invest in a skilled public health workforce.”* (Tulchinsky and McKee, 2011). And, as former President Barroso of the European Commission has emphasised (Bonk et al., 2013): *“There is no better indicator of the true wealth of a society than the state of its health systems, their effectiveness and inclusiveness.”*

2 Objectives and remit of the statement

This statement takes as its starting point the following question: is Germany fulfilling its potential in public health and responding to the global challenges? Taking a problem- and asset-based approach, analysis based on international comparisons indicates where Germany is not always attaining excellence. Germany is falling behind in terms of life expectancy and in dealing with some rapidly growing challenges such as obesity and diabetes as well as other non-communicable disorders. For example, Germany has among the highest costs from cancer in the EU (Luengo-Fernandez et al., 2013), despite also being, historically, one of the biggest funders of cancer research. Clarification of the implications of these statistics needs to take account of possible differences in the type of cancers between countries.

How then should Germany invest to better effect particularly in health promotion and disease prevention or infectious disease outbreak management, while also ensuring consistent health standards throughout the country, analysing large data sets and using robust evidence to inform policy options to cope with present and future opportunities and challenges? What resources would be needed to sustain this new commitment, in terms of the diversity and quality of the public health workforce, support for excellent research and its translation to practice and an educated and empowered population? What are Germany's global responsibilities?

The statement seeks to identify immediate and longer-term options for building on current strengths in public health and cognate disciplines, to devel-

op national governance structures and critical mass to prepare for a future that, increasingly, encompasses global health goals.

We aim to clarify what public health in Germany should achieve and what academic structures – for research and teaching, and their use to inform policy and practice – would enable this achievement. Our approach involves the following:

1. Analysis of the present situation and development of strategic recommendations to improve academic institutions, their funding and performance in public health in Germany. This analysis includes comparison of academic structures and their resources found to be effective in other countries.
2. In recognition of the importance of the expanding field of global health, we explore options for how reformed academic public health capabilities in Germany can contribute pro-actively to a strengthened role at an international level and for further improving the structures which are needed to assume such a role in evidence-based global health.

Recommendations are made with regard to the structures needed by public health institutions in Germany to enhance research, education, policy development and public awareness – to improve public health on a national level and to strengthen Germany's role in global health.

The following chapters in this statement draw on Working Group discussion of some key questions:

- What is public health – is it understood differently in different countries?
- What is the history of public health in Germany – science and structures – and why is it currently problematic? What is the European context (other Member State capacities, European Commission objectives and WHO frameworks)?
- How is public health organised in different countries in terms of processes and priorities, and what is the impact on its functioning? What are the necessary disciplines and competencies? What are the relative roles of the public and private sectors and what tensions arise at the interfaces? How is civil society included?
- What are the global public health challenges? How should advances in science and innovation be taken into account? How can national initiatives in developed countries influence global health in low- and middle-income countries? What are the issues for global governance?

Our messages are directed to the following:

- Academia and its funders (in particular, universities, the Helmholtz Association, Leibniz Association, Max Planck Society, Fraunhofer Society or federal agencies such as the RKI).
- Policy makers in parliament and the Ministries (in particular for Health, Education, International Cooperation, Foreign Affairs, Environment, Economic Affairs, Research) and those at the German *Länder*.
- Other parts of the health economy, for example insurance and pharmaceutical companies, med-tech companies.
- The many actors and organisations in civil society committed to health at the local, national and global level.
- International partners, for example in the European Commission, other European funding bodies and global organisations, in particular WHO, the

United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP) and other United Nations (UN) bodies.

The statement aims to identify where there is consensus, what is still controversial and what requires further analysis. The primary focus is on developing recommendations for academic institutions in Germany, to enable them to contribute locally, nationally and internationally, and for governmental agencies as funders and partners. The roles of private and public sectors always need to be considered as complementary players. Much of the discussion of key issues will also be relevant for other countries and there is a need to strengthen the voice of the German public health community in the debate outside Germany. The Leopoldina as Germany's National Academy of Sciences will together with her partner academies acatech and the Union of the German Academy of Sciences subsequently consider the options for working together with other academies in the EU and worldwide to develop further insight, share good practice and stimulate action.

3 The goals and functions of public health

3.1 Scoping workshop

Drafting of this statement was informed by a series of seven workshops in 2013, organised by the German National Academy of Sciences Leopoldina with topics set by a planning group of the Leopoldina's Praesidium with participation of the Leo-

poldina's Commission on Health and the Standing Committee of the Leopoldina. Outputs from these seven workshops have been published⁶ and the first workshop (Box 1) introduced many of the themes considered in further detail in subsequent workshops and throughout this statement.

Box 1: Workshop discussion points: history of public health in Germany and abroad: developments, definitions, national and global challenges.

Developing and maintaining effective public health systems requires the political will to shape a society's social and economic conditions with appropriate interventions in law, infrastructure and health. Examination of the history of public health and its embeddedness in institutions is necessary to understand previous impact and current developments in Germany, in particular the relationships with clinical medicine and societal developments. This understanding is also necessary to elucidate what future options are possible.

Historically, public health has been focused as a national undertaking but increasingly has wider, international, dimensions; global responsibilities now represents a major opportunity and challenge. Among other relatively recent changes in public health are (1) the increasing involvement of civil society and the recognition of citizen's rights, such that what was authoritarian in nature is becoming increasingly participatory, and (2) the interaction between the public and private sectors. Increasing forces from the commercial environment necessitate strengthening of the discipline of public health ethics and debate across the sectors. The economic argument for public health research (maintaining a healthy workforce, creating jobs and growth and encompassing costs to the social protection system and families) is insufficient; public health is also critically important in delivering citizens' rights, quality of life, well-being and global public goods.

Issues for an ethical and policy framework in public health, for consent and choice, have been discussed in detail by the Nuffield Council on Bioethics (2007), who described the "intervention ladder" as a way of thinking about the acceptability and justification of different policies for public health. The least intrusive step is generally to do nothing; the most intrusive is to legislate in such a way as to restrict liberty. The more intrusive the intervention, the stronger the justification has to be within the hierarchy of evidence.

⁶ Workshop results are published on <http://www.leopoldina.org>.

Public health interventions must be based on evidence and should be piloted, but there will always be an element of uncertainty which requires the will to act politically. Accompanying policies and interventions with research to monitor the progress made, ascertains and reinforces the scientific dimensions in implementation. The present significant gap between what researchers find and the extent to which health policies change is one reason for the weak and haphazard performance of public health systems. The Evidence-Informed Policy Network at the WHO Regional Office for Europe (<http://global.evipnet.org>, accessed 18 November 2014) aims to improve access and use of context-specific research evidence to strengthen health outcomes. The main barriers to translation are found to be lack of personal relations, irrelevant research, mutual distrust between researchers and politicians and disagreement over budgets. It is also important to recognise that evidence is not the only pillar of public health – consideration of human rights and societal choices are also highly important.

Health is one of the most complex systems. It comprises the biology of the individual, the social and physical environment and personal and community lifestyles. Coping with complexity is the epistemological challenge of the future. Important sub-fields of public health such as environmental health, community health, behavioural health, health economics, insurance medicine, occupational health, gerontology, medical and urban sociology and anthropology, in addition to the classic areas in basic sciences and medicine, will all play a critical role in shaping future understanding of health and what is called “new public health”. Some originally important sub-fields in public health have re-emerged, notably consideration of the social determinants that will increasingly influence construction of “health-in-all” policies. Recent national and international developments have implications for the required multiple competencies demanded of the public health workforce, as communicators and partners as well as health experts, their continuing education, their need to reinforce the link between research and practice and, of particular importance, their interactive role to inform strategic choices by policy makers.

3.2 Characterising and defining public health

Health is a fundamental human right, enshrined in Article 25 of the 1948 Universal Declaration of Human Rights of the Charter of the United Nations. Although there are many definitions, one useful characterisation of health (Huber et al., 2011) is the ability to adapt and self-manage in the face of social, physical or emotional challenges.

Public health practice, and as an academic field, requires multi-sectoral, integrated approaches to protect and promote the health status both of individuals and society (Box 1). Public health is an active, scientifically justified and shared decision-making process, in a world where information circulates fast with enormous risks of distortion.

Strategies to achieve better health on a population level vary widely around the world but many countries have recognised that the status quo is no longer sustainable and, therefore, are reforming their public health systems. This continuing transformation from “sick care” to effective prevention and health promotion is long overdue and must have high priority in developing an evidence-based and scientifically monitored health strategy. Public health science must be part of this transformation process to ensure the connection to social and economic reform, health promotion and universal access.

Although some of the strategic developments in this transformation process may be new (Box 1), the impetus can be traced back to the origins of public health (Box 2).

Box 2: Definitions of public health.

A core definition was provided by Winslow in 1920: *“the science and art of preventing disease, prolonging life and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.”*

This definition was adapted (shortened) by Acheson (1988): *“the science and art of preventing disease, prolonging life and promoting health through organised efforts of society.”* The succinct definition has now been proposed by WHO (2011) for widespread adoption in view of its important characteristics: (1) it is intentionally generic and does not specify particular public health priorities, and that it is concerned with the total system and not only the eradication of a particular disease; (2) it refers to public health as both a science and an art, which is a combination of knowledge and action; (3) it focuses on the core purpose of public health to prevent disease, prolong life and promote health; and (4) it emphasises public health as an organised social function.

The Institute of Medicine (IOM) (1988) defines *“the mission of public health as fulfilling society’s interest in assuring conditions in which people can be healthy.”*

The Winslow definition has also been very influential in informing other health policy development, for example the work of Wanless for the UK government (2004), where the importance of supporting *“informed choices”* was re-emphasised. The meaning of public health and its various definitions has been discussed extensively elsewhere in the academic literature (for example, Verweij and Dawson, 2004).

The term *“new public health”* has been coined to embrace all the relevant fields for research, teaching, policy and implementation. Translation of health research from bench to bedside to populations and back is the broad area to be considered under this term.

The health of a population is dependent on a variety of factors: biological and environmental influences, social determinants, lifestyles and the status of the health system. The social determinants have received considerable attention (WHO Commission on Social Determinants of Health, 2008). For public health to flourish, it is vital to take an integrated view of these influences and their interdisciplinary basis (as discussed in the following chapters), to recognise the rapidly emerging new challenges and the rise of new pressures within health systems (Box 1), as well as the continuing challenge to develop the instruments to reduce socially induced health in-

equalities and identify the actions required to implement these instruments. The position paper from the German Public Health Association (*Deutsche Gesellschaft für Public Health [DGPH]*) (Gerlinger et al., 2012) addresses these issues in the context of the past and present status of public health in Germany and the institutions involved.

3.3 Public health disciplines and competencies

There are two translational steps in using knowledge to improve health. The first – most commonly identified as transla-

tional research – is from science to novel health-care interventions. However, there is a second, vital, translational step, from identifying the interventions and strategies known to be effective to well-implemented policies and practices in the community. This requires public health competencies.

As described in the recommendations of the US Council of Education for Public Health and the European Agency for Public Health Education Accreditation⁷, the core disciplines of public health are the following:

- Methods in public health.
- Epidemiology, population health and its determinants.
- Health policy and health economics.
- Management and administration of health services.
- Health education and promotion.
- Public policy.
- Social and behavioural epidemiology.
- Cross-disciplinary themes including biosciences, evolution, law, ethics, ageing, nutrition, maternal and child health, mental health, demographics, information technology (IT) use, health informatics, leadership and decision-making, psychology, sociology, global health, marketing, communication and advocacy, health anthropology, human rights, programme planning and development, public health genomics, technology development and health education.

This list provides a basis for the required competencies in public health, but it needs to be progressively updated to take account, for example, of the competencies increasingly required to address global health issues, systems issues as well as the political and commercial determi-

nants of health.⁸ Public health activities in academia can also be regarded as closely linked with work in health systems research and services delivery and HTA⁹, because similar disciplinary skills are required.

3.4 Public health functions

Governmental involvement in public health can be considered in terms of core responsibilities (Institute of Medicine, 1988) for assessment, policy development and assurance (Table 1). These responsibilities are discharged in the various settings, including environmental health, occupational health, maternal and child health, disease prevention, vaccination, and global health and require strong academic underpinning for research and its dissemination, particularly via teaching and the linkage to policy formulation.

Table 1: Overarching public health responsibilities for government.

Core function	Essential public health services
Assessment	Identifying challenges and priorities: monitor health status; diagnose and investigate health problems
Policy development	Providing solutions to local and national health problems and providing conditions in which people can be healthy: inform, educate and empower people; mobilise community partnerships; develop policies and plans; enforce laws and regulations
Assurance	Creating access to appropriate and cost-effective care: link people to health services; assure a competent workforce; evaluate effectiveness, accessibility and quality of health services; research for new insights and innovative solutions to health problems

Source: Institute of Medicine (1988) and WHO (2011).

⁷ European competencies in public health have been published by the Association of Schools of Public Health in the European Region (ASPHER). The Agency for Public Health Education Accreditation (APHEA) was launched in 2011 and will perform accreditation to bring public health education to a standard level in Europe.

⁸ A perspective on the academic curriculum to deliver these competencies, from the next generation of public health specialists, is provided as extra material, although it is recognised that this will also need to be updated progressively.

⁹ There is potential for an increasing role of HTA in public health, to guide investment and implementation of the diverse range of interventions sharing the objective to promote efficacy and effectiveness as part of evidence-based practice (La Torre et al., 2013).

The specific priorities for public health operations and services can be classified in various ways and the detail will vary according to context; assessment by WHO (2011) is shown in Box 3, compatible with the list of core disciplines for the work force as described earlier (section 3.3). These essential operations will be considered in further detail in the following chapters.

**Box 3: Ten essential public health operations
(detailed definitions and scope are provided in WHO, 2011).**

1. Surveillance of diseases and assessment of the population's health.
2. Identification of priority health problems and health hazards in the community.
3. Preparedness and planning for public health emergencies.
4. Health protection operations (environmental, occupational, food safety and others).
5. Disease prevention.
6. Health promotion.
7. Assuring a competent public health and professional health-care workforce.
8. Core governance, financing and quality assurance for public health.
9. Core communication for public health.
10. Health-related research.

4 Public health challenges, advances and prospects

4.1 Introduction

Public health is re-emerging as a political priority in many countries. There is need to revise public health policies that have their origins in a different era when communicable diseases were the predominant threat and challenges were predominantly national. The case can be made that public health legislation and policy warrants systematic review (Unschuld, 2014). Academies worldwide can identify with the advice from the Institute of Medicine (2011): *“IOM urges government agencies to familiarise themselves with public health and policy interventions that can influence behaviour and more importantly change conditions – social, economic and environmental – to improve health.”*

There are significant opportunities for revived public health systems to contribute to the health and economic status of the nation. However, it has to be admitted (Wanless, 2004), *“What is striking is that there has been so much written often covering similar ground and apparently sound, setting out the well-known major determinants of health, but rigorous implementation of identified solutions has often been sadly lacking ... In spite of numerous policy initiatives being directed towards public health they have not succeeded in re-balancing health policy away from the short-term imperatives of health care.”* Future national and global health policies must address the repeatedly identified underlying social determinants of health and effect change in pursuit of societal goals.

Multiple perspectives must be incorporated into public health strategy (Box 1): from provider, researcher, insurer, health-care industry and policy-maker, with respect to a shared value of public interest, and recognition that all involved must be accountable to the public according to defined measures of success. There will need to be new emphasis on long-term health value. This requires new thinking on how to measure outcomes, how to allocate costs and how to maximise social protection. Some argue that there has been a disproportionate emphasis on biomedical determinants of health and disease status at the expense of understanding the social determinants, and that the current system resists pressure for change because the focus on specific problems in clinical medicine, however soundly based, leaves only limited resources for preventive measures. In some countries (such as the USA [Brandt and Gardner, 2000]), there has long been a history of tension between public health and clinical medicine. Although this history may seem discouraging, current problems in the burden of disease can be seen to pose new opportunities for effective collaboration between population-based and clinical interventions.

4.2 Living conditions and causality

Many public health challenges are associated with lifestyle factors and wider social determinants but it can be difficult to quantify specific contributions (Box 4).

Box 4: Workshop discussion points: living conditions and causality.

Many correlations have been observed between living conditions (environmental, social, economic and psychological) and health, but interpretation is sometimes controversial. It is of central importance to ascertain what correlations are founded on causal relationships and what the mediating mechanisms are. Demonstrations of causality with health indicators by epidemiological, econometric or other techniques may be difficult because of the complex chain of causes involved and the influence of more distant structural factors.

