DEMETRIQ
Developing methodologies to reduce inequalities in the determinants of health

Final summary report

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Edited by Johan P. Mackenbach and Margaret M. Whitehead

Department of Public Health

Erasmus MC

University Medical Center Rotterdam

Rotterdam

The Netherlands

Department of Public Health and Policy

University of Liverpool

Liverpool

United Kingdom

Foreword

This report brings together the results of the DEMETRIQ project, an international collaborative project that aimed to develop methodologies to reduce inequalities in the determinants of health.

The report presents the outcome of a collaborative work in which many partners have participated. Coordinators were Prof. Johan Mackenbach (Erasmus MC) and Prof. Margaret Whitehead (Liverpool University). Members of the steering committee and Work Package leaders were Prof. Bo Burström (Karolinska Institute), Prof. David Stuckler (Oxford University), Prof. Ken Judge (Bath University), Prof. Steve Platt (Edinburgh University), Prof. Pekka Martikainen (Helsinki University), Prof. Olle Lundberg (Stockholm University), Dr. Maciek Godycki-Cwyrko (Lodz Medical University) and Prof. Giuseppe Costa (Turin University).

This report consists of a summary of the project results which follows the guidance for final reports set out by the European Commission. Most of the substantive results of the project, however, have been reported as draft papers for international scientific journals. These additional documents can be found at the project website (www.DEMETRIQ.eu). These documents will become publicly accessible as soon as they have been accepted for publication in a journal.

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For feedback and correspondence, please contact us at j.mackenbach@erasmusmc.nl and mmw@liverpool.ac.uk.

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Johan Mackenbach and Margaret Whitehead

Contributors

Project team members

Department of Public Health, Erasmus MC:
Rianne de Gelder, Yannan Hu, Ivana Kulhánova, Frank van Lenthe, Petra de Vries, Johan Mackenbach

Department of Public Health and Policy, University of Liverpool:
Rachel Anderson De Cuevas, Ben Barr, Anne Dawson, Caroline Devine, James Higgerson, Sarah Mosedale, Sue Povall, Margaret Whitehead

Department of Public Health, Karolinska Institute:
Bo Burström, Mona Backhans, Lotta Nylen

Department of Health, University of Bath:
Ken Judge, Steve Platt

Department of Social Research, University of Helsinki:
Pekka Martikainen, Kimmo Herttua

Centre for Health Equity Studies, Stockholm University:
Olle Lundberg, Anton Lager, Anthony Garcy

Department of Family and Community Medicine, Medical University of Lodz:
Maciek Godycki-Cwirko, Ania Kowalczyck

Department of Clinical and Biological Sciences, University of Turin:
Giuseppe Costa, Teresa Spadea, Nicolas Zengarini

Department of Sociology, University of Oxford:
David Stuckler, Aaron Reeves

Evaluation methodologists

Finn Diderichsen, Penny Hawe, Mark Petticrew, Jennie Popay, Alex Scott-Samuel, Alan Shiell, David Taylor-Robinson

Advisory board

Martin McKee, Erio Ziglio

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1. Executive summary

Socioeconomic inequalities in health are a major challenge to public health in Europe and reducing them is a priority for many countries and for the EU. However, the scientific evidence-base for policies to tackle health inequalities is very limited, in part because of severe methodological challenges in conducting evaluation studies in this field.

The objectives of DEMETRIQ were: 1. To develop, evaluate and refine methodologies for assessing the effects of policies on the pattern and magnitude of health inequalities. 2. To assess the differential health effects of policies in the fields of unemployment and poverty reduction; tobacco and alcohol control; and access to education and preventive health care. 3. To synthesise the evidence from the findings of objectives 1 and 2, and to actively engage users in the research to promote effective exchange of knowledge for policy and practice.