Finding causal links between living conditions and health status is increasingly important in an era of globalisation characterised by significant changes in the nature of work, employment and markets. Stress induced in the individual by lack of control over their own life has emerged as a major factor adversely influencing health. Disease prevention programmes often fail in those with stressful lives because individual behaviour is maintained to cope with current stress rather than changed to improve future health. Historically, research on adverse health effects of the work environment has concentrated on occupational medicine, specifically the chemical and physical hazards, ergonomic conditions and impact of shift work. The modern focus is now on occupational health research, analysing the stress-inducing work organisation, employment conditions and social relationships. It is important to assess the interplay of the effects of the social determinants of health throughout the lifespan, their interaction with health systems, work systems and the wider context.

Public health recommendations for policy makers must be based on stringent and robust scientific evidence to quantify causal contributions by social factors and to identify what should be done to reduce adverse health impacts. There are particular problems in Germany in addressing regional health disparities and vulnerable groups with poorer health; specification of these problems requires renewed efforts both to analyse the current evidence base and to provide long-term commitment to collect new data. The use of robust and relevant evidence in policy-making requires choice of good methods to inform the decision-maker, using the established tools for knowledge translation (Peirson et al., 2013). It is also important to communicate where there is uncertainty in the current evidence base and where gaps can be filled by new research.

The increased need to generate and use validated evidence has implications for the public health workforce, in recruiting practitioners from a wide range of disciplines, requiring commitment to work cooperatively with other professions, and learning skills in leadership, advocacy and co-working (with governments, NGOs and the private sector, in particular).

The issues for assessing causality have also been discussed extensively elsewhere. For example, a report by the UK Academy of Medical Sciences (2007) evaluates the evidence for a wide range of environmental causes of disease, considers causality in terms of social and biological mechanisms, and identifies priorities for policy action. Recent research analysis has tended to reinforce the value of the guidelines developed by Bradford Hill to help decide when a statistical association was likely to reflect true causation (Hill 1965; Academy of Medical Sciences, 2007). Work published by WHO (2013, UCL Institute of Health Equity) uses the living conditions case-study approach to review inequities in health and develop a new European policy framework for health and well-being with the goal of identifying what interventions can be implemented with sufficient scale and intensity to make a

difference across the diverse contexts of the European region (see also chapter 7).

4.3 Data protection and health research

In population research there are increasing opportunities to link disease registries with other databases of clinical, demographic, environmental and socio-economic information, to ascertain the influence of risk factors and interventions (for example, the European Network of Cancer Registries [ENCR]¹⁰). However, in considering the research requirements for assessing causality, it is important to realise that promotion of health and health research may not always be aligned with the objective of absolute protection of privacy. Current EU legislative efforts to protect personal data and enhance privacy are of considerable importance but it is imperative to set the balance between the public good of health research and the protection of the individual. Any new legislation in the EU to regulate personal data protection must take account of the societal benefits of health research and the existing safeguards in this area so that new obstacles to research are not introduced, intentionally or inadvertently (Fears et al., 2013). Population research studies may not always be able to seek explicit informed consent for use of patient information to answer future research questions; this difficulty may be accentuated by the latest revision of the Declaration of Helsinki (Millum et al., 2013).

4.4 Addressing public-private sector tensions

The chronic non-communicable diseases are more prevalent in disadvantaged groups, and current pressures increasing social inequality will exacerbate the burden of disease. The determinants of growing

health problems such as obesity are complex (Nuffield Council on Bioethics, 2007) and the solutions are likely to require systematic action across sectors to address multiple risks (Box 4 and Kickbusch, 2008). Attempts to study and reduce obesity exemplify how many public health challenges are linked with commercial interests of transnational companies (for example, in production of food and soft drinks) – these are now referred to as the commercial determinants of health. The impact of the commercial environment as a social determinant of health warrants much more research. Tackling these problems requires new interaction with the private sector and new awareness of consumer legislation that has not always been part of the traditional public health curriculum. There have been missed opportunities for sharing effective legislation worldwide for public health: a first step would be to revive databases of evidence-based analysis to underpin knowledge transfer and implement legislation (Attaran et al., 2012).

Despite concerns about industry behaviour, the relationship between the public and private sectors need not always be confrontational, but must be addressed (Nuffield Council on Bioethics, 2007). It is important to develop the evidence-based environment where shared objectives for improving health can be pursued in the public interest. For example, the growing proportion of older people in the general population creates new markets for health technologies, there is significant potential for industry to develop assistive devices and for the public sector to become increasingly involved in the evidence-based assessment of such technologies, in the setting of standards and in ensuring that innovation does not aggravate social inequity (Leopoldina, acatech & Akademienunion, 2010). The experience of the Innovative Medicines Initiative¹¹, a

10 Cf. <http://www.enrcr.eu> (accessed 18 November 2014).

11 Cf. <http://www.imi.europa.eu> (accessed 19 January 2015).

pre-competitive partnership between the European Commission and the European pharmaceutical industry sector provides a good example of what can be achieved in pursuing mutually agreed interests for health priorities, supporting innovation by smaller as well as larger companies.

4.5 Prevention and health promotion

The benefits of incorporating prevention in practice have become increasingly apparent. Immunisation has made infectious diseases such as poliomyelitis, rubella and pertussis rare. Early detection of risk factors (hypertension) and diseases (cervical cancer) has decreased mortality and morbidity. Intervention strategies for health promotion and disease prevention, and the implications for public health systems, were discussed in the workshop (Box 5).

Box 5: Workshop discussion points: prevention and health promotion.

Attention to health promotion and disease prevention can contribute greatly to key priorities of health-care systems: improving health outcomes, enhancing patient satisfaction and reducing costs. Promoting health is essential in primary care, but secondary and tertiary care are also focusing more on wellness and function in the context of living with chronic diseases. Population-based approaches, which encompass the concepts and models of epidemiology and public health, are essential in the effective management of health care.

The problems of chronic disease and the ageing society are drivers for promotion and prevention. Chronic diseases are the leading cause of death in Europe. The costs of chronic diseases are expected to rise (Busse et al., 2010), but there is also a huge prevention potential (Martin & Henke, 2008). Accumulating evidence indicates that chronic diseases cluster in co-morbidities with risk factors and social determinants in common (Barnett et al., 2012). In ensuring a focus on adding healthy life years, health impact assessment helps policy makers identify the likely implications of decisions taken in other fields (for example city planning or the school curriculum), revealing unintended health risks and leveraging opportunities to improve well-being of the community. Such assessment has implications for interdisciplinary research and the choice of evaluation methodologies (all necessarily based on sound science) and for the level of intervention at which to measure impact, as well as for the linkage between research and practice.

Health literacy is a key tool for prevention, best applied within the broad context of a “prevention society” and as part of an integrated community intervention strategy throughout the lifespan. There must be shared commitment in seeking consensus on priorities at a time of limited resources. Efforts to increase citizen empowerment will need to reflect ethical considerations (perhaps, particularly, regarding the interaction with the commercial sector) and take account of the changing environment in which people live, rather than exclusively focusing on individual behaviour. Public health interventions and prevention are often based on economic considerations but it must also be realised that health is a value in itself. In view of the public health deficits in Germany, it is urgent to build the necessary interdisciplinary structures, capitalising on the skills of those who have an international standing and identifying the needs for infrastructure and tools to support them.

Many intervention programmes have been evaluated but there are unanswered questions regarding which methods and components are effective and what is appropriate for transfer to other intervention contexts. In a recent report on the culture of prevention in health care, the French Académie nationale de médecine (2013) raises related issues with regard to the importance of effective coordination and funding of prevention programmes, their scientific evaluation and the importance of health education in schools. There is considerable scope for harmonisation of prevention programmes in Europe (see also chapter 7), because of the many similarities with respect to risk factors, issues of health economics and social inequalities, as well as the possibilities for doing better in shared collection and use of robust evidence.

4.6 Understanding and tackling the interfaces

To be successful, public health strategy requires supportive public policies that assure adequate and sustained investment for clarifying the important determinants of health (Box 4), a strong governmental infrastructure and a public health system that incorporates the understanding that health is everyone's responsibility (Box 5). There are three critical interfaces for evidence-based public health action (Kickbusch, 2008):

- Global–local: public health can no longer be pursued just at the national level. Its borderless nature requires complementary strong national and global institutions, mechanisms, instruments and funding, as well as the shared commitment to global public goods.
- Public health–other sectors: the public health sector can no longer deal with emerging challenges on its own. There is a need for new public–private

partnerships and recognition of the importance of “health in all policies”, a horizontal strategy contributing to improved population health, dependent on examination of determinants of health that can be altered to improve health but are mainly controlled by the policies of sectors other than health. The strategy was introduced during the 2006 Finnish Presidency of the EU, has been a central principle of the European Health Strategy 2008–2013 (Ståhl et al., 2006) and is an important instrument in dealing with the social determinants of health and the ability to influence them or to compensate for their impact on health.

- Technical excellence–political commitment: public health can no longer be seen as a purely professional and technical endeavour. It needs the support of civil society and of political decision-makers to address the equity, exclusion and human rights issues at stake.

Ways in which these interfaces are taken into account in policy development worldwide are illustrated by two pieces of legislation, where government is viewed not just as regulator but as partner:

- Norwegian Public Health Act, 2011: based on principles that include health equity, “health-in-all policies”, sustainable development and public participation. Responsibility for public health is accorded to the whole of society rather than the health sector alone and this has implications for the professional basis of public health.
- South Australia Public Health Act, 2011: espouses similar principles to Norway and is characterised by an outward orientation of public health as partnership with government, the public and private sectors.

The current health policy for Japan (2011–2015) also emphasises the importance of national initiatives in strengthen-

ing multi-stakeholder partnerships with other governments, multilateral agencies, donors, NGOs, civil society and business (Okada, 2010).

4.7 Incorporating new scientific understanding: the example of public health genomics and evolutionary medicine

In addition to the problem of rapid responsiveness to current challenges, public health systems can sometimes be criticised for failing to look far enough ahead to discern new challenges and to capitalise on the opportunities arising from progress in medicine, the natural and social sciences and humanities.

One development – used here as an example to illustrate the importance of building the responsiveness to new information – may be characterised broadly in terms of evolutionary medicine, public health genomics and epigenetics (mediating environmental influences on gene expression). Now that the genomes of so many model organisms have been sequenced, it has become clearer that many important genes have been functionally maintained during evolution. However, this conserved biology in humans does not necessarily provide flexibility to cope well with our more recent environmental and societal changes – there is a limit to the plasticity of human development (Leopoldina et al., 2010). The resultant gap between our old biology and the new and fast

changing environment results in reduced fitness (evolutionary trap) and contributes to the diseases of civilisation and the growing burden on health systems. Advances in genomics, genetics and epigenetics will lead to better understanding of the biological causes of ill health, linking the genotype to the phenotype in health and disease in personalised medicine, through a systems biology approach that must also take account of environmental and societal factors. Evolutionary medicine (Gluckman & Bergstrom, 2011; Nesse et al., 2012, Ganten und Niehaus, 2014, Ganten, Spahl und Deichmann 2009) is an overarching concept, relating human biology to the dynamics of the environment, to help understand disease determinants and inform the new thinking to improve public health; that is, to change environment and society to fit with our human body. The emerging fields of Omics (including genomics, transcriptomics, proteomics, metabolomics, microbiomics) will contribute largely to our new understanding and will probably alter the consideration of medicine, health and public health in dramatic and currently largely unforeseen ways. That is one of the reasons why health research needs to be even more interdisciplinary in the future.

The workshop on public health genomics explored the potential contribution to public health broadly (Box 6); this contribution is critically dependent on improving the translation from laboratory work to clinical development and implementation in routine health practice (Vignola-Gagne et al., 2013).

Box 6: Workshop discussion points: public health genomics.

Historically, clinical geneticists tended to concentrate on testing for monogenic diseases and chromosome disorders whereas public health geneticists addressed common diseases with multifactorial origins. Today, an integrated approach is required to strengthen public health. The concept of community genetics has been developed to cover the art and science of the responsible and realistic application of health- and disease-related genetics and genomics knowledge and technologies in human populations and communities to the benefit of individuals therein.

Public health genomics was essentially non-existent in Germany, and in many other countries, as an academic discipline and as a field in practical medicine, but is now developing. The National Cohort in Germany¹² is an encouraging programme.

The Genetic Testing Act aims to secure individual autonomy but its lack of definition of “screening” allows other testing to proceed outside the Act with troubling consequences for quality control and patient management. Commercial provision of genetic testing through the internet and direct to the consumer is also creating problems for informed consent, counselling and quality assurance with potential consequences for health systems¹³.

Some claims for the value of genomics in personalised medicine are overstated but it is also the case that some useful discoveries, notably in oncogenetics and cardiogenetics, are still not routinely implemented into health care, to the detriment of effective surveillance and disease prevention. For example, it is estimated that 100,000 people die each year in Germany from sudden cardiac death, of which 15 % is attributable to a monogenic condition. Early diagnosis could lead to prevention by medication, avoiding extreme sports and, where needed, implantable cardioverter defibrillators. Similar issues are at stake for pharmacogenetics and tailored drug delivery. There are also newly emerging opportunities in many disease areas for whole genome sequencing to improve the accuracy of testing. Moreover, the application of technology to pathogen genome sequencing offers significant scope for improved surveillance, investigation and control of infectious disease (see Box 7). The opportunities include detection of pathogen antimicrobial resistance, patient stratification to optimise treatment, and outbreak detection and control. Genomics has also become a significant part of vaccine design and antibiotic discovery efforts.

One major concern is the disproportionate pattern of funding for genomics (and other Omics technologies) – the vast majority of the investment going into research and very little to downstream implementation, “to do what we know”. Additional obstacles for translation to practical application also need to be overcome; in particular, physicians and the public should be better informed about appropriate conclusions from research findings.

The methodological challenges in handling and interpreting large data sets in Omics are also relevant for the consideration of other large databases, for example from cohort studies, pharmacovigilance and public health surveillance; and there may be generalizable lessons to be learnt for devising optimal medical system and other procedures for generating, curating and accessing large data sets. Big data, the technology, data protection, interpretation and implementation in health care and on a population basis represent continuing challenges. International standards will be of great importance.

12 Cf. http://www.nationale-kohorte.de/index_en.html (accessed 18 November 2014).

13 Statements by Leopoldina, acatech and the Union of the German Academies of Sciences and Humanities as well as by EASAC–FEAM discuss the issues surrounding the increasing tendency to offer genetic tests through the internet for determining susceptibility to complex, common disorders (Leopoldina et al., 2010; EASAC-FEAM, 2012). These direct-to-consumer genetic services raise scientific, regulatory and ethical questions and provide a good example of the new tensions facing public health in a rapidly developing commercialised environment.

It is essential that the introduction of new genetic tests is based on sound science and the established principles that govern other testing in medical practice (Marzuillo et al., 2014). The potential contribution of predictive genetic diagnosis to individual and public health was discussed in detail in a previous statement from the academies (Leopoldina et al., 2010). There will be new possibilities to expand the understanding of the biological contribution to common, complex illnesses with both multifactorial and monogenic subtypes. However, it is important to consider further what will be needed for the responsible development of this technology (Zimmern, 2011) to contribute to service development, professional education and training, informed public policy and stakeholder engagement. Although some are sceptical about the growing focus on personalised medicine based on genomics advances and fear an ever-increasing medicalisation, a good case can be made (Rawlins, 2013) that personalised medicine and public health can be complementary, cost-effective approaches to maintaining the health of populations.

Many of the issues for the wider application of clinical genetics and the development of public health genomics have been considered in detail by the European Society of Human Genetics, drawing on the moral framework for genetic testing established in the Additional Protocol to the Convention on Human Rights concerning Genetic Testing for Health Purposes (Council of Europe, 2008), and will not be discussed further in the present statement. Among recent policy papers from the European Society of Human Genetics are recommendations concerning whole genome sequencing; a public health framework for genetic testing for common disorders; provision of genetic services, including genetic screening programmes; implications of genetic information for insurance and

employment purposes; and the interface between genetic and reproductive technologies.¹⁴

¹⁴ European Society of Human Genetics (ESHG) policy recommendations are on <https://www.eshg.org/eshg-docs.o.html> (accessed 20 November 2014).

5 Addressing global health challenges: good global health begins at home

5.1 Introduction

Global health can be described as the “*goal of improving health for all people in all nations by promoting wellness and eliminating avoidable disease, disability and death.*” (Institute of Medicine, 2009). The “global” in global health refers to the scope of the problems, not their location (Kaplan et al., 2009): “*Global health emphasises transnational health issues, determinants and solutions; involves many disciplines within and beyond the health sciences and promotes inter-disciplinary collaboration; and is a synthesis population-based prevention with individual-level clinical care*”. Global health, in transcending national boundaries and governments, needs to address the wide range of determinants of health – social, economic, commercial and environmental – as well as the global burden of disease. It poses many multi-sectoral challenges and requires strong global governance institutions¹⁵.