The main results can be summarized as follows. The DEMETRIQ project has developed new guidance for those who want to exploit Natural Policy Experiments to evaluate the impact of population-wide policies on social inequalities in health. This guidance has then been applied, and further refined, in a wide range of empirical studies. In order to facilitate these studies, a longitudinal dataset has been built with data on health inequalities at several points in time in a large number of European countries. The empirical studies have produced mixed results. It was easier to find Natural Policy Experiments that made matters worse, rather than ones that improved the situation and had the potential to narrow health inequalities. Also, for many Natural Policy Experiments that in theory should have narrowed inequalities, we were unable to identify a clear inequalities reducing impact of the policies in practice. This applies to flexicurity, modern tobacco control efforts, expansion of higher education, and primary care reform in CCEE. Fortunately, several studies conducted as part of the DEMETRIQ project also pointed to positive impacts of policies, particularly in the areas of financial security and employment opportunities for disadvantaged groups, health care funding, and breast cancer screening.

While these results has strengthened the evidence-base for policy-making, it is also clear that more research is needed to provide policy-makers with a sufficiently wide range of policy options, and we therefore end with a number of recommendations for further study. We believe that the European Union has an important role to play in supporting this research agenda.

2. Project context and objectives

2.1 Rationale

Socioeconomic inequalities in health are a major challenge to public health in Europe and reducing them is a priority for many countries and for the EU (EC 2009). By socioeconomic inequalities in health we refer to the substantial differences in health between socioeconomic groups found within each European country, with morbidity and mortality rates systematically increasing with decreasing socioeconomic position. People with a lower level of education, a lower occupational class, or a lower level of income tend to die at a younger age, and to have, within their shorter lives, a higher prevalence of all kinds of health problems. These inequalities in health have been found in all European countries with available data, and usually amount to between 5 and 10 years difference in life expectancy, and between 10 and 20 years difference in disability-free life expectancy (Mackenbach 2006).

Reducing health inequalities offers great potential for significant overall health gain. A 2007 study estimated that the number of deaths that can be attributed to health inequalities is more than 700,000 per year in the European Union (EU-25) as a whole. The number of life years lost due to these deaths is about 11.4 million, and the number of prevalent cases of ill-health that can be attributed to health inequalities is estimated to be more than 33 million (Mackenbach et al 2007). If we could tackle the causes of these health inequalities, and thereby achieve at least a partial "upward levelling" of health inequalities (Whitehead & Dahlgren 2007), over-all population health would benefit enormously.

This is why, since the "rediscovery" of socioeconomic inequalities in health in the early 1980s, several European countries have invested in research into the determinants of these inequalities (Whitehead, 1998, Siegrist & Marmot 2006). As a result, we now know in relatively great detail what causes these health inequalities. Research in for example the United Kingdom, Sweden, Finland and the Netherlands has shown that socioeconomic inequalities in health at adult and older ages reflect the cumulative effect over the life-course of disadvantage in many spheres of life. At least four groups of factors play a role: material living conditions, psychosocial conditions, health-related lifestyles, and access to essential services such as health care (Graham 2009).

This has enabled national and local governments, as well as non-governmental and health care organizations, to start thinking about specific policies and interventions to reduce health inequalities. Health inequalities are avoidable. They are not simply a matter of random or biological variation, but ultimately derive from the actions of individuals, communities, private companies, governments et cetera (EC 2009). Tackling these health inequalities may require action not only on their specific determinants, but also on their root causes, such as poverty, unemployment, and inequalities in access to education (Whitehead et al 2001, Dahlgren & Whitehead 2007).

2.2 Methodological challenges

Both policy-makers and researchers are, however, faced with enormous challenges. The scientific evidence-base for policies to tackle health inequalities is very limited: most of the evidence relates to the determinants of health inequalities, and there is very little empirical evidence on what works to reduce health inequalities. To the extent that there is such evidence, there is an 'inverse evidence law': the availability of evidence tends to vary inversely with the potential impact of the intervention (Nutbeam 2003). There is a concentration of evidence on the effect of small-scale projects aimed at individual behavioural change, and a dearth of evidence on major policies applied across areas and countries, even though the latter could potentially have a greater population impact.

Evidence is lacking not only because research has only recently and gradually moved beyond explanation to intervention development and evaluation, but also because of inherent difficulties in developing and evaluating policies in this field. Many policies to influence these determinants are outside of the health care system (Dahlgren and Whitehead, 2007), and can be characterised as complex social interventions embedded within complex systems (Shiell et al 2008, MRC 2008). Such interventions cannot be evaluated using conventional research designs, and have therefore seldom been evaluated for their impact on population health, and even more seldom for their differential impact on different socioeconomic groups (Bambra et al 2009).