5.2 Infectious diseases

Communicable diseases continue to be a major contributor to mortality and morbidity worldwide, and the threats cross borders. In Europe, the academies of science have a significant history of interest in the issues for understanding and tackling infectious disease (EASAC, 2011a). A report from the European Centre for Disease Prevention and Control (ECDC) (ECDC, 2013) observes that the recent economic crisis may have worsened infectious disease rates in the poorest populations in Europe.

The workshop (Box 7) noted that the growth of the global population, ease of travel, increase in immunocompromised and frail persons, poor compliance with vaccines and the close connection with livestock and other animals have large impacts on the incidence of infectious disease. The situation is exacerbated by poor diagnosis, misuse of antibiotics, antimicrobial drug resistance and other limitations in drug availability and nutrition and by the impact of climate change.

Box 7: Workshop discussion points: infection epidemiology.

It is possible to eradicate many infectious diseases. Tuberculosis could be eliminated if there were better understanding of the complex survival strategies of the causative organism, its synergies with other pathogens such as HIV, its other co-morbidities, particularly with diabetes, the host factors involved and the mechanism of development of resistance to antibiotics.

Continuing progress in the treatment of many infections is now threatened by the increasing numbers and widening distribution of pathogens resistant to antimicrobial drugs. The global

¹⁵ Definitions of global health and their implications are discussed in detail elsewhere, for example Beaglehole & Bonita (2010) and The Graduate Institute, Geneva (2013).

threat from antimicrobial resistance and the need for a concerted strategy to tackle the problem was outlined in a joint statement from the global academy networks (IAP–IAMP, 2013; Fears & ter Meulen, 2013). The specific issues for Germany and the priorities for research and innovation were discussed in detail in a statement by the Academy of Sciences and Humanities in Hamburg and the Leopoldina (Academy of Sciences and Humanities in Hamburg and German National Academy of Sciences Leopoldina, 2013). A coherent national antibiotic strategy relies on international collaboration and must combine commitment to prevent infection (by better vaccination and better infection control), to preserve the antibiotics currently effective, and to promote new antibiotics and diagnostics, all dependent on generating the underpinning knowledge about antibiotic resistance (see also Box 6).

Other recent infectious disease outbreaks in Germany had considerable public health and economic impact. Among significant episodes were the norovirus outbreak in schools and kindergartens in 2012 and the large enterohaemorrhagic *Escherichia coli* and haemolytic–uremic syndrome outbreak in 2011 that was estimated to cost €1.6 billion. Among the lessons learnt from these outbreaks was the need for better notification from clinicians to health authorities and for better integration between responsible institutions at state and federal levels, and between health, veterinary and food safety authorities.

To cope with current and (re-)emerging diseases, the sometimes weak interfaces in Germany between public health, microbiology and clinical medicine must be strengthened. This necessitates strengthening the academic status of the field. As part of improving outbreak management procedures (outbreak recognition and control measures; Box 8), there must also be better use of monitoring systems and a better understanding of public perceptions, also using social media to communicate and engage.

Confronting the global infectious disease challenges requires action across a broad front (see chapter 8 on recommendations) by the following means:

- Funding organisations – to support priorities for research and innovation, interdisciplinary work, cohort studies.
- Researchers – in pursuit of novel directions, use of modern techniques and support of individualised medicine approaches.
- Health professionals – to encourage early detection and management of outbreaks, support research endeavours and the training and career development of the public health workforce.
- Governments and health authorities – to collect surveillance data, provide the infrastructure for outbreak management, promote communication of research outputs and raise awareness of the issues by all stakeholders, perhaps particularly in support of efforts to enhance vaccine uptake and prevent the spread of antimicrobial resistance.

The recent example of the epidemic of Ebola virus in West Africa in 2014/2015 accentuates the urgency for addressing the global infectious disease challenges. There are particular implications for strengthening health services in developing countries, for coordinated surveillance, for international emergency responsiveness and for the innovation that will ensure access to anti-infective agents and vaccines. There is also need to use alternative approaches, using new media, to teach about global public health emergencies during crises (including epidemics and conflict), perhaps using massive open online courses.

The use of vaccination to eradicate disease is relevant to the broader discussion of the social determinants of health because infectious diseases may be associated with socio-economic deprivation (the conditions of daily living of those most vulnerable; in particular poor housing conditions, poor hygiene as well as limited access to health services). Many vaccine strategic issues, including research and innovation priorities, epidemiology and pharmacovigilance, maintenance of vaccine stocks for public health preparedness, international collaboration, and public education, were discussed in a previous Leopoldina statement (2008)¹⁶, calling for a national vaccination plan. Further Leopoldina advice on vaccination will be published subsequently.

In Working Group discussion of the current situation in Germany, it was observed that the RKI already takes on many tasks of a national public health institute:

- Aiming to improve the health of the population, using surveillance systems for observation and analysis of infectious disease and characterisation of pathogens as well as recording non-communicable diseases and their determinants.

- Communicating scientific knowledge, for example through an epidemiology bulletin throughout the public health community and providing science-based information to advise the Federal Ministry of Health and other policy makers.
- Teaching in various schools of public health, offering courses to the German Public Health Service and devising a postgraduate course in epidemiology.
- Cooperating with municipal and *Länder*-level authorities, for example on vaccination and protection against infection.
- Networking with other EU countries to exchange expertise and develop standards and recommendations, and representing Germany in international activities, for example with the ECDC.

Further discussion of how these RKI functions could serve as a model more generally in public health structures is provided in chapter 8.

The Working Group also emphasised the need to do better in strengthening the national infrastructure and procedures for communicable disease outbreak management in Germany (Box 8).

Box 8: Objectives in outbreak management: what can be done better?

The structure of outbreak management should be rethought and refocused, to embrace the following:

- Broad and rapidly available national platform of expertise to prepare for unexpected events.
- The power to deal with the magnitude of the problems that may be faced: “a mandate to act”.
- Implementation of genomics and next-generation sequencing methodologies in the public health context for the improved typing and tracing of outbreaks.
- Learning lessons in clinical medicine and public health from the sophisticated processes available for tracing food products in livestock and other agricultural systems (designed to prevent and contain contaminated products in the food chain).

See also Box 7 and Timen (2010) for discussion of competences and networks required; recommendations are discussed further in chapter 8.

¹⁶ Opportunities and challenges of vaccination, on http://www.leopoldina.org/uploads/tx_leopublication/2008_NatEmpf_Schutzimpfung-DE.pdf (accessed 19 January 2015).

5.3 The need for global frameworks

Many other current public health problems are of global significance and require responses involving multiple sectors (Kickbusch, 2011a).

Ageing populations are a global challenge for public health preparedness and responsiveness (Anon., 2013). The non-communicable diseases (particularly cardiovascular disease, cancers, diabetes, obesity and chronic respiratory disease) are of rapidly escalating global importance (Beaglehole et al., 2011) and there are opportunities for Germany to take a leading role in analysing and addressing the non-communicable diseases on a global scale.

It is also necessary to take more account of mental disorders, the largest contributor to health-related costs in Europe and increasingly contributing to morbidity worldwide. The health consequences of climate change contribute to damaging health equity (WHO, 2010). Globalisation has multiple complex and contradictory health impacts.

The challenges are compounded by the shared pressure of cost-containment, accompanied by rising societal expectations and availability of new technologies (Box 6; Tulchinsky and McKee, 2011). Nonetheless, the process of globalisation has created not only threats to health but also new opportunities that require global frameworks to share and exchange knowledge and good practice (Battams and Matlin, 2011).

There is still some controversy as to whether public health should now be considered synonymous with global health, while taking into account local contexts. Some argue against such an approach, because public health often still has a strong national focus and history. For example, there is a common view in many universi-

ties, faculties and schools of public health that global health does not include domestic as well as international health (the latter associated primarily with support to lower-income countries). However, the rise of global and cross-border determinants of health may render this view increasingly untenable. For the rest of this statement we consider that global issues are a necessary responsibility of all national systems, particularly in terms of the research agenda and monitoring functions.

As the drivers of ill health are increasingly global (Ottersen et al., 2014), so too must be the tools to study population health and to develop and evaluate interventions (Box 4). In recent decades much public health analysis has focused on the proximate causes of ill health, for example lifestyle factors, but there is need to understand that the ultimate causes and aspects of lifestyle are affected by the social, legal and political contexts: “*The distal factors act across the life course leading to accumulation of relative social and economic advantage and disadvantage*” (Marmot et al., 2012).

5.4 National and global strategies

The German Federal Ministry of Health published its Global Health Policy in 2013 – how best can academia now help to support this strategy? In the workshop (Box 9), case studies from various countries were discussed and examples from the USA, UK and Switzerland were used to explore the current status of other countries in analysing and addressing the issues for domestic and global health (see the Appendix for further description of the system in Switzerland).

Box 9: Workshop discussion points: Public health: national and global strategies.

Few countries have a defined national strategy even when there are major public health programmes in place. Nonetheless, comparison of the systems for academic support and workforce development provides further insight on the options for national governance and other organisational challenges in Germany. There is increasing interest in many other countries in devising global health strategies guided by general principles on maximising aid effectiveness – to strengthen health systems, work in partnership, integrate with other sectors, incorporate research and innovation, and use metrics for better monitoring and evaluation.

The impact of climate change is likely to accentuate global health issues. Although a significant amount of health impact assessment has been accomplished, including in the 5th Intergovernmental Panel on Climate Change (IPCC) assessment, there is need to do more in using multi-model projections for climate change impact, allowing for interactions between variables (for example, between disease spread, agriculture, nutrition and other environmental changes). In view of the inevitable uncertainties in simulation, it would be valuable to use recorded data (for example, on spread of human and animal infection) retrospectively to verify models by comparing their predictions with the changes actually observed.

Among the general questions to be answered in developing effective national public health systems are the following: How to increase the involvement of academia as a trusted partner? How to coordinate public health education for multiple universities and funders? How to create complementarity and coherence among multiple government departments? How to prepare now for future challenges (for example, the ageing population) and emerging opportunities (for example, public health genomics)? How to work with global partners in capacity building?

In considering the future options for Germany, international comparison of different systems emphasises the importance of:

- Critical mass – financial, institutional, and inter-sectoral, with clarification of the relationship with EU-level activities.
- Excellence – in research and education throughout public health systems, with clear career pathways.
- Inter- and transdisciplinarity – cross-sectoral programmes achieving understanding and collaboration in all health-related areas of science with participation by organisations and stakeholders in politics, the public and private sectors, civil society and academia.
- Integration – of national priorities with global aspects.
- Raising the public and political visibility of public health – and this also requires improving the image and status of the public health professional.
- Various models – can be contemplated for a national system of public health institutions; this will require debate with politicians but it is essential that whatever option is proposed, it is of excellent quality and commits to training and education in global health.

5.5 Addressing global health governance challenges

In pursuing intergovernmental responsibilities in global health, there has been a long history of inadequate governance (Gostin and Monk, 2009) encompassing weaknesses in leadership and multilateral collaboration, inadequate resource allocation, priority setting and accountability. The political and economic reasons for this inadequate governance are themselves primary areas of research in public health. However, there is some room for optimism and new initiatives in global health governance (Pang et al., 2010) bring new opportunities to define shared priorities and to learn from each other. Global health governance shares the characteristics of complex adaptive systems with its multiple and diverse contributors (including recent increases in involvement by NGOs, the private sector and philanthropy) and the application of complexity theory offers insight into the current dynamics of public health governance (Hill, 2010; Hanlon et al., 2011). Further analysis by the WHO Regional Office for Europe (WHO Europe, 2011) re-emphasises the point that governance for health requires joint action of the health and non-health sectors, of public and private sectors, and citizens, for a common interest. Thus governance “*requires a synergistic set of policies, many of which reside in sectors other than health as well as sectors outside of government which must be supported by structures and mechanisms that enable collaboration*”. Active and sustained collaboration is also increasingly important in global health research to move towards greater equity in both health and health research (Zarowsky, 2011).

When considering objectives and mechanisms, it is important also to appreciate that increasing collaboration in research and innovation to tackle shared

problems is a good example of “science for diplomacy”, placing cooperation in science and health at the heart of foreign policy (Royal Society and AAAS, 2010). Health can be seen as particularly relevant to strategic foreign policy objectives because it is integral to the global agendas for security, economics and social justice (Fieldbaum et al., 2010; Kickbusch, 2011b), and universities must develop their roles in this global diplomacy and governance.

5.6 Responsibilities for academia

There are significant implications for training, research and collaboration. Requirements for global health and public health training are not addressed in many EU countries (Lee et al., 2011), but the initiation of a Commission on Education of Health Professionals (Bhutta et al., 2010) should help to develop a new generation of professionals better equipped to deal with the challenges of global health. Clearer understanding of the global health challenges helps to define the public health functional response required, which in turn defines the necessary professional competencies; these in turn define the academic teaching structures required to generate the competencies. For example, recent changes to the public health curriculum in Columbia University in the USA were driven by the issues for globalisation, urbanisation, population ageing and health disparities.¹⁷

There is scope for much more collaboration across academia and between national academies of science, and there are some encouraging initiatives:

1. The European Academic Global Health Alliance¹⁸ is a platform bringing together ASPHER and non-ASPHER members

¹⁷ Cf. <http://publichealth.columbia.edu/degree-programs/columbia-mph> (accessed 18 November 2014).

¹⁸ Cf. <http://www.eagha.org/> (accessed 18 November 2014).

of academic institutions expressing an interest in global health, now expanded as a World Federation for Academic Institutions in Global Health. Initial discussion has focused on the multidimensional nature of global health and the potential objectives to advocate for evidence-based policies and increased resources for global health in the EU, to contribute to capacity building and partnership development in lower-income countries, to encourage the evaluation of investments in global health and to undertake horizon-scanning to identify new areas relevant for public health education.

2. The M8 Alliance, connecting leading universities and national academies worldwide, is creating a world forum on public and global health, the World Health Summit (with regional meetings), bringing together leaders from academia, politics, industry and civil society. They explore the contribution that scientific evidence can make to informing policy on the major global topics: for example, mental well-being in large urban areas; reduction of risk factors for non-communicable disease; health impacts of climate change; and workforce capacity building (Adli et al., 2011). The M8 Alliance Statement at the World Health Summit in 2013 reiterates the need for translating evidence to policy alongside action on global health for development, education and leadership, research and innovation.¹⁹
3. The recent Statement by IAP (2013) responding to the report of the UN panel on the post-2015 development agenda provides various recommendations on priorities for action and declares the willingness of academies of science worldwide to continue to be involved in informing the policy options.

5.7 The options for increasing academic involvement in global health in Germany

Addressing the issues for global health requires new ways of working to include colleagues from policy and research in non-health sectors such as climate, trade, agriculture, law, finance, development and more (Box 1 and Box 9). There must also be new ways of cross-border teaching, of cooperation with low- and middle-income countries, of translating findings, and inter-sectoral interventions to protect and improve health. This requires addressing the currently fragmented research capacity in global health in Germany, to create critical mass for research and teaching and achieve the global reach essential to tackle shared health problems. Options are discussed further in chapter 8.

¹⁹ Cf. http://www.worldhealthsummit.org/fileadmin/downloads/2013/WHS_2013/Publications/M8_Statement%20Berlin.pdf (accessed 18 November 2014).

6 The history and current situation of public health in academia in Germany

6.1 Historical origins²⁰

Early forms of modern public health services had already developed at the end of the 13th and the beginning of the 14th centuries in northern Italian cities, the driving force being the regular endemic plagues. In early modern times, public health measures evolved which then became regular institutions of the cities of commerce, encompassing

- general regulations with health effects such as food inspection and market orders,
- municipal supervision of those practising medicine,
- the establishment of city hospitals for the infirm and others for special isolation, for example because of leprosy or plagues, and
- the beginnings of a municipal doctor's and surgeon's service.

When the territorial states were consolidated on legal and administrative levels in the late 17th and early 18th centuries, medical and sanitary supervision unfolded. During the enlightened absolutism, a so-called “medical police”, for example by Johann Peter Frank (1745–1821), generated a public medicine that was linked to administrative and political goals with the aim of retaining power by increasing the population; the paternalistic welfare state towards the end of absolutism developed public health as part of its “populating policy”, with women being the human capital of

this policy. Their role thus became substantially determined by medicine.

During the bourgeois revolution in the 19th century, the notion of the monetary value of a human being also emerged. Driven by a paternalistic idea of welfare, the first modern health services came into existence, drawing on developments in epidemiology, statistics, physics, geography, meteorology and other disciplines. The 19th century cholera pandemics accelerated this development. In the second half of the 19th century and in the early 20th century, modern health sciences then defined a biological chain of causes and a closed circle of human hygiene, taking hold of literally all areas of human existence:

- conditional hygiene determined by the environment,
- infectious hygiene with microbiology being the driver,
- constitutional hygiene reflecting the dynamic relationship between exposition and disposition,
- racial hygiene and eugenics focusing on the forthcoming human life, and
- social hygiene reflecting the health of societies at large.

Approaches informed by microbiology and theories of hygiene led to the development of the hygienic infrastructure of industrial societies. In the early 20th century, a focus on individual behaviour and risk, for example for typhoid or tuberculosis, helped to inform development of the communal health welfare system.

The idea of obligatory collective health has developed since the turn of

²⁰ This chapter draws on material from Labisch & Woelk (2012), Labisch (2015) and Ladurner et al. (2011).

the 20th century. In the biologicistic ideology of National Socialism it was moulded into a model of future-oriented health, with health-care goals for a “genetically healthy” and “racially pure” population. This idea of a totalitarian programme of health care was based categorically on exclusion and was performed in decisive areas: sterilisation, euthanasia and the Holocaust. The National Socialism aberration of health care can serve as an historical example of erroneous developments based on ideology.

After the Second World War in the Western world, the degenerative diseases of industrialised countries emerged: cardiovascular diseases, diabetes, and also cancer for instance, were mainly conceived as personal risks, to be tackled either by individual early disease detection schemes or in large public health campaigns.

The history of population-based primary prevention with the vital importance of the aim of reducing social inequities has been described in detail elsewhere (for example, Rosenbrock, 2007) and it is necessary to understand this legacy when considering the future options for action. Further discussion on the past and present status of public health in Germany and on the measures needed to enhance public health is provided in the position paper of the DGPH (Gerlinger et al., 2012).

6.2 Relationship between academic public health and public health service

6.2.1 Public health services in Germany

Assuring the working of health services is an essential public health function (Morris, 1957). In Germany, health services for individuals are organised through statutory health insurance (SHI; *Gesetzliche Krankenversicherung* and financed by wage-dependent contributions of the in-

surees (approximately 90 % of the resident population) and the employers. SHI is based on the Social Insurance Act V (*Sozialgesetzbuch V*), a public law enacted by the Federal Parliament (both lower and upper house). It covers outpatient and inpatient services, drugs, rehabilitation and several other services. In 1995 long-term care services were added (*Pflegeversicherung*). Stewardship of the SHI is traditionally in the hands of corporate self-administration, which is overseen and regulated by the state. Tax subsidies play only a minor role in hospital investments and child health services. Certain health promotion and prevention measures are included in the responsibilities of the SHI.

The *Öffentlicher Gesundheitsdienst* (ÖGD), the public health service, on the other hand, is part of tax-financed government administration at regional, state and federal levels. There is need to address the historical, but artificial, partial separation in Germany between academic public health and the ÖGD. After the Second World War, West German ÖGD structures remained operative at the regional level. Academic public health was slowly relaunched according to international academic models only in the late 1980s and early 1990s.

Today's overall structure of the German health system has often been described as standing on three pillars: outpatient care, hospital care and public health. Although the government has a direct strong influence on the ÖGD and federal institutions, for example RKI, the government's influence is much lower on health insurers and very low on civil society organisations (e.g. self-help groups), which are gaining increasing recognition in the German health system.²¹

²¹ Yet, self-help groups are recognised in the *Sozialgesetzbuch*, and SHI can and must finance them.

The modern ÖGD has multiple tasks: for example, health protection, including infectious disease control; disaster management; regulation and control of medical professionals and institutions; environmental health protection; and therapeutic care for the health of individuals and the general population, in particular for social factors. Child protection within the ÖGD exemplifies care for the individual child, reflecting social factors and structures. The ÖGD is structured according to legally defined state and federal German Government structures, and its tasks and responsibilities are based on state legislation. This structure, alongside government institutions and with decentralised legislation, has been considered crucial for the strength and successes of the ÖGD. The issues about how the functions of the ÖGD could in future relate to academic public health infrastructure are discussed in further detail in chapter 8.

The system of health insurance provides instruments of disease prevention. The rights and duties of the clients and the health insurers in Germany are regulated by legislation (*Sozialgesetzbuch*). They include preventive examination (for example pregnancy surveillance), screening of newborn infants for treatable diseases, health surveillance up to the age of 17 years (including vaccination and dental surveillance), bi-annual laboratory screening from the age of 35 years, cancer screening (cervix, colon, breast, skin, prostate) and special programmes (for example for patients with diabetes).

According to standard estimates, only a small proportion of German health insurance fees is spent on prevention: in 2008 expenditure on organised public health and prevention programmes represented only 3.7 % of total expenditure on health (Noack, 2011). This is still higher than the 2.9 % of health spending allocated to public health on average in Western European countries (WHO, 2011). How-

ever, this approach to estimating spending on prevention is too narrow because prevention cannot be equated only with medical practice (Box 5) but must also take into account many other activities associated, for example, with road safety, food safety and control of tobacco use.

6.2.2 Academic public health

A perceived lack of priority in some German public health activities historically is also reflected in the research agenda. Fragmentation of research capacity has several detrimental effects: diminishing quality of knowledge generated; reducing capacity for science-based policy development; and decreasing cost-effectiveness of the investment in research. For example, until recently there has been little attempt at the national level to undertake large population-based epidemiological cohort studies on determinants of disease. There has been significant effort at the regional level, for example MONICA/KORA (Augsburg)²², SHIP (Greifswald)²³, EPIC (Potsdam and Heidelberg)²⁴, ISAAC (Münster, Greifswald, Munich and Dresden)²⁵ and EUROASPIRE IV (Würzburg)²⁶. These regional centres can be regarded as internationally competitive in epidemiological research, and the Helmholtz initiative to develop a national cohort is an important new strategic step. However, there has been concern expressed that this pays insufficient attention to exploring the social determinants of health.

Between 1985 and 2002 the German Federal Government committed to public health capacity building by com-

22 Cf. <http://www.helmholtz-muenchen.de/kora/ueber-kora/index.html> (accessed 19 January 2015).

23 Cf. <http://www.medizin.uni-greifswald.de/cm/fv/ship.html> (accessed 19 January 2015).

24 Cf. http://www.dkfz.de/de/epidemiologie-krebserkrankungen/arbeitsgr/ernaerepi/EPIC_po3_EPIC_Heidelberg.html (Heidelberg) and <http://www.dife.de/forschung/abteilungen/epic-potsdam-studie.php> (Potsdam) (accessed 19 January 2015).

25 Cf. <http://isaac.auckland.ac.nz/> (accessed 19 January 2015).

26 Cf. http://www.epidemiologie.uni-wuerzburg.de/projekte/euroaspire_iv/ (accessed 19 January 2015). The study centre for the first three surveys was in Münster, but moved on to Würzburg in 2012.

missioning national initiatives involving graduate scholarship programmes abroad and research programmes that established five regional Public Health Research Networks (Noack, 2011). International evaluation of these centres produced a mixed assessment; problems were compounded by lack of infrastructure and sustainable funding to continue supporting academic career development and research. Some of these networks have been able subsequently to continue research programmes, although at a less ambitious level, and Germany still ranks low in the European region with regard to public health research intensity. In the late 1980s, eight German universities started a master's degree programme in Health Sciences and in 1991 the University of Bielefeld established the first German school of public health. Later, the Federal Ministry of Research and Technology funded a suite of grants programmes on prevention, rehabilitation, patient oriented research, and health economics with the stated objective to support capacity building in these fields.

In the field of health, as of October 2014, there were 270 bachelor's degree courses and 200 master's degree courses.²⁷ Among these were courses in health sciences/public health, social work, nurs-

ing, therapeutic professions, nutrition, physical education, health economics or vocational education. The academisation of health professions in Germany for the most part takes place at Universities of Applied Sciences as they offered 219 bachelor's degree courses and 144 master's degree courses. Moreover, other degree courses, for example in engineering, can be geared towards health-related professions. Several Universities of Applied Sciences have established faculties or research priorities on health sciences/public health emphasising a population-related perspective on health. The broad research and education landscape is not yet adequately mapped.

6.2.3 Research output

Bibliometric analysis provides one estimate of the comparative ranking of Germany in international scientific production in public health and epidemiology. An analysis has been made of publications for the years 2000–2012 and for impact assessment for 2000–2010 using the Scopus database.²⁸ The main findings from this bibliometric analysis are shown in Box 10 and Box 11.

Box 10: Publications in public health – summary of a bibliometric analysis.

- The top ten most productive countries (by whole count of publication) are USA (42,958) > UK (13,663) > Canada (6,723) > Australia (6,202) > Brazil (5,343) > the Netherlands (3,926) > Sweden (2,516) > Spain (1,709) > Germany (1,604) > France (1,508).
- Generally, all these countries show growth in the number of public health publications over this period, especially the USA. For Germany a steady increase in publications can be observed from 2000 (59 articles) to 2012 (255 articles).

²⁷ Cf. <http://www.gesundheit-studieren.de> (accessed 3 October 2014).

²⁸ Full details of the methods, including choice of journals, and results are provided in this supplementary material on www.leopoldina.org. It is relatively difficult to be sure that all relevant literature in public health is captured in this type of analysis, and global coverage may not be as complete for example, for articles relating to health education and health promotion.

- Comparing the count of whole publications with the count of fractional publications (that is, where a publication is shared between countries) gives insight into relative international cooperation. Of the top ten countries, Germany has the highest degree of international collaboration by this measure, and the level of collaboration has increased recently.
- Germany also has a relatively high citation rate for publications in public health compared with the other countries and, again, the relative citation rate has increased in recent years. Germany has a relatively low share of uncited publications: that is, fewer German research results remain unused.
- The most productive institution (University of Heidelberg) accounts for 9.6 % of German research articles in public health in 2000 to 2012, followed by the University of Bielefeld (8.1 %), the Charité, Berlin (7.36 %), the University of Hamburg (7.04 %), and the TU Dresden (6.61 %).
- The ten most cited German institutions in public health in Germany are similar to the top ten productive German institutions (see section 10.2). However, there are some variations in the positions taken by the institutions. Heinrich-Heine-Universität Düsseldorf is the most cited German institution in public health, collecting 429 citations to their publications from 2000 to 2010 in 3-year citation windows, while according to publications it ranked 7th.

Box 11: Publications in epidemiology – summary of a bibliometric analysis.

- The top ten most productive nations (by whole count of publication) are USA (28,889) > UK (7,341) > Canada (4,101) > China (3,387) > France (3,327) > Australia (2,906) > the Netherlands (2,880) > Germany (2,531) > Italy (2,464) > Japan (2,298).
- As for publications in public health, there has been considerable growth in publications in epidemiology over the period studied.
- Germany also has a relatively high citation rate for publications in epidemiology and, again, has relatively low share of uncited publications, with this share decreasing slightly.
- The most productive institution the German Cancer Research Centre (*Deutsches Krebsforschungszentrum* [DKFZ]) accounts for 16.74 % of the studies in the period studied, followed by the RKI (10.24 %), the University of Heidelberg (8.16 %), the University of Munich (7.95 %), and the Charité, Berlin (7.74 %).
- In terms of publications the DKFZ was cited most (14.48 %), followed by the RKI (10.30 %), the Charité, Berlin (6.45 %), the Helmholtz Zentrum München (6.17 %), and the University of Munich (5.90 %).

6.2.4 Concerns about academic public health in Germany

Concerns about fragmentation of public health in academia in Germany are compounded by several factors:

- Lack of consensus on terminology: and lack of clarity about the relative roles and responsibilities of public health, social medicine, prevention and health promotion, and medical sciences.
- Inadequate academic basis: generally there is only limited public health pres-

ence in the medical faculties and there is controversy in Germany about the optimal degree of connectivity between clinical medical and public health faculties. Appropriate connectivity of public health with other key areas (social and labour policies, education provision, agriculture, transport and the built environment, for example) also needs to be strengthened as discussed elsewhere in this statement. Public health research attracts little funding by comparison, for example, with ba-

sic biosciences. Moreover, it has been found difficult to justify the value of the interdisciplinary research inherent in public health to funding bodies that have traditionally focused on specific scientific disciplines.

- **Uncertain impact:** published outputs often have only limited impact – sometimes because of the methodological challenges – compared with other areas of science. However, an important distinction must be made between impact in the sense of citation by other publications and impact in society. Developing better indicators of the impact of research is itself an important research area (see also chapter 8). The research performance issues are not confined to Germany. It has been observed (Walport and Brest, 2011) that, by contrast with some other research disciplines, data sharing is not yet the norm within the public health community. This lack of data sharing needs to change or it will limit both research progress and its translation to impact for health benefits.
- **Limited career development:** there are comparatively few obvious career development opportunities in public health, whether in universities, national organisations (with some notable exceptions, in particular the RKI), international organisations located in Germany (with the major exception of the *Deutsche Gesellschaft für Internationale Zusammenarbeit* [GIZ]) or industry. The ÖGD, on the other hand, is constantly looking for applicants. However, there are many important

careers in government and public agencies where public health graduates use their skills but the position may not be labelled as public health. There are also possibilities to provide academic career paths for public health professionals in other disciplines and departments, for example by integrating public health teaching and research in schools of political sciences and social sciences, facilitating interdisciplinary approaches and collaborations. Furthermore, consideration should be given to joint appointments between academia and public health institutions, and with NGOs. There is need to increase visibility about what public health entails.

Nonetheless, and notwithstanding these multiple concerns, Germany can capitalise on significant strengths to address the new opportunities and challenges in public health: unparalleled financial resources, a strong tradition of medical research and innovation, equally strong research in sociology and political science, critical mass of technical expertise, a new commitment to epidemiology and increasing recognition of global responsibilities. These strengths can serve to promote scientific excellence and a firmer link between academia and practice.

6.3 The public health workforce

Many of these career and training issues were discussed in further detail in the workshop (Box 12) addressing opportunities for strengthening the public health workforce.

Box 12: Workshop discussion points: public health workforce.

The objectives of strengthening health promotion and disease prevention services have significant implications for the public health workforce in terms of their number, quality and ability to inform health policy. Citizens will also have an increasing role in public health, with implications for health literacy and lay involvement in the research agenda; the public health workforce has a contingent responsibility to communicate clearly about health matters to lay audiences.

In 2010, 4.8 million people were working in the German health system, more than ever before, but it is difficult to assess numbers involved in specific public health functions. Certain planning capacities and quality assurance procedures are devolved to the corporate, health insurance, sector. There is no standardised definition of a public health professional, so it is difficult to assess comparative performance standards. According to WHO analysis, an efficient workforce is usually the least well developed of the essential features of public health systems. However, there are significant opportunities to use new tools in training and continuous professional development (for example massive open online courses). The shift from medical care to health promotion will see the greater involvement of non-physicians based in community initiatives.²⁹ This changing understanding requires raising awareness of public health in other sectors (for example, the built environment) and ensuring the incorporation of appropriate knowledge into all the diverse career structures that will be part of public health.

The modern public health workforce, whatever its disciplinary origins, will need to do better in linking practice with academia (practice-based evidence and evidence-based practice), in acquiring policy literacy (to drive the engagement with politicians) and in placing greater emphasis on global health. In all areas a strong research base is essential, focusing on excellence, to furnish the evidence to interpret public health complexities and to inform the choice of strategic options.

There is reasonable consensus on what a curriculum offered by schools of public health in the European region should look like (Bjegovic-Mikanovic et al., 2013). There is considerable activity by the ASPHER Working Group on public health workforce development and the Agency of Public Health Education Accreditation is accrediting master's degree programmes in public health to assure quality, transparency and convergence of public health education in Europe.

Students have nevertheless expressed anxiety about their difficulty in assessing the quality of the choices available in public health education. From the student and employer perspectives, it

would be helpful for there to be an inventory of quality-assured study options together with clearer information on what the public health graduate is expected to know.³⁰

The WHO European Action Plan for strengthening public health activities provides a comprehensive framework to assist national objectives for capacity development.³¹ A major problem in Germany is the relatively low visibility of public health and low status of the public health professional. There is still much to be done to assess what essential public health services are performed, by whom and with what competences.

²⁹ The nature and functions of the public health workforce are also under discussion in other Member States. For example, in the UK a recent survey of public health professionals (Jongsma, 2014) found significant dissatisfaction, with many respondents "not feeling professionally fulfilled". Other UK concerns related to the fragmentation of the public health workforce and practice, lack of professional independence from political interference, uncertainty about organisational direction, and workforce numbers, perhaps particularly for medical professionals who were less likely to want to work for local authorities.

³⁰ Further discussion will be provided in additional material, which can be accessed on www.leopoldina.org.

³¹ Cf. <http://www.euro.who.int/en/health-topics/Health-systems/public-health-services/publications/2012/european-action-plan-for-strengthening-public-health-capacities-and-services> (accessed 18 November 2014).

7 The European background

7.1 Public Health and the EU

At the level of the EU institutions, there is interest in strengthening the internal market in health but most of health policy is usually perceived to be a Member State responsibility (Ladurner et al., 2011). There is EU value in capitalising on diversity in systems and experience: studying within a common framework the different solutions for similar public health problems arising in different contexts. Europe is a remarkable but inadequately exploited natural laboratory for studies of the effect of health policy (Mackenbach et al., 2013).