As recognized by the FP7-HEALTH-2011 call to which DEMETRIQ responded, there is an urgent need to extend and strengthen the evidence base on differential policy impact, in order to identify the most effective ways to reduce health inequalities in different European countries. We propose to exploit the opportunities offered by 'Natural Policy Experiments' to the full. European countries differ in their implementation of potentially relevant policies, and this variation has so far been used only rarely to generate new knowledge about what does and does not work to tackle health inequalities. Methodologically, this is a highly challenging task, which requires methodological innovation as well as harmonized data collection. This project, "Developing methodologies to reduce inequalities in the determinants of health" (acronym: DEMETRIQ), has been designed to meet this challenge.

2.3 Objectives

The objectives of DEMETRIQ are:

1. To develop, evaluate and refine methodologies for assessing the effects of social, economic and health policies on the pattern and magnitude of health inequalities among socioeconomic groups.
2. To assess the differential health effects by socioeconomic group of Natural Policy Experiments in the fields of unemployment and poverty reduction; tobacco and alcohol control; and access to education and preventive health care.
3. To synthesise the evidence from the findings of objectives 1-2, and to actively engage users in the research to promote effective exchange of knowledge for policy and practice.

2.4 Research strategy

The proposed methodologies cannot be developed as a theoretical exercise in isolation from the evaluation of real-life policies. They have to be developed and tested while exploring the impact of actual policies. Therefore our methodological development is integrated with the evaluation of selected key policies.

The work has been organised in ten work-packages (WP), each led by a senior researcher with substantial expertise in the area. This senior researcher was supported by a team of co-researchers from within his/her organization. Additionally, the WP 1, 3 and 10 received input from respectively a group of policy evaluation methodologists, a group of data analysts and a group of potential users (in WP4).

WP1-3 were designed to lay the basis for the work in the other work-packages. WP1 and WP2 aimed to develop/adapt the methodologies for the project as a whole, and WP3 to collect the data and construct the longitudinal databases.

WP4-9 were selected to focus on what we judge to be important strategic drivers of reductions in health inequalities. They can be grouped into three policy clusters:

- Economic change and social protection (WP 4 and 5). *Drivers: Unemployment & Poverty*
- Population-wide behavioural change (WP 6 and 7). *Drivers: Tobacco & Alcohol*
- Access to universal services (WP 8 and 9). *Drivers: Education & Preventive health care*

We have used quantitative as well as qualitative approaches and combinations of methods to further the understanding of which policies work, how they work and why and for whom.

WP10 has exploited the fact that the project as a whole is designed around an integrated framework, with the methodological development and policy impact assessment WPs working together in an iterative process. This WP aims to synthesise the findings of WP 1 to 9 and develop methodological guidance on the evaluation of Natural Policy Experiments from an equity perspective for policy and research communities. Further, an important aspect of the WP is the assessment of how lay people can be most effectively involved in the research process.

WP11 has been concerned with the coordination and administrative and financial management of the project as a whole.

3. Main results

We have grouped the main results of the project in 6 parts. We start by presenting what we have learned about methodology (section 2.1, based on Work Packages 1, 2 and 10). We then present the results of trend analyses performed on the longitudinal database (section 2.2, based on Work Package 3). In the next sections we present the results of in-depth analyses of the effects of policies, starting with policies in the area of economic change and social protection (section 2.3, based on Work Packages 4 and 5), followed by policies in the area of population-wide behavioural change (section 2.4, based on Work Packages 6 and 7), and ending with policies in the area of access to universal services (section 2.5, based on Work Packages 8 and 9). Finally, we briefly present the results of our stakeholder outreach (section 2.6, based on Work Package 10), before drawing some overall conclusions from the project as a whole (section 2.7).

3.1 Methodology

Approach

Policies that address the social and economic conditions in which people live have the greatest potential to reduce health inequalities; however these are often the hardest to evaluate using traditional experimental methods. This has led to calls for more evaluations of the impact of policies as they happen. A number of methods have been developed for evaluating such Natural Policy Experiments (NPEs) and an increasing number of studies use these techniques. However, the understanding of the strengths and limitations of these techniques is still limited, and we have therefore developed guidance for their application, focused on how the impact of policies on socioeconomic inequalities in health can be assessed.