The success of the EU Agency ECDC (Semenza et al., 2008) and the potential for it to develop a remit broader than its current focus on communicable disease, which is more akin to the US Center for Disease Control and Prevention (CDC), provides one basis to build on national public health strengths and create new European coherence in public health. It is vital for academia in Germany to continue to explore the opportunities inherent in these EU-level endeavours and broadly contribute to the debate on the EU health mandate and on the assurance of health protection in other European policies (Rosentrotter et al., 2013).

Germany is not alone in the EU in expressing concerns about its public health competencies and the necessary academic infrastructure for research and teaching. Issues about the education and training of the public health workforce in Europe have been discussed in detail (Tulchinsky and McKee, 2011). The new

needs for education (Box 5, Box 9 and Box 12) have had to take account of the evolution of the scope of public health in Europe from its origins in hygiene in the 19th century, through to current strategies aiming to address the determinants of health acting at a population level, including the social environment, influences of vested interests and health choices.

7.2 Comparison of Member State capacities

At a meeting to discuss public health capacities in the EU convened by the Polish Presidency of the EU Council, an analysis was made of public health strengths and weaknesses in the Member States. This assessment (Box 13) found consistent needs for more financial resources, for a focus on measures of success (relating to both governance and accomplishments) and for more coherent policy framework. These are all issues with implications for the academic sector. Priorities are often still determined politically rather than on the basis of evidence, with consequent instability in effect over political cycles.

Box 13: Summary comparison of public health capabilities in EU Member States
(source: Brand, 2011).

- Organisational structures: there are many public health projects but regional capacities are unequal; linkages with health care are underdeveloped and are even weaker with other sectors. Differences between population groups (including minorities) are often poorly addressed.
- Workforce: many of those who are involved in public health tasks do not perceive that they are part of public health. Generally, there is no lack of schools of public health but career pathways are poorly developed.
- Financial resources: there is considerable imbalance in health funding in favour of curative health services; the contribution of other sectors to public health is poorly quantified. The specific effect of the economic crisis on the currently limited financial resources and on health outcomes has yet to be ascertained³². The challenge is not just to collect robust evidence but also to get European leaders to listen to the evidence.
- Partnerships: academic collaborations often exist at local, regional and international levels but there is usually weak linkage between the academic and policy-making communities. Public health does not have prominence in other sectors and there is scepticism about the value of academia-industry partnerships in public health.
- Knowledge development: most Member States have good indicators of health status. Public health research is generally poorly funded and is dominated by medical research. Evaluation initiatives to monitor public health and health promotion programme implementation are often weak.

7.3 European Commission health and research strategies

The EU public health programme has had a controversial history. The European Court of Auditors found weaknesses in the 2003–2007 programme in terms of strategic planning, priority setting and the identification of quantifiable success criteria (Watson, 2009). Although the auditors also warned the European Commission not to stray beyond its legal limit in funding health projects, given that public health in the EU is mainly a national responsibility (Ladurner et al., 2011), the European Commission has continued to develop interests in public health capacity building in the 2008–2013 programme. The third EU health programme (2014–2020) is in the responsibility of the Directorate-General for Health and Food

Safety is the main instrument the European Commission now uses to implement the EU health strategy which is mainly public health. It supports actions alongside the health programme's 23 thematic priorities to improve and protect human health and help Member States develop and maintain innovative and sustainable health systems. In comparison to this brought approach, the available budget (€449.4 million) seems rather small.

EU funding of public health research is co-ordinated by the European Commission, Directorate-General for Research and Innovation (DG-RTD). The overall amount and type of funding is determined by the European Commission during the decision-making process around each framework programme (FP). DG-RTD has provided funding for public health research since 2000. The funding has been exclusively for once-off projects rather than larger programmes of research. DG-RTD

³² However, initial results are being published to demonstrate significant impact on public health (Allebeck, 2013).

has committed €425.46 million since that date (FP5: €31.4 million, FP6: €29.6 million, FP7: €364.5 million) and has funded 190 different projects (FP5: 22 projects, FP6: 27 projects, FP7: 141 projects). Under the new programme Horizon 2020 framework programme (2014–2020) health research will be funded under the specific heading of “Health, Demographic Change and Wellbeing“. It aims to support the development of new, safer and more effective interventions and keep older people active and independent for longer. It wants also to contribute to the sustainability of health and care systems. Although in the current work programme public health is not specifically mentioned, there are and will be calls about different infectious diseases. In future work programmes till 2020 other public health related topics will be taken up such as research on health promotion and disease prevention or international public health and health systems.

Further thought is needed to specify the strategic public health agenda that should be part of Horizon 2020 of the upcoming work packages, taken together with the efforts of WHO and the individual Member States.

7.4 WHO European Health Policy 2020

Health 2020 is the new WHO European health policy framework³³, to support actions across governments and society to “*significantly improve the health and well-being of populations, reduce health inequalities, strengthen public health and ensure people-centred health systems that are universal, equitable, sustainable and of high quality*”. This initiative has been designed to cover issues and options associated with the objectives of rejuvenating health systems (with particular regard to

equity, governance and the economics of prevention) and developing the common understanding of what constitutes public health services (WHO, 2011³⁴), again with important implications for the roles of the academic sector, as discussed in the previous chapters. The analysis is based on self-assessment of European country capacities to meet their public health objectives and the implications for development of public health infrastructure, including workforce skills. The assessment of health system performance is made relative to the proposed ten essential functions of public health operations (Box 3), but it could be argued that there should be greater emphasis of the role of innovation in discharging the essential functions. Furthermore, the functions do not explicitly cover the role of European countries in global health.

33 Cf. <http://www.euro.who.int/en/health-topics/health-policy/health-2020-the-european-policy-for-health-and-well-being> (accessed 18 November 2014).

34 Detail is in the document from the WHO Regional Committee for Europe, EUR/RC61/Inf.Doc/1 (August 2011), *Developing a framework for action for strengthening public health capacities and services in Europe*.

8 Conclusions and recommendations

8.1 Introduction

The previous chapters have described the importance of public health as a new interdisciplinary science, translating basic research into better health of populations and developing questions from public health issues relevant for basic research. It is the responsibility of German research organisations and funding agencies to give health and public health a higher priority.

Health is complex but the challenges demand action to treat and prevent even though the complex system may not be fully understood – as long as intervention is evidence-based using sound science in implementation and monitoring for effects and unwanted side effects.

It is necessary to empower one Ministry and one State Secretary to be responsible for the coordination of public health in the government and federal agencies, supported by an inter-ministerial group on public health.

Germany also has a major responsibility in global health, and the recent government statement on strategy (BMG, 2013) is warmly welcomed; institutional mechanisms and instruments must follow.

Our detailed conclusions and recommendations are as follows.

8.2 Redesigning academic public health in Germany: form follows function

As discussed in previous chapters, the mission for universities in public health is to improve population health by fostering research, training and education, with engagement to inform policy and practice. The desired objectives can be construed in terms of the four overlapping areas discussed previously: (1) public health for national issues; (2) public health at the EU level; (3) global health, covering the issues that transcend national boundaries; and (4) international health, traditionally focused on issues for lower-income countries. A substantial German commitment to public health in academia should cover all four areas.

There are many excellent individuals working in public health in Germany and they need to be supported by improved structures. There is urgent need to grow the critical mass of the emerging regional clusters of public health and to connect these clusters within a national strategy. Inevitably, different universities develop their own focus, and this can become a strength. What is important at this stage of the analysis is to clarify the strengths they have in common as well as their individual research priorities. A strategy for establishing a strong structured academic public health in Germany will need to bring together government, research funders and the scientific community within Germany and international organisations and connect them with the global developments. The following sections in this chapter attempt to provide

a basis for starting this process. To complete the assessment that will be essential to inform robust long-term reform, it will be necessary to provide a more detailed analysis of the current landscape for academia than has been possible in the time available for this statement. This is our first recommendation.

8.3 International benchmarking

In considering international examples of public health academic structures as potential benchmarks for reform in Germany, experience was shared by the Working Group with public health experts from the USA (Johns Hopkins University), UK (London School of Hygiene and Tropical Medicine), Australia (Monash University), Switzerland (the agenda for a school of public health [SSPH+ governing bodies, 2010]); see Appendix) and France (the national school of public health, EHESP). This benchmarking of international experience, taken together with other analysis (Tulchinsky and McKee, 2011), identifies common constraints faced by European departments of public health based in medical faculties and common challenges faced by newly emerging schools.

Benchmarking health policies and health outcomes requires comparable data across countries. The European Commission, the Organisation for Economic Co-operation and Development (OECD) and WHO provide such data sets. If one wants to link health outcomes with those health policies that may have caused them, suitable comparable data sets that also collect potential alternative causes and the country-typical social environments are costly, therefore rare and not sustainably funded (e.g. the EU-sponsored Survey of Health, Ageing and Retirement in Europe [SHARE]).

However, while elements of good practice can be incorporated from an

understanding of “what works” in other countries, and while it is also useful to consider what might be envisaged as the minimum requirement (in terms of departments, faculty and other resources) for the different models of a school of public health, it is desirable not to become fixated on the international comparators or the past. Moreover, countries such as the USA with good academic public health systems may have poor national practices, poorer health and shorter lives (National Research Council & Institute of Medicine, 2013). This can be explained, in part, by the translational deficit in applying knowledge, with an acknowledged need to do much better in connecting evidence with practice and to develop new policy options to address the underlying determinants of health through efficient policies and programmes (Teutsch and Fielding, 2011).

A case can be made that radical reorganisation is required in Germany, to take account of the rapidly advancing scientific basis of public health and the growing inter-sectoral opportunities and challenges, the global priorities and users’ perspectives. In devising the strategy for change, the question should also be asked, how will it be known if the reform of academic public health infrastructure is successful? Our main recommendations for education and training, research and the translation of research outputs are summarised in Box 14. The following sections (8.4–8.6) discuss these recommendations in further detail with the options for re-designing academic infrastructure (section 8.7). We emphasise that there is the opportunity now for Germany to pioneer something new in public health – we suggest that consideration is given to creating a centre in interdisciplinary global health.

Box 14: Summary of recommendations for education and training, research and its translation.

Education and training

Building better connections between academic public health and public health practitioners and society in Germany. Other important and emerging players such as schools and foundations should be included. Academies can play an important role in initiating and supporting public health programmes at various levels and in promoting public discussion for example with respect to new technologies, ethics and strategic orientation.

Opening new career paths and providing diversity in the public health workforce at national, European and global levels.

Organising coherent provision of undergraduate and post graduate programmes in public and global health with an inventory of quality-assured courses, together with strong commitment to continuing professional development and distance learning including massive open online courses, where appropriate, in European or international partnerships.

Including public and global health components in the curriculum of all health professionals and other sectors, particularly in the social and environmental sectors and foreign policy. The concept of “health-in-all policies” needs to be included as early as possible in education and training.

Recognising the responsibility and importance of the public and global health workforce to engage with society at large.

Research

There must be new emphasis on interdisciplinary research while maintaining standards of excellence. This has implications for funding agencies in evaluating research proposals and peer review as well as for the structure of university departments. Public health will need to be developed as a truly interdisciplinary science and the respective structures to support this need to be established. This must be achieved independently of existing faculty boundaries.

One major priority is to develop an innovative public and global health research agenda that reflects the global changing burden of disease. Such research should bring together people from different sectors, areas of expertise and countries to develop effective policies, programmes and strategies to improve health through non-health sector interventions and strengthen health systems.

There must be coordinated effort to employ the significant unused potential of randomised trials, cohort studies and other methods to answer public health questions, especially on the implications of implementation of public health measures.

There must be more investment in new research areas in public and global health programmes in addition to classical epidemiology and population-based data sets. For example, genomics and other Omics on a population basis, the new science of molecular evolution of infectious diseases and, importantly, the genomic understanding of the evolution of man (“evolutionary medicine”) open up new vistas to understanding health and disease, public health and prevention, population genetics, emerging infectious diseases, resistance to antimicrobial agents, public mental health, non-communicable diseases and their risk factors.

More research effort is required to understand these cross-cutting issues, including the broad field of inequality and social determinants that influence health. The term “new public health” has been coined to embrace all the relevant fields of research, teaching, policy and implementation. It is critically important to ensure that EU legislative measures to regulate personal data protection do not introduce new obstacles to health research and improved health.

Translation of research outputs and public engagement

Commitment to translation is essential if research results are not to be wasted. Academia has a role and responsibility not only to generate fundamental and applied knowledge but also to identify and advise on ways to implement that knowledge for health, policy development, public dialogue and international collaboration.

This commitment requires new and efficient structures in universities and research institutions with respect to research, teaching and career paths to facilitate the transfer of knowledge from bench to bedside to populations at the local, regional, national and international level.

Translation in public and global health requires public, open dialogue and strategic relationships between academic public health, policy, the private sector, the health industry, and civil society in Germany, across the EU and globally.

We strongly recommend increased public engagement in the health debate at all levels. Germany needs to find new ways for the citizen to access health information and services, and to be actively involved in research. Reform of academic infrastructure will only achieve its optimal value if accompanied by increased public engagement, for example to communicate about benefits and risks of approaches in health promotion, health care and the use of new technologies. The academies may be well placed and have a responsibility to participate in this process because of their structural interdisciplinarity and their independence.

Commitment to translation requires clear national priorities. Germany must also, however, take an active role in the debate on what should be covered by the EU mandate for public health. The academies of sciences and the major research organisations must continue their leading role to mobilise the scientific community to provide the sound evidence base to advise policy makers in Germany, the EU and at a global level. Germany is definitely a global player and needs a public debate about its engagement in humanitarian programmes and in global health. The World Health Summit hosted in Germany can serve as a global forum for this purpose.

8.4 Education and training

8.4.1 Building the connection with the German Public Health Service (ÖGD)

There is need for more clarity, within the public health workforce and academia, about which tasks require which level of training. How should those working in public health be taught? Which specialisms require basic training, degrees from

schools of applied sciences or university degrees? To address these questions, it is considered very relevant for future public health in Germany that the structure of the ÖGD is reflected in the division of tasks and responsibilities of the academic public health architecture. This could contribute to the necessary bridging of the separation between academic public health and public health practitioners in Germany. It will

also help to improve the attractiveness of the public health services to young people seeking career choices. Academic public health in Germany is disconnected from the existing governmental public health services and has not contributed to evidence-based public health policy at federal, state or local levels commensurate with requirements. If academic public health is to gain increased importance, as well as collaborating with the existing public health practitioners, it must also function as an academic basis for ÖGD, to the benefit of all parties involved.

The currently functioning teaching facilities for the ÖGD workforce are established teaching academies in Dusseldorf, Munich and Meissen. The Berlin School of Public Health is in the process of establishing itself as a fourth such teaching facility. Some of these teaching facilities liaised in recent years with local public health schools to establish academic degrees for their public health training (e.g. Munich). However, most of the ÖGD relevant public health teaching expertise and ÖGD knowledge is locked within these academies, and little knowledge is shared among ÖGD practitioners, the wider academic community or the general public. Thus, it is essential to establish knowledge sharing and relevant operational research within the ÖGD and, bi-directionally to share experience and expertise with academic public health institutions to ensure leadership and strengthening of the ÖGD workforce capacity in a decentralised manner.

8.4.2 Other issues for delivering education and training

- There should be new paths to providing diversity in the public health workforce, not just based on the medical sector, and not only training for work in the public sector. Discussion of the options for career pathways should consider good practice in other countries to clarify what public health covers, establish identity and enhance reputation. For

example, three professional societies (Deutsche Gesellschaft für Medizinische Informatik, Biometrie und Epidemiologie [GMDS], Deutsche Gesellschaft für Sozialmedizin und Prävention [DG-SMP], Deutsche Region der Internationalen Biometrischen Gesellschaft [IBS-DR]) established a “certificate” of competence in epidemiology based on a portfolio of pertinent achievements and an oral qualifying examination. The UK has a register for accreditation of the public health workforce, both medical and non-medical, which acts to encourage entry to the profession. Achieving EU agreement on the competences required for entry to the profession would help to support workforce mobility.

- The new scope of public health education must incorporate interdisciplinary and inter-sectoral thinking. Among new content will be policy literacy, “health-in-all policies”, genomics and informatics, global health, ethics and media awareness. Teaching in the methodologies of research is needed to train how to generate and use evidence, and how to link evidence with practice, including the practice of public policy. Skills for cooperation and co-working with other disciplines, professions and sectors (including NGOs and the private sector) must also be taught, together with the skills for leadership and advocacy.
- National provision of public health degrees should include bachelor’s, master’s and PhD level; PhD programmes have particular importance in supporting research objectives. There are new opportunities for joint degrees, for example public health with international relations, law and economics, and joint master’s degrees in public health and MD. New tools can be used in support of continuing professional development and distance learning (e.g. massive open online courses). Education modules should also be developed for local and central government as part of in-service training.

- A quality-assured inventory to guide the student in making choices about courses would be helpful; the European Accreditation Agency can be expected to facilitate this.
- Public health components, and more generally the concept of “health-in-all” policies, should be included within the curriculum of all health professionals and in other sectors. The first should explicitly be labelled as public health in the curriculum. The medical school curriculum would benefit from increased input about public health, the political and social contexts, population and demographic aspects of health, health-care delivery science, and global health as well as, more generally, instruction to evaluate the implications of scientific advances for clinical practice and to assess claims made by the private sector. There is scope for wider adoption of the good practice developed in some medical schools for taking the health problem-oriented approach in the curriculum, integrating all relevant disciplines.
- Training is also required to improve procedures for early detection of infectious disease outbreaks, requiring doctors to be taught about the need to express their concerns to public health authorities.
- The public health workforce also has a role in education of the citizen, so that the community-at-large is more health-literate and better able to appreciate the implications of advances in science and technology, for example vaccines (Eisenstein, 2014) and antimicrobial resistance, and better able to interrogate claims from the private sector (e.g. consumer genomics). Informing public debate requires better use of social media to deliver messages, early, clearly and consistently (e.g. on risk factors and on disease outbreak management). Better use of the media generally would help to display public health excellence, in practice, research and role models, make career pathways more

attractive and raise the esteem of public health professionals.

8.5 Research

Priority research areas for Germany are reviewed in the position paper of the DGPH (Gerlinger et al., 2012) and will not be discussed in detail in the present statement. Choice of research topics needs to remain independent. The necessity of excellence in multi-disciplinary research to underpin public health has been discussed in detail recently in other countries (for example the UK [Academy of Medical Sciences, 2013]), who have also emphasised the necessary close relationship between researcher, practitioner and policy-maker and the need to strengthen pathways for public health training and career progression. It is important to reiterate some points made in previous chapters and to emphasise the need for increased strategic investment in public health research. Competitive funding programmes are important but must not lead to fragmentation in research objectives and outputs:

- Some public health problems are tackled and solved in the community and do not currently reach the academic agenda of priorities. Academia must consider a wider research agenda, while always embracing excellence and collaboration.
- A new emphasis on interdisciplinary research must address the questions that are beyond the scope of a single discipline. New interdisciplinary connections create new challenges: for example, in obesity research the various explanatory models (such as those based on evolutionary biology or environmental and social determinants) are not mutually exclusive but do not use a common language. Developing a common platform for research in public health will make the field more attractive for young people and align with initiatives for opening

new career pathways. It is also important to ensure that appropriate interdisciplinary connections are made between other current German strengths (for example climate change research) and public health research.

- There is significant potential to use randomised trials, for example, to compare options for intervention in obesity, tobacco and alcohol consumption, and in comparing approaches to non-communicable disease diagnosis and screening in population cohorts at particularly high risk. There is also great potential for making better use of long-term cross-sectional population and cohort designs to study pathways to ill health and evaluate the effectiveness of implementing interventions in public health. In addition to health and healthcare interventions, such studies need to document the social and economic environment and its changes to identify potential costs and benefits from preventive action. Internationally comparative studies are particularly helpful in this respect. It must also be recognised, however, that because of the complexity of some of the public health challenges, randomised trials and cohort studies must be augmented by other research designs, for example observational studies, in contributing to methodological developments in public health.
- One impediment to public health research is that research grant systems are often based on disciplinary assessment. The funding bodies need to reconsider their criteria and procedures for evaluating interdisciplinary research proposals so as to increase their expertise in evaluating public health research projects.
- Research funding is often technology-driven in orientation whereas it should be needs- and ideas-driven. More effort is needed to examine regional disparities in health and the status of vulnerable groups as well as the working of health services in the region
 - this effort requires both collecting more data and more analysis of available data. Research on social determinants must also address the influence of the commercial environment with its large impacts on health.
- There is significant scope to build on current research capacity in epidemiology and social sciences, including health economics, behavioural sciences and cognitive and systems science. A more active approach to public health monitoring and evaluation will generate new research questions and augment linkage with work priorities at the regional (EU) and global (WHO) levels. There is need to expand effort in funding, handling, linking and accessing large data sets in research and surveillance, for example disease registries, national and international cohort studies, pharmacovigilance and other routine data sets (such as those from general practice).
- One major priority is to develop an innovative global health research agenda that reflects the global changing burden of disease. Such research should bring together people from different sectors, areas of expertise and countries to develop effective policies, programmes and strategies to improve health through non-health sector interventions and strengthen health systems. Increasing research on global health issues requires interdisciplinary approaches (e.g. to assess impact of climate change on health). One essential element in an integrated global health research agenda is to expand research on pathogens (and their antimicrobial resistance), to understand virulence and host susceptibility and to serve as the basis for new drug and diagnostic development.
- The EU Horizon 2020 programme of research funding the major public health problems and to include health systems and policy research. There is need for more cooperation between

EU countries to work on agreed public health priorities, to build networks and to share information – the optimal utilisation of what already exists can help to offset tendencies for growth in bureaucracy and should precede the creation of new structures.

- Academia has a role not only to generate fundamental and applied knowledge but also to identify and advise on ways to address gaps in the implementation of that knowledge for service delivery, policy development, public dialogue and international collaboration. Translational public health requires the use of research evidence in policy and practice, including responding to local and international priorities and documenting the emerging evidence on effectiveness. It is important, therefore, for academia to invest more sustained effort in developing methods, criteria and indicators that could be used to measure research uptake and impact, so as to advise on what works and can be transferred to new contexts.

8.6 Translation or research outputs and public engagement: applying the information that already exists

Research investment is wasted if there is no commitment to translation. The opportunities and challenges are exemplified by public health genomics: there is need to do more to translate between basic research, clinical practice and population health, in both directions (Vignola-Gagne et al., 2013). Caution is warranted in the face of the hyperbole often accompanying new claims; the scientific community must also exercise its responsibility to advise on developing national goals and guidance on what tests and treatments should be implemented and what should not be implemented. Assessment of quality must be evidence-based.

- A broad agenda for engagement is vital to raise awareness of public health issues and to increase the national and international profile of academic initiatives and their contributions to the advancement of science and public health. Engagement strategies must be based on a robust evidence base to connect research, its funders and its users, to maximise the impact on policy, practice, innovation and collaboration and, in turn, inform the future research agenda.
- There is need to develop strategic relationships with policy-makers and the civil society, and practice-related organisations inside Germany, such as IQWIG (Institute for Quality and Efficiency in Health Care) or AQUA (Institute for Applied Quality Improvement and Research in the Health Care), within the EU, such as ECDC, and globally, particularly with WHO, and to tackle interfaces with the private sector, the health industry and civil society. Health impact assessment is an important tool to ascertain the consequences of policy decisions in other sectors.
- We strongly recommend increased public engagement. Germany needs to find new ways for the citizen to access health information and services, and to be actively involved in research, as participants and, for example, in helping to ensure appropriate priorities and relevant end-points. It is probable that reform of academic infrastructure will only achieve its optimal value if accompanied by increased public engagement on health matters. There are considerable challenges associated with understanding and communicating risk, changing attitudes and behaviour at a time when some in the medical profession remain conservative in their assumptions about their responsibility for public health. An additional challenge for academia is to help policy-makers in Germany make the case to their electorate that there is legitimate self-interest in tackling

health problems in other countries: for example, that there is interdependence in a shared vulnerability to communicable disease and other risks that cross borders.

- Academia will have an increasing role in supporting those outside the medical profession in promoting and maintaining public health, including the new ways to access health information and services. There are also significant opportunities for academia at the interface between medical and social sciences to take a lead in informing media communication relating to disease burden, risk and preparing for the unexpected, for example from (re-)emerging infectious diseases.
- There is now considerable experience in Germany in using scientific evidence to inform public policy development and decision-making. There are two dimensions to influencing policy through academic research: (1) to generate the evidence and concomitantly and (2) to develop the methodology that connects research outputs to policy innovation. Academia has additional roles in exploring the issues associated with the implementation of policy and evaluating the consequences of that implementation. There are already models of good practice to adopt in devising effective mechanisms to sustain timely interaction between the research and policy-making communities. The Leopoldina has taken a leading role in mobilising the scientific community to provide the evidence base to advise policy-makers both in Germany and, as a founder member of EASAC, throughout the EU. Guidelines to share good practice in science policy dialogue have been developed by EASAC (EASAC, 2011b) and by the European Science Advisory Network for Health (EuSANH, 2011). Germany should take an active role in the debate on what should be covered by the EU mandate for public health and the policy implications therein.
- While there is general agreement that policy advice needs to be evidence based, in practice causal attributions between policies and their effects are often difficult. There is, however, little formal quality control in such public policy advice. The academic community has a stronger role in evaluation: this role needs to include the evaluation of policy decisions and instruments, and their impact (“policy-based evidence”) as well as the evaluation of the feasibility and effects of health interventions.
- Global health is increasingly important in all the aspects of public health considered above. Academia must raise its profile as a trusted partner in global health programmes, to provide relevant context, inform options and evaluate outcomes. Major objectives should include the following: contributing to international research advances; partnership in support of capacity building in other countries; and development of internationally focused training and exchange programmes.

8.7 Structural options for reform

Public health will benefit from reform. It needs strengthening in research and education. New structures will demand new funding because the existing basis needs to be maintained and further developed. There are differences of opinion as to whether there should be close physical connection between schools of public health and medicine. If the connection to medicine is too close there is concern that medicine will dominate; however, if it is too distant there is concern that public health will be neglected in the medical curriculum.

What, then, are the broad options for academic reform? As discussed in previous chapters, it is important to understand what can be shared between medicine and public health and to agree that,

whatever the institutional arrangements, there should be productive interaction such that graduates from all the disciplines learn mutual respect and work together. Health and public health pose challenges which can only be tackled if there is truly an interdisciplinary approach. This needs to be reflected in the institutions, organisations, structures, teaching and research. International outreach is even more important than in many other disciplines.

Although there are varying views about the nature and effectiveness of the present structures, there is consensus that academic public health expertise in Germany is at a high scientific level, but it is too fragmented to live up to expectations. To live up to international standards and to reach a further qualitative leap, academic public and global health needs to be independent. Developing a strategy for coordination must build on the excellence in disciplines already existing in the leading universities and in other institutions and informed by experience in public health practice, and should also capitalise on continuing developments and regional strengths in the research environment in Germany. We advise diversity in seeking organisational solutions.

Whatever the structural option chosen, it must be of high quality and supported by sustained funding to secure the structural interactions between universities and other institutions involved in public health. It must be accompanied by a continuous commitment to monitor the impact of reform. Furthermore, however reform is implemented, it is also vital to promote the culture of evidence-based continuing improvement. That is, to monitor the impact of reform and to act on the findings.

More of the same is not our recommendation. It is important that the public health community develops a new feeling of joint responsibility, openness and togetherness for the important nation-

al needs and global challenges. This will have to lead to new joint programmes and new structures at national and international levels.

It is considered important that from the beginning of the new national effort, great importance and attention is given to the participation and development of some precise and well-defined European and/or international programmes and collaborations. It is also important that the new “German Public Health” initiative (see below) is structurally closely linked to major European and international institutions. Whatever path is followed, universities will need to play a strong role.

Among the potential solutions are four different models:

1. **“Public and Global Health Network Germany”**. Such a network would strengthen current structures and improve coordination, collaboration, and national and international and networking. There would be great value in developing a strategic national competitive funding programme to support this in a competitive merit-based manner. This could be initiated by funding bodies in Germany and should be open to established funding mechanisms including individual grants, special research grants and “clusters”. This competitive funding scheme could be supplemented by grants from the Federal Ministries and from the *Länder*.

Such a competitive process and a detailed strategic analysis of existing or emerging centres may well result in the establishment of three or four major Public Health Centres situated at universities in Germany, bringing together relevant disciplines such as epidemiology, health system sciences, biostatistics, social sciences or medicine. This would certainly provide a new stimulus for the field but it would need an element of coherence and continuity.

The network's structure could also take advantage of the already-existing competences and experience at universities, at established DZG with disease orientation by German universities and Helmholtz Centres, as well as the RKI, and must link with other public health services to create critical mass. It has to be clear that the universities are important partners; otherwise it will not be possible to obtain one of the main objectives, namely to strengthen public health education and teaching. It will also be crucial to involve from the very beginning the respective planning and advisory institutions at the level of the state and federal governments. In practical terms, it may be feasible to capitalise on the Helmholtz Association of National Research Centres in medical disciplines, as well as Leibniz Institutes, Max Planck Institutes, federal agencies such as the RKI and others who already have activities and programmes in public health, to provide new partnerships, funding opportunities, coordination and critical mass.

2. “German Virtual Institute for Public and Global Health”. This would start with a virtual coordinating structure involving actors mentioned under item 1 to nucleate developments and, in addition, to explore what can be added by EU networking. It may also be desirable to combine elements from the different options: individual centres to lead on particular topics, with a coordinating centre to provide coherence to the framework overall.

3. “Institute for Public and Global Health”. An already existing or a newly founded institute takes on responsibility to promote and support public and global health research, teaching and policy in Germany. Other institutions in this field could collaborate and network with this institute. Elements from items 1 and 2 can be integrated here.

4. “German Centre (or Foundation) for Public and Global Health”. This option would be based on a new, strong, central institute, a hub, which would have the important task of supporting and coordinating an affiliated national network, thereby ensuring that support of excellence in research and teaching is assured in all qualifying centres throughout the country, especially in the universities, but also in non-university institutions. There are various ways to construct such a national centre and its closely linked network of institutions and working groups. One is to support of the core role of the universities and to provide stable federal funding, while at the same time retaining regional strengths and involving non-university institutions. According to this model, the function of a national centre would include the following:

- collaboration with partners in Germany, the EU and worldwide;
- generation of knowledge across a broad front; coordination of decentralised and interdisciplinary training;
- a focus on global health priorities;
- a lead role in the network of regionally based schools of public health, brokering between national and global interests and activities;
- to be a voice of social critique and advocacy for public health;
- encouragement of public dialogue;
- exercise of the mandate to act in public health matters;
- a convincing and effective governance, at the same time assuring participation of partners.

Such a structure could and would have to provide more stability than a loose network, special funding programmes or a virtual institute. It should be aimed at a close cooperation of universities, universities of applied sciences, research institutes and the public health service in order to achieve an efficient transfer of the results and encourage research on public

relevant topics. This structure could take advantage of the competences and experience in the science, coordination and governance at universities and at the DZG, as well as the RKI. In any case, the universities are important partners to ensure that public health education and teaching are strengthened. It can be envisaged that university departments, working groups or other institutions, even outside Germany, become formal external members of the “Centre for Public and Global Health”, including participation in its governance. The different legal structures of the different DZG as well as that of the BIH should be studied as possible models of governance and funding for such a Centre.

These options need further discussion, bringing together additional evidence and perspectives. We strongly recommend establishing a national “Public and Global Health Initiative” (PGH Initiative) so that Germany can fulfil the role that society and the national and international community is rightfully expecting.

Therefore, as part of the next steps, we make the following recommendations.

- Immediately establish a PGH Initiative Founding Committee consisting of representatives of academic public health, non-university research organisations such as the RKI, ÖGD, other relevant bodies in Germany and international experts. This high-level and visible “PGH Initiative” Founding Committee will make the best use of the recommendations from the present statement and will have to make sure that those with responsibility take up the challenges and collaborate on novel solutions without delay. This step gains additional importance in view of the new challenges that will arise from the adoption of the sustainable development goals at the United Nations in 2015.
- As independent institutions, academies provide a suitable platform to bring together all actors relevant for such a process:
 - to engage in further international benchmarking of public health workforces (numbers, career diversity, linkages) and academic structures and their performance,
 - to define collective needs,
 - to identify mutual interests, and
 - to create new links between the partners.
- Develop criteria and indicators of excellence for a process to establish national public health objectives.
- Explore possible strategies to link ÖGD, academic public health and other institutions based on national and global health needs and evaluate the support required to stimulate joint research and scientific activities. The PGH Initiative Founding Committee should define immediate actions and set out an indicative timetable for action over the next 4 years. The strategy devised must be sufficiently flexible to cope with rapid advances in science and technology as well as the new and growing public health challenges.