Rapid reviews of evaluations of natural policy experiments were conducted, both by the Liverpool and Rotterdam teams, with the former focusing on study design for complex social interventions, logic models, and evaluations of policies in the WP 4-6 fields, and the latter focusing on quantitative analysis techniques. Also, a number of workshops were held with a panel of expert methodologists. This was used to develop a framework for evaluating NPEs. During several meetings of DEMETRIQ partners this framework has been developed into reporting guidance and a validity assessment taking into account empirical evidence and methodological considerations emerging from the DEMETRIQ programme of empirical research.

Furthermore, reporting of the results of such research is often inadequate, which hampers the assessment of its validity and generalizability. There are also currently limited tools for researchers to assess studies' validity when synthesising evidence from multiple studies in systematic reviews. Those tools that are available are designed for observational clinical studies and do not sufficiently address validity issues associated with evaluations of complex social policies. We have therefore also developed a reporting and assessment framework, which is incorporated into the Evaluation Guide.

Development of methodologies for evaluating Natural Policy Experiments

The particular gap in the evidence base that DEMETRIQ set out to fill was the question of how to exploit Natural Policy Experiments to evaluate the impact of population-wide policies on social

inequalities in health. In DEMETRIQ, we have adopted the MRC definition of 'natural experiment', adapted for our purposes to focus specifically on Natural Policy Experiments (NPE) in the field of public health and health inequalities:

> "policies that are not under the control of the researchers, but which are amenable to research using the variation in exposure that they generate to analyse their impact" (MRC 2011, 4).

They have also been characterized as "experiments of opportunity" (Morris) – being naturally occurring rather than planned experiments.

The key points about natural policy experiments emerging from this definition for public health evaluation purposes are:

- The researcher has no control over which people or groups are exposed to the policy and which are not. Policy-makers, implementers and policy context govern who gets exposed to what and when, not researchers.

- The key operational characteristic of a NPE is that it generates variation in exposure to a policy that is amenable to research. The central concern for the design of evaluations in this field is therefore how to identify and devise ways of exploiting variations in exposure, the effects of which can be compared.

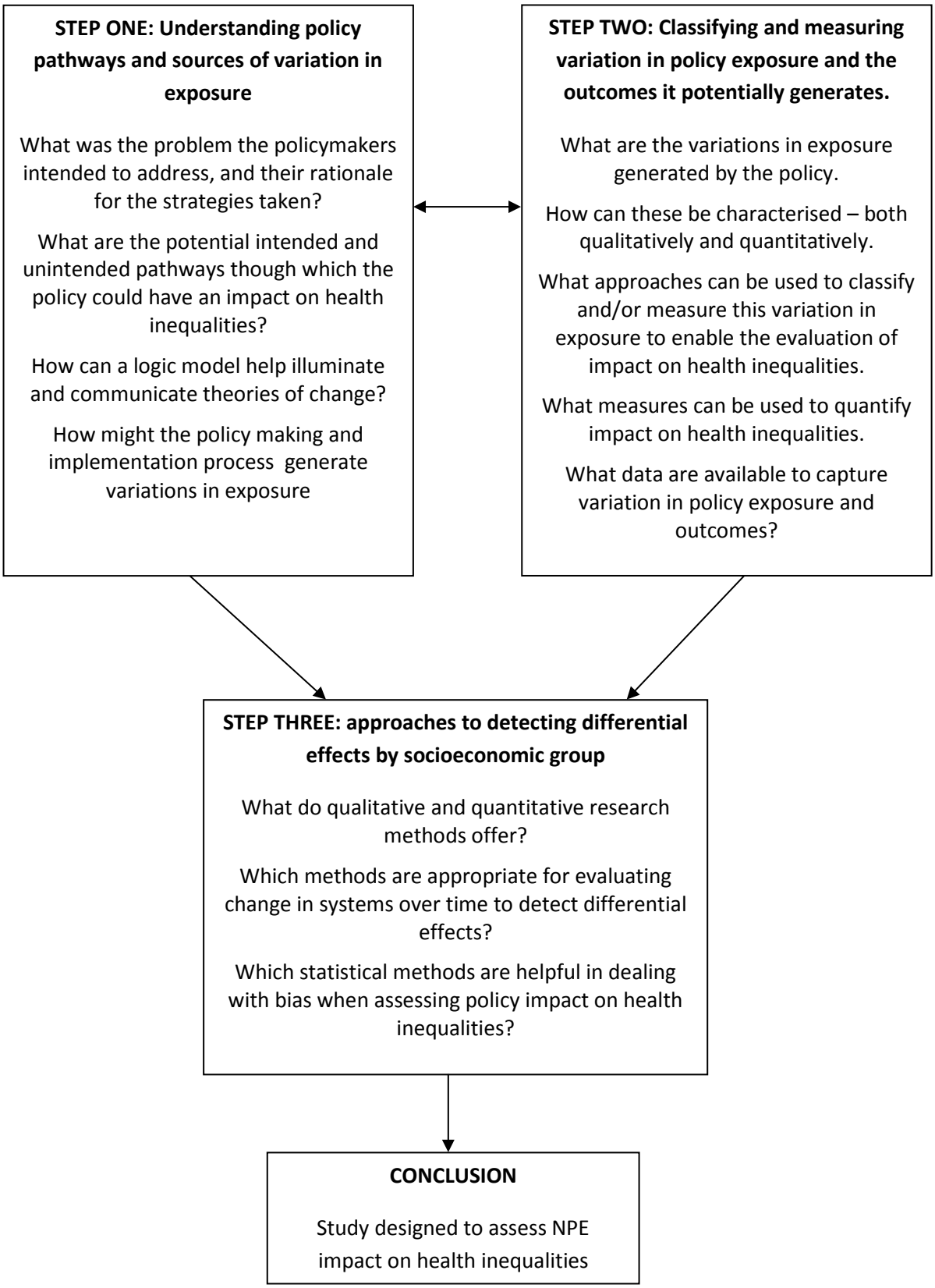
- The term refers to an intervention/policy and NOT to a study design. No particular study design is implied by the definition, and a range of designs could potentially be considered depending on the evaluation question. Starting from this premise, we developed a new architecture of study design for the purpose of evaluating NPEs for their health inequalities impact, set out in the Evaluation Guide and summarized below.

Re-thinking approaches to study design

We soon realized that the standard categories of study design used in intervention research were inadequate for our purposes and that more radical thinking was required. What was needed amounted to a new architecture of study design, which encompassed the many different factors that need to be taken into consideration in deciding how best to evaluate the complex policies and systems that influence the social determinants of health inequalities. What we have come up with is a process of assessment and decision-making that leads to the most appropriate design for a NPE in its specific context.

We outline three steps for designing such evaluations. The first step involves understanding the policy in question. What kind of policy is it? What problem is/was it intended to address and how might it bring about change? Through what pathways might impact on health inequalities occur? The second step is to identify the variation in exposure which might be used to construct an NPE and the data that would be required and define measures of both policy exposure and impact. In the third step the most appropriate analytic methods are chosen, informed by everything learned from the previous two steps i.e. the theory of change, the characteristics of the policy, the type(s) of variation in exposure, the data available and the possible measures (Figure 1).

Figure 1: Designing a study to evaluate natural policy experiments for their impact on health inequalities



It is important to note that not all policies can be evaluated in this way. In thinking through the three steps the researcher will determine whether the policy in question constitutes a 'Natural Policy Experiment' (NPE) and so can be evaluated as we describe. At any stage it may become clear that the policy does not fit this category i.e. the nature of any variation in exposure generated and the data available make the evaluation of its impact unfeasible.

This approach is described step by step in the Evaluation Guide (paper A.1).

Development of logic models for evaluating health inequalities impact

Our new architecture of study design is underpinned by the development of logic models for DEMETRIQ purposes. A logic model is a graphic description of a system, designed to identify important elements and relationships within that system. Long used by programme planners and evaluators to help articulate how an intervention or policy works to solve a specified problem, they are increasingly becoming standard in intervention research and the design of systematic reviews.