9 References

- Académie nationale de médecine (2013). *La culture de prévention en sante: des questions fondamentale*. <http://www.academie-medecine.fr/wp-content/uploads/2013/11/DreuxRapport-Culture-de-pr%C3%A9vention-en-sant%C3%A9.pdf> (accessed 13 April 2015).
- Academy of Medical Sciences (2007). *Identifying the environmental causes of disease: how should we decide what to believe and when to take action?* <http://www.acmedsci.ac.uk/viewFile/publicationDownloads/119615475058.pdf> (accessed 18 November 2014).
- Academy of Medical Sciences (2013). *Research in the UK public health system*. <http://www.acmedsci.ac.uk/viewFile/535a3b1c6ce57.pdf> (accessed 18 November 2014).
- Academy of Sciences and Humanities in Hamburg and German National Academy of Sciences Leopoldina (2013). *Antibiotics research: problems and perspectives*. http://www.leopoldina.org/uploads/tx_leopublication/2013_06_17_Antibiotics_Research.pdf (accessed 18 November 2014).
- Acheson D (1988). *Public Health in England: The Report of the Committee of Inquiry into the Future Development of the Public Health Function*. HMSO, London.
- Adli M, Kleinert S, Bonk M, Wesselingh S & Ganten D (2011). *Science to policy: M8 Alliance invites policy makers to step in*. *Lancet* 378, 1447–1449.
- Allebeck P (2013). *Health effects of the crisis: challenges for science and policy*. *European J Public Health* 23, 721.
- Anon. (2012). *Global health in 2012: development to sustainability*. *Lancet* 379, 193.
- Anon. (2013). *How to cope with an ageing population*. *Lancet* 382, 1225.
- Attaran A, Pang T, Whitworth J, Oxman A & McKee M (2012). *Healthy by law: the missed opportunity to use laws for public health*. *Lancet* 379, 283–285.
- Austrian Academy of Sciences, Finnish Academy of Sciences and Letters, German National Academy of Sciences, Polish Academy of Sciences, Royal Danish Academy of Sciences and Letters, Royal Society, Royal Swedish Academy of Sciences, Swiss Academies of Arts and Sciences (2014). *Mastering Demographic Change in Europe – 8 European Academies’ Statement*. Halle (Saale), 2014.
- Barnett K, Mercer SW, Norbury M, Watt G, Wyke S & Guthrie B (2012). *Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectoral study*. *Lancet* 380, 37–43.
- Battams S & Matlin S (2011). *The case for Europe as a leader in research and innovation for global health*. Global Health Europe Position Paper. <http://www.globalhealthurope.org> (accessed 18 November 2014).
- Beaglehole R & Bonita R (2010). *What is global health?* *Global Health Action* 3: 5142 – doi: 10.3402/gha.v3i0.5142.
- Beaglehole R, Bonita R, Alleyne G & Horton R (2011). *NCDs: celebrating success, moving forward*. *Lancet* 378, 1283–1284.
- Berkley S, Chan M, Dybul M, Hansen K, Lake A, Oso-timehin B & Sidibe M (2013). *A healthy perspective: the post-2015 development agenda*. *Lancet* 381, 1076–1077.
- Bjegovic-Mikanovic V, Vukovic D, Otok R, Czabanowska K & Laaser U (2013). *Education and training of public health professionals in the European Region: variation and convergence*. *International Journal of Public Health* 58(6), 801–810.
- Bonk M, Kleinert S & Horton R (2013). *New voices in global health*. *Lancet* 382 (Suppl 1), 1.
- Brandt AM & Gardner M (2000). *Antagonism and accommodation: interpreting the relationship between public health and medicine in the United States during the 20th Century*. *American Journal of Public Health* 90, 707–715.
- Bhutta ZA, Chen L, Cohen J, Crisp N, Evans T, Fineberg H, Frenk J, Garcia P, Horton R, Ke Y, Kelley P, Kistnasamy B, Meleis A, Naylor D, Pablos-Mendez A, Reddy S, Scrimshaw S, Sepulveda J, Serwadda D & Zurayk H (2010). *Education of health professionals for the 21st century: a global Independent Commission*. *Lancet* 375, 1137–1138.
- Brand H (2011), Workshop “Public health capacity in Europe”, part of the Ministerial conference of the Polish EU Presidency on “Solidarity in health, closing the health gap between European Union States”, Poznan, November 2011.
- BMG – Bundesministerium für Gesundheit (2013). *Shaping Global Health Taking Joint Action Embracing Responsibility*. The Federal Government’s Strategy Paper BMG-G-11045. https://www.bundesgesundheitsministerium.de/fileadmin/dateien/Publikationen/Gesundheit/Broschueren/Screen_Globale_Gesundheitspolitik_engl.pdf (accessed 18 November 2014).
- Busse R, Blümel M, Scheller-Kreinsen D & Zentner A (2010). *Tackling chronic disease in Europe: Strategies, interventions and challenges*. World Health Organization.
- Commission on Macroeconomics and Health (2001). *Macroeconomics and health: investing in health for economic development*. WHO. <http://whqlibdoc.who.int/publications/2001/924154550x.pdf> (accessed 18 November 2014).

- Council of Europe (2008). Additional Protocol to the Convention on Human Rights concerning Genetic Testing for Health Purposes. Strasbourg. <http://conventions.coe.int/Treaty/EN/Treaties/Html/203.htm> (accessed 15 January 2015).
- EASAC (European Academies' Science Advisory Council) (2011a). *European public health and innovation policy for infectious disease: the view from EASAC*. Policy Report 14.
- EASAC (European Academies' Science Advisory Council) (2011b). *Science Policy dialogue project*. <http://www.easac.eu/home/policy-dialogue.html> (accessed 18 November 2014).
- EASAC (European Academies' Science Advisory Council) & FEAM (Federation of European Academies of Medicine) (2012). *Direct-to-consumer genetic testing for health-related purposes in the European Union*. <http://www.easac.eu/home/reports-and-statements/detail-view/article/direct-to-co.html> (accessed 15 January 2015).
- ECDC (European Centre for Disease Prevention and Control) (2013). *Health inequalities, the financial crisis, and infectious disease in Europe*. http://www.ecdc.europa.eu/en/publications/Publications/Health_inequalities_financial_crisis.pdf (accessed 13 April 2015).
- Eisenstein M (2014). *An injection of trust*. *Nature* 507 S17–S19.
- European Commission (2011). *Establishing a Health for Growth Programme, the third multi-annual programme of EU action in the field of health for the period 2014-2020*. COM (2011) 709 final. http://ec.europa.eu/health/programme/docs/prop_prog2014_en.pdf (accessed 18 November 2014).
- EuSANH (European Science Advisory Network for Health) (2011). *A framework for science advice on health: principles and guidelines*, EuSANH-ISA, 229716. <http://www.eusanh.eu/> (accessed 18 November 2014).
- Fears R & ter Meulen V (2013). *What do we need to do to tackle antimicrobial resistance?* *Lancet Global Health* doi: 10.1016/S2214-109X(13)70086-X.
- Fears R, Brand H, Frackowiak R, Pastoret P-P, Souhami R & Thompson B (2013). *Data protection regulation and the promotion of health research: getting the balance right*. *Quarterly J Medicine* doi: 10.1093/qjmed/hct236.
- Federal Ministry of Health (2013). *Shaping global health, taking joint action, embracing responsibility*. http://www.bmg.bund.de/fileadmin/dateien/Publikationen/Gesundheit/Broschueren/Screen_Globale_Gesundheitspolitik_engl.pdf (accessed 18 November 2014).
- Fieldbaum H, Lee K & Michaud J (2010). *Global health and foreign policy*. *Epidemiologic Reviews* 32, 82–92.
- Ganten D & Niehaus J (2014). *Die Gesundheitsformel: die großen Zivilisationskrankheiten verstehen und vermeiden*. Knaus, München.
- Ganten D, Spahl T & Deichmann T (2009). *Die Steinzeit steckt uns in den Knochen: Gesundheit als Erbe der Evolution* (3rd edition). Piper, München.
- Gerlinger T, Babitsch B, Blattner B, Bolte G, Brandes L, Dierks M-L, Faller G, Gerhardus A & Gusy B for the Deutsche Gesellschaft für Public Health (2012). *Situation and perspectives of public health in Germany – Research and Teaching. Position paper of the German Public Health Association*. *Gesundheitswesen* 74, 762–766.
- Gostin LO & Monk EA (2009). *Grand challenges in global health governance*. *British Medical Bulletin* 90, 7–18.
- Gluckman P & Bergstrom C (2011). *Evolutionary biology within medicine: a perspective of growing value*. *British Medical Journal* 343, 1319–1321.
- Hacker J (2010). *The impact of life sciences on achieving the Millennium Development Goals*. Roundtable discussion on biotechnology, German Center for Research and Innovation, New York.
- Hanlon P, Carlisle S, Hannah M, Reilly D & Lyon A (2011). *Making the case for a “fifth wave” in public health*. *Public Health* 125, 30–36.
- Hill AB (1965). *The environment and disease: association or causation?* *Proceedings of the Royal Society of Medicine* 58, 295–300.
- Hill PS (2010). *Understanding global health governance as a complex adaptive system*. *Global Public Health* doi: 10.1080/17441691003762108.
- Huber M, Knottnerus A, Green L, van der Horst H, Jadad AR et al. (2011). *How should we define health?* *British Medical Journal* 343, d4163.
- Lampert T & Kroll LE (2006). Messung des sozioökonomischen Status in sozialepidemiologischen Studien in: Richter M & Hurrelmann K (eds) *Gesundheitliche Ungleichheit*, VS Verlag für Sozialwissenschaften, 297–319.
- IAP (2013). *Response to the report of the high level panel of eminent persons on the post-2015 development agenda*. <http://www.interacademies.net/10878/22347.aspx> (accessed 18 November 2014).
- Institute of Medicine (1988). *Future of public health*. Committee for the study of the future of public health, Washington, DC.
- Institute of Medicine (2009). *The US commitment to global health: recommendations for the public and private sectors*. Washington, DC.
- Institute of Medicine (2011). *For the public's health: revitalizing law and policy to meet new challenges*. Washington, DC.
- Jongsma H (2014). *Findings from the public health survey*. Health Policy and Economic Research Unit, British Medical Association.
- Kaplan JP, Bond TC, Merson MH, Reddy KS, Rodriguez MH, Sewankambo NK & Wasserheit JN for the Consortium of Universities for Global Health Executive Board (2009). *Towards a common definition of global health*. *Lancet* 373, 1993–1995.
- Kickbusch I (2008). *Identifying critical societal public health needs: in search of the public health paradigm for the 21st Century*. White Paper for World Federation of Public Health Associations.
- Kickbusch I (2011a). *Advancing the global agenda*. UN Chronicle XLVIII No. 4. <http://unchronicle.un.org/article/advancing-global-health-agenda/index.html> (accessed 18 November 2014).
- Kickbusch I (2011b). *How foreign policy can influence health*. *British Medical Journal* 342, 1345–1346.
- Klenk J, Rapp K, Buchele G, Keil U & Weiland SK (2007). *Increasing life expectancy in Germany: quantitative contributions from changes in age- and disease-specific mortality*. *European Journal of Public Health* 17, 587–592.
- Labisch A (2015). *History of Western Medicine*. In Wright J (ed), *International Encyclopedia of the Social and Behavioral Sciences*, 2nd Edition, Elsevier, Oxford.

- Labisch A, Woelk W (2012). *Geschichte der Gesundheitswissenschaften*. in: Hurrelmann K, Razum O (eds.) *Handbuch Gesundheitswissenschaften*, Beltz-Juventa Weinheim/München, 5., vollständig überarbeitete Auflage, 55–98.
- Ladurner J, Gerger M, Holland WW, Mossialos E, Merkur S, Stewart S, Irwin R & Soffried J (2011). *Public health in Austria. An analysis of the status of public health*. Observatory Studies Series No. 24. http://www.euro.who.int/__data/assets/pdf_file/0004/153868/e95955.pdf?ua=1 (accessed 18 November 2014).
- La Torre G, de Waure C, Boccia A & Ricciardi W (2013). *The promising application of health technology assessment in public health: a review of background information and considerations for future development*. *Journal of Public Health* 21, 373–378.
- Lee ACK, Hall JA & Mandeville KL (2011). *Global public health training in the UK: preparing for the future*. *Journal of Public Health* 33, 310–316.
- Leopoldina (German National Academy of Sciences Leopoldina) & acatech (National Academy of Science and Engineering) (2010). *More years, more life. Recommendations of the joint academy initiative on aging*. *Nova Acta Leopoldina* 108, No. 372.
- Leopoldina (German National Academy of Sciences Leopoldina), acatech (National Academy of Science and Engineering) & Akademienunion (Berlin-Brandenburg Academy of Sciences and Humanities [representing the Union of the German Academies of Sciences and Humanities]) (2010). *Predictive genetic diagnostics as an instrument of disease prevention*. Halle (Saale). http://www.leopoldina.org/uploads/tx_leopublication/201011_natEmpf_praedikative-EN_03.pdf (accessed 18 November 2014).
- Leopoldina (German National Academy of Sciences Leopoldina), acatech (National Academy of Science and Engineering) Union der deutschen Akademien der Wissenschaften eds (2014). *Individualisierte Medizin – Voraussetzungen und Konsequenzen*. Halle (Saale). http://www.leopoldina.org/uploads/tx_leopublication/2014_Stellungnahme_IndividualisierteMedizin.pdf (22 May 2015).
- Luengo-Fernandez R, Leal T, Gray A & Sullivan R (2013). *Economic burden of cancer across the European Union: a population-based cost analysis*. *Lancet Oncology* 14, 1165–1174.
- Mackenbach JP, Karanikolos M & McKee M (2013). *The unequal health of Europeans: successes and failure of policies*. *Lancet* 381, 1125–1134.
- Marmot M, Allen J, Bell & Goldblatt P (2012). *Building of the global movement for health equity: from Santiago to Rio and beyond*. *Lancet* 379, 181–188.
- Martin K & Henke, KD (2008). *Gesundheitsökonomische Szenarien zur Prävention*. Europäische Schriften zu Staat und Wirtschaft Bd 25. Nomos, Baden-Baden.
- Marzuillo C, De Vito C, D'Andrea E, Rosso A & Villari P (2014). *Predictive genetic testing for complex diseases: a public health perspective*. *Quarterly Journal of Medicine* 107, 93–97.
- McKee M, Stuckler D & Martin-Moreno JM (2010). *Protecting health in hard times*. *British Medical Journal* 341, 681–682.
- Millum J, Wendler D & Emanuel EJ (2013). *The 50th Anniversary of the Declaration of Helsinki. Progress but many remaining challenges*. *Journal of the American Medical Association* doi: 10.1001/jama.2013.281632.
- Morris JN (1957). *Uses of Epidemiology*. Livingstone, UK.
- National Research Council & Institute of Medicine (2013). *US health in international perspective: shorter lives, poorer health*.
- Nesse RM, Ganten D, Gregory TR & Omenn GS (2012). *Evolutionary molecular medicine*. *Journal of Molecular Medicine* 90, 509–522.
- Noack H (2011). *Governance and capacity building in German and Austrian public health since the 1950s*. *Public Health Reviews* 33, 264–276.
- Nuffield Council on Bioethics (2007). *Public health: ethical issues*. <http://nuffieldbioethics.org/wp-content/uploads/2014/07/Public-health-ethical-issues.pdf> (accessed 18 November 2014).
- Nuffield Council on Bioethics (2010). *Medical profiling and online medicine: the ethics of “personalised health-care” in a consumer age*. <http://nuffieldbioethics.org/wp-content/uploads/2014/07/Medical-profiling-and-online-medicine-the-ethics-of-personalised-health-care-in-a-consumer-age-Web-version-reduced.pdf> (accessed 18 November 2014).
- Oeppen J & Vaupel JW (2002). *Broken limits to life expectancy*. *Science* 296, 1029–1031.
- Okada K (2010). *Japan's new global health policy: 2011–2015*. *Lancet* 376, 938–940.
- Olshansky J, Antonucci T, Berkman L, Binstock R, Boersch-Supan A, Cacioppo J, Carnes B, Carstensen L, Fried L, Goldman D, Jackson J, Kohli M, Rothert J, Zheng Y & Rowe J (2012). *Differences in life expectancy due to race and educational differences are widening and may not catch up*. *Health Affairs* 31, 1803–1813.
- Ottersen OP et al. (2014). *The political origins of health inequity: prospects for change*. *Lancet* 383, 630–665.
- Pang T, Daulaire N, Keusch G, Leke R, Piot P, Reddy S, Rys A & Szlezak N (2010). *The new age of global health governance holds promise*. *Nature Medicine* 16, 1181.
- Peirson L, Catallo C & Chera S (2013). *The registry of knowledge translation methods and tools: a resource to support evidence-informed public health*. *International Journal of Public Health* 58, 493–500.
- Rawlins M (2013). *Genomics and us*. *Nature* 498, 34.
- Rose G (1992). *The strategy of preventive medicine*. Oxford University Press, UK.
- Rosenbrock R (2007). *Primary prevention top fight inequalities – the German experience and lessons learned*. Lecture at the Wellesley Institute, Toronto, Canada.
- Rosentrotter N, Clemens T, Sorensen K & Brand H (2013). *Twentieth anniversary of the European Union health mandate: taking stock of perceived achievements, failures and missed opportunities – a qualitative study*. *BMC Public Health* 13:1074, doi:10.1186/1471-2458-13-1074.
- Royal Society & AAAS (2010). *New frontiers in science diplomacy*. RS Policy document 01/10. http://www.aaas.org/sites/default/files/New_Frontiers.pdf (accessed 18 November 2014).

- Semenza JC, Apfel F, Rose T & Giesecke J (2008). *A network strategy to advance public health in Europe*. *European Journal of Public Health* 18, 441–447.
- Ståhl T, Wismar M, Ollila E, Lahtinen E & Leppo K (2006). *Health in all policies: prospects and potentials*. Ministry of Social Affairs and Health, Helsinki, http://ec.europa.eu/health/ph_information/documents/health_in_all_policies.pdf (accessed 4 April 2015).
- SSPH+ (Swiss School of Public Health) governing bodies (2010). *The future of public health in Switzerland: setting the agenda for a Swiss School*. Position paper, Zurich.
- Teutsch SM & Fielding JE (2011). *Comparative effectiveness – looking under the lamppost*. *Journal of the American Medical Association* 305, 2225–2226.
- The Graduate Institute, Geneva (2013). *Discussing a definition of global health*. http://graduateinstitute.ch/files/live/sites/iheid/files/sites/globalhealth/shared/1894/Publications/Publications%202013/Definition_Global_Health_v3.pdf (accessed 18 November 2014).
- Timen A (2010). *Outbreak management: towards a model for the next crisis*. National Institute for Public health and the Environment, The Netherlands.
- Tulchinsky TH & McKee M (2011). *The need for public health education*. *Public Health Reviews* 33, 7–15.
- UCL Institute of Health Equity (2013). *Review of social determinants and the health divide in the WHO European region*. WHO Regional Office for Europe. http://www.euro.who.int/__data/assets/pdf_file/0004/251878/Review-of-social-determinants-and-the-health-divide-in-the-WHO-European-Region-FINAL-REPORT.pdf?ua=1 (accessed 18 November 2014).
- Unschuld PU (2014). *Ware Gesundheit: das Ende der klassischen Medizin* (3rd edition). Beck, München.
- Verweij M & Dawson A (2004). *Chapter 2 in Ethics, prevention and public health*. Dawson AJ & Verweij MF (eds.) Oxford University Press.
- Vignola-Gagne E, Rentanen E, Lehner D & Husing B (2013). *Translational research policies: disruptions and continuities in biomedical innovation systems in Austria, Finland and Germany*. *J Community Genetics* doi: 10.1007/s12687-012-0130-0.
- Walport M & Brest P (2011). *Sharing research data to improve public health*. *Lancet* 377, 537–539.
- Wanless D (2004). *Securing good health for the whole population*. Department of Health and HM Treasury, UK.
- Watson R (2009). *Auditors question the value of EU public health programmes*. *British Medical Journal* 338, 128.
- Wellcome Trust (2004). *Public health sciences: challenges and opportunities*. Report of the Public Health Sciences Working Group. http://www.wellcome.ac.uk/stellent/groups/corporatesite/@policy_communications/documents/web_document/wtd003191.pdf (accessed 18 November 2014).
- WHO (World Health Organization) Commission on Social Determinants of Health (2008). *Closing the gap in a generation*. http://www.who.int/social_determinants/thecommission/finalreport/en/index.html (accessed 18 November 2014).
- WHO (World Health Organization) (2010). *Protecting health in an environment challenged by climate change: European Regional Framework for Action*. EUR/55934/6Rev.1.
- WHO (World Health Organization) (2011). *The new European policy for health – Health 2020: Vision, values, main directions and approaches*. http://www.who.int/workforcealliance/knowledge/resources/Health2020_long.pdf (accessed 18 November 2014).
- WHO (World Health Organization) Europe (2011). *Governance for health in the 21st century: a study conducted by the WHO Regional Office for Europe*. EUR/RC 61/Inf.Doc/6.
- Winslow CEA (1920). *The untilled fields of public health*. *Science* 51, 23–33.
- Zarowsky C (2011). *Global health research, partnership, and equity: no more business-as-usual*. *BMC International Health and Human Rights* 11 (Suppl. 2), S1.
- Zimmern RL (2011). *Genomics and individuals in public health practice: are we luddites or can we meet the challenges?* *Journal of Public Health* 33, 477–482.

10 Appendix

10.1 The Swiss School of Public Health³⁵

The Swiss School of Public Health (SSPH+) is a federal project launched 10 years ago because of a strong commitment from the federal State Secretary for Research, Education and Innovation (SERI), the willingness of the directors of the institutes of public health as well as those of the institutes of health economics. Owing to specific prerogatives of Swiss universities, (funded primarily by cantons) and to the fact that research is funded through other types of instrument, the SERI decided to fund the existing university institutes of public health, mainly through a mechanism dedicated to promote postgraduate and continuing education in public health. The Swiss University Conference (SUC) was the designated nationwide body disseminating the federal money through the dedicated university institutes.

The SERI decided to promote the creation of a Foundation named the “Swiss School of Public Health (SSPH+)”, in which universities with an academic activity in public health became a founding member. During a full decade, about 2 to 3 million Swiss francs a year have been brought to these institutes, in addition to their existing budgets (amounting to about 150 million Swiss francs a year in Switzerland).

The long-term objective was to help structuring academic public health in Switzerland in full respect of regional prerogatives of each university. SSPH+ hosted the federal grant with minimal infrastructure and running costs. The headquarters is located at the University of Zurich. SSPH+ is currently run by three co-chairs, one from each linguistic area. Almost all the amount of federal grant has been re-invested each year, either in supporting postgraduate master’s degree programmes (dedicated to continuing education) or the two Swiss doctoral programmes, one in public health and the other in health economics. SSPH+ also funded grants for professorships, for which a selective process of hiring was chosen, and the grants were only given to those universities, who committed themselves to provide permanent positions after a seeding period of 4 years.

SSPH+ has been a major contributor to capacity building in academic public health in the three linguistic areas of Switzerland. The federal funding will end in 2016, but the founding universities are willing to continue to support SSPH+ by financing those activities that need coordination and for which the critical mass is lacking at individual universities.

³⁵ This appendix was prepared by Antoine Flahault (University of Geneva, Switzerland and University of Paris Descartes, France), Sandra Nocera (Swiss School of Public Health, Zurich, Switzerland) and Fred Paccaud (Lausanne University Hospital, Switzerland).

10.2 Selected results of the bibliometric analysis

Tabelle A1: The ten most productive German institutions in public health (2000 – 2012)

Institution	No. of Articles	Share of All German articles (2000 – 2012)
Ruprecht-Karls-Universität Heidelberg	154	9.60 %
Universität Bielefeld	130	8.10 %
Charité – Universitätsmedizin Berlin	118	7.36 %
Universität Hamburg	113	7.04 %
Technische Universität Dresden	106	6.61 %
Ludwig-Maximilians-Universität München	97	6.05 %
Heinrich-Heine-Universität Düsseldorf	86	5.36 %
Ernst-Moritz-Arndt-Universität Greifswald	83	5.17 %
Universität Bremen	74	4.61 %
Helmholtz Zentrum München – Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH) HMGU	73	4.55 %

Tabelle A2: The ten most cited German institutions in public health (2000 – 2010)

Institution	Citations	Share of Citations of German articles
Heinrich-Heine-Universität Düsseldorf	429	7.65 %
Ruprecht-Karls-Universität Heidelberg	373	6.65 %
Universität Hamburg	347	6.19 %
Universität Bielefeld	345	6.15 %
Robert Koch-Institut	319	5.69 %
Charité – Universitätsmedizin Berlin	310	5.53 %
Albert-Ludwigs-Universität Freiburg	270	4.82 %
Ludwig-Maximilians-Universität München	244	4.35 %
Technische Universität Dresden	236	4.21 %
Freie Universität Berlin	235	4.19 %

Note: All values computed from 3-year citation windows.

10.3 List of boxes

Box 1: Workshop discussion points: history of public health in Germany and abroad: developments, definitions, national and global challenges.	19
Box 2: Definitions of public health.	21
Box 3: Ten essential public health operations (detailed definitions and scope are provided in WHO, 2011).	23
Box 4: Workshop discussion points: living conditions and causality.	25
Box 5: Workshop discussion points: prevention and health promotion.	27
Box 6: Workshop discussion points: public health genomics.	29
Box 7: Workshop discussion points: infection epidemiology.	32
Box 8: Objectives in outbreak management: what can be done better?	34
Box 9: Workshop discussion points: Public health: national and global strategies.	36
Box 10: Publications in public health – summary of a bibliometric analysis.	42
Box 11: Publications in epidemiology – summary of a bibliometric analysis.	43
Box 12: Workshop discussion points: public health workforce.	44
Box 13: Summary comparison of public health capabilities in EU Member States (source: Brand, 2011).	47
Box 14: Summary of recommendations for education and training, research and its translation.	51

10.4 List of tables

Table 1: Overarching public health responsibilities for government	22
---	----

10.5 List of abbreviations

AQUA	Institute for Applied Quality Improvement and Research in the Health Care – <i>Institut für angewandte Qualitätsförderung und Forschung im Gesundheitswesen</i>
ASPHER	Association of Schools of Public Health in the European Region
BIH	Berlin Institute of Health
CDC	US Center for Disease Control and Prevention
DGPH	<i>Deutsche Gesellschaft für Public Health – German Public Health Association</i>
DGSMP	<i>Deutsche Gesellschaft für Sozialmedizin und Prävention</i>
DKFZ	German Cancer Research Centre – <i>Deutsches Krebsforschungszentrum</i>
DZG	German Centres for Health Research – <i>Deutsche Zentren der Gesundheitsforschung</i>
EASAC	European Academies Science Advisory Council
ECDC	European Centre for Disease Prevention and Control
ENCD	European Network of Cancer Registries
ESHG	European Society of Human Genetics
EU	European Union
FEAM	Federation of European Academies of Medicine
FP	Framework Programme
GIZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i>
GMDS	<i>Deutsche Gesellschaft für Medizinische Informatik, Biometrie und Epidemiologie</i>
HTA	Health Technology Assessment
IAMP	Interacademy Medical Panel
IAP	InterAcademy Partnership
IBS-DR	<i>Deutsche Region der Internationalen Biometrischen Gesellschaft</i>
IOM	Institute of Medicine
IPCC	Intergovernmental Panel on Climate Change
IQWIG	Institute for Quality and Efficiency in Health Care – <i>Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen</i>
IT	information technology
MOOCs	Massive open online courses
NGO	Nongovernmental organisation
OECD	Organisation for Economic Co-operation and Development
ÖGD	German Public Health Service – <i>Öffentlicher Gesundheitsdienst</i>
PGH Initiative	Public and Global Health Initiative
RKI	Robert Koch Institute
SHARE	Survey of Health, Ageing and Retirement in Europe
SHI	Statutory health insurance – <i>Gesetzliche Krankenversicherung</i>
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

10.6 Methods

10.6.1 Members of the Working Group

Spokesperson

Detlev Ganten	Stiftung Charité, IAMP Co-chair Berlin
---------------	--

Members of the Working Group

Jean-Francois Bach	Académie des sciences, Paris (France)
Axel Börsch-Supan	Max Planck Institute for Social Law and Social Policy, Munich
Reinhard Burger	Former President Robert Koch Institute, Berlin
Martina Cornel	Clinical Genetics/EMGO Institute for Health and Care Research, VU University Medical Center, Amsterdam (Netherlands)
Antoine Flahault	Institute of Global Health, University of Geneva (Switzerland)
Peter Goldblatt	UCL Institute of Health Equity, London (Great Britain)
Jörg Hacker	President of the German National Academy of Sciences Leopoldina, Halle (Saale)
Iлона Kickbusch	Global Health Programme, Graduate Institute of International and Development Studies, Geneva (Switzerland)
Uwe Koch-Gromus	Dean of the Medical Faculty, Universitätsklinikum Hamburg-Eppendorf, Hamburg
Alfons Labisch	Institute of the History of Medicine, Universitätsklinikum Düsseldorf
Peter Propping	Institute for Human Genetics, University of Bonn
Bernt-Peter Robra	Institute of Social Medicine and Health Economics, Universitätsklinikum Magdeburg
Frank Rösler	Department of Psychology, University of Hamburg
Günter Stock	President of the Union of the German Academies of Sciences and Humanities, Berlin
Volker ter Meulen	Past-President of the German National Academy of Sciences Leopoldina, IAP Co-chair, Würzburg
Jos van der Meer	President of EASAC, Internal Medicine, Radboud University, Nijmegen (Netherlands)
Hans-Peter Zenner	ENT-Medicine, Universitätsklinikum Tübingen

Scientific officer and editors

Kathrin Happe	German National Academy of Sciences Leopoldina, Halle (Saale)
Robin Fears	Herts, UK

10.6.2 Reviewers

Klaus Hurrelmann	Professor of Public Health and Education, Hertie School of Governance, Berlin
Josephine Jackisch	Master Student “Dynamics of Health and Welfare”, Ecole des Hautes Etudes en Sciences Sociales (EHESS) Paris and Linköping University, Sweden
Joel Ménard	Université Paris Descartes (France)
Peter Piot	Director, London School of Hygiene and Tropical Medicine (Great Britain)
Pekka Puska	Past director, Finnish National Institute for Health and Welfare (Finland)
Ralf Schwarzer	Health Psychology, Free University of Berlin

10.6.3 Procedures

On the initiative of the German National Academy of Sciences Leopoldina, the working group was established on 19 December 2013 by the Standing Committee of the German National Academy of Sciences Leopoldina. The working group was preceded by 7 fact-finding workshops in 2013 with more than 70 Experts from 12 countries. Thereafter, the working group drafted this statement in 2 meetings in English language. The statement was finally adopted by the Standing Committee of the German National Academy of Sciences Leopoldina on 4 March 2015.

10.6.4 Additional material

Reports of the workshops and the full bibliometric analysis can be accessed on the Leopoldina’s website.

Selected publications in the Monograph Series on Science-based Policy Advice

Statement on Plant Genetic Engineering (2015)

Palliative care in Germany – perspectives for practice and research (2015)

Individualised medicine – prerequisites and consequences (2015)

Academies call for consequences from the Ebola virus epidemic (2014)

On Designing Communication between the Scientific Community, the Public and the Media –
Recommendations in light of current developments (2014)

Socialisation in early childhood – Biological, psychological, linguistic, sociological and economic
perspectives (2014)

Clinical Trials with medicinal products on humans – Ad hoc Statement regarding the proposal
for a regulation of the European Parliament and of the Council on clinical trials on medicinal
products for human use, and repealing Directive 2001/20/EC (2014)

Animal Experimentation in Research – Statement on the Transposition of EU Directive
2010/63 into German Law (2012)

Preimplantation genetic diagnosis (PGD) – The effects of limited approval in Germany (2011)

Predictive Genetic Diagnostics as an Instrument of Disease Prevention (2010)

Revision of EU Directive 86/609/EEC on the protection of animals used for scientific purposes
(2010)

All publications can be accessed freely on the academies' websites.

**German National Academy
of Sciences Leopoldina**

Jägerberg 1
06108 Halle (Saale)
Phone: +49 (0)345 472 39-867
Fax: +49 (0)345 472 39-839
E-Mail: politikberatung@leopoldina.org

Berlin Office:
Reinhardtstraße 14
10117 Berlin

**acatech – National Academy
of Science and Engineering**

Residenz München, Hofgartenstraße 2
80539 München
Phone: +49 (0)89 5 20 30 9-0
Fax: +49 (0)89 5 20 30 9-9
E-Mail: info@acatech.de

Berlin Office:
Unter den Linden 14
10117 Berlin

**Union of the German Academies
of Sciences and Humanities**

Geschwister-Scholl-Straße 2
55131 Mainz
Phone: +49 (0)6131 21 85 28-10
Fax: +49 (0)6131 21 85 28-11
E-Mail: info@akademienunion.de

Berlin Office:
Jägerstraße 22/23
10117 Berlin

The German National Academy of Sciences Leopoldina, acatech – National Academy of Science and Engineering, and the Union of the German Academies of Sciences and Humanities provide policymakers and society with independent, science-based advice on issues of crucial importance for our future. The Academies' members are outstanding researchers from Germany and abroad. Working in interdisciplinary working groups, they draft statements that are published in the series of papers *Schriftenreihe zur wissenschaftsbasierten Politikberatung* (Monograph Series on Science-based Policy Advice) after being externally reviewed and subsequently approved by the Standing Committee of the German National Academy of Sciences Leopoldina.

Monograph Series on Science-based Policy Advice