For DEMETRIQ purposes, the challenge has been to extend the concepts and methods further to encompass not just the pathways to average health outcomes, but the potential causal pathways leading to health inequalities. This requires taking into account the effect a policy might have on differential exposure to health-damaging factors, as well as the possibility of differential impacts and unintended consequences of a specific policy on different socioeconomic groups in the population.

The steps in constructing a logic model include articulating: the observed health inequalities problem; the perceived causes of the problem; the policy goals to address the problem; the underlying theory of change about how and why the proposed policy might work to bring about change in the causes; the process and context of implementation; plausible intended health inequalities impact; plausible alternative pathways that may bring about positive or negative unintended outcomes.

We illustrate in the Evaluation Guide how logic models can then be used to specify points in the pathways for evaluation, the outcomes to be measured, and the processes and contextual factors to be taken into consideration, with examples from DEMETRIQ evaluations.

Refining approaches to detecting differential effects

We reviewed the principles, strengths and weaknesses of the main research approaches that can be used to identify the impact of an NPE on health inequalities, summarized in Step Three of our Evaluation Guide, and considered how the approaches could be refined further for DEMETRIQ purposes. This led to two main areas of methodological interest. First, which methods are appropriate for evaluating change in systems over time, given that many of the policies of interest to DEMETRIQ operate within complex systems? To answer this question we drew lessons from evaluations that have tried to take a systems approach to assessing the impact of NPEs on health inequalities, often integrating qualitative with quantitative methods. Second, when dealing with more straightforward scenarios (where policy exposure is characterized as exposed/non-exposed rather than a component of a system), what statistical/econometric methods are there to deal with the bias resulting from the confounding in such a scenario?

Evaluating change in systems over time

For many policies there is complex variation both in the level and characteristics of exposure to the policy. The way the policy is implemented may vary between different contexts. A policy may have many interrelated components that mean it cannot be meaningfully standardised. Mixed methods, employing both qualitative and quantitative approaches, are needed to unpick and understand change in systems over time. From our reviews and development work, we advocate the use of case study approaches for evaluating change in systems over time. A case study is a research strategy that uses either qualitative or quantitative methods (or both) to understand a phenomenon in its real-life context. Case study approaches are particularly relevant to the evaluation of impacts of universal policies which aim to improve the social determinants of health. They seek to construct a coherent, unified narrative about impact from diverse evidence, including surveys and some experimental quantitative evidence, but also qualitative information, the whole combined in a way that contributes to an understanding of policy impact on different groups in the population.

A case study approach was used in some of our cross-country comparative analysis, in which, rather than studying many countries superficially, the analysis is limited to a few countries or cases, which are studied in-depth. This in-depth approach is necessary when there are many contextual factors to handle, and there is a need to pick apart what is a policy impact from other contextual factors impinging on outcomes. See the Evaluation Guide (Step Three) and the flexicurity evaluation in section 3.3.

Statistical/econometric approaches to deal with bias

We also identified helpful statistical approaches for assessing impact on health inequalities when policy exposure is characterized as exposed/non-exposed rather than a component of a changing system. The potential for bias is still a serious issue to overcome.

Assessing the impact of NPE's on health inequalities implies ascertaining causal relationships, but because variation in exposure usually results from political or administrative processes outside of the researcher's control, the exposed and unexposed groups will often not be directly comparable (Petticrew 2005). We reviewed the literature for analytic techniques with a potential to eliminate the bias resulting from such confounding, and identified a total of 7 techniques, mostly developed within the discipline of econometrics. These techniques are: standard multivariate regression; fixed effects models; difference-in-differences techniques; propensity score matching; instrumental variable techniques; regression discontinuity analysis; interrupted time series analysis. Each of these techniques has its own scope of application, and its capacity to eliminate confounding depends on characteristics of the natural experiment and the data that have been collected. While this is all, to some extent, common knowledge, our review also found that application of these techniques to the assessment of differential effectiveness, i.e. differences in policy impacts by socioeconomic position, is very scarce. This is partly because such applications are not dealt with in standard textbooks, and are sometimes far from straightforward. We therefore developed specific guidance for how to apply these techniques to answer questions about policy impacts on health inequalities, on the basis of either introducing interaction terms in regression models, or of conducting stratified analyses.

An illustration of our methodological refinements applied to evaluation of the English Health Inequalities Strategy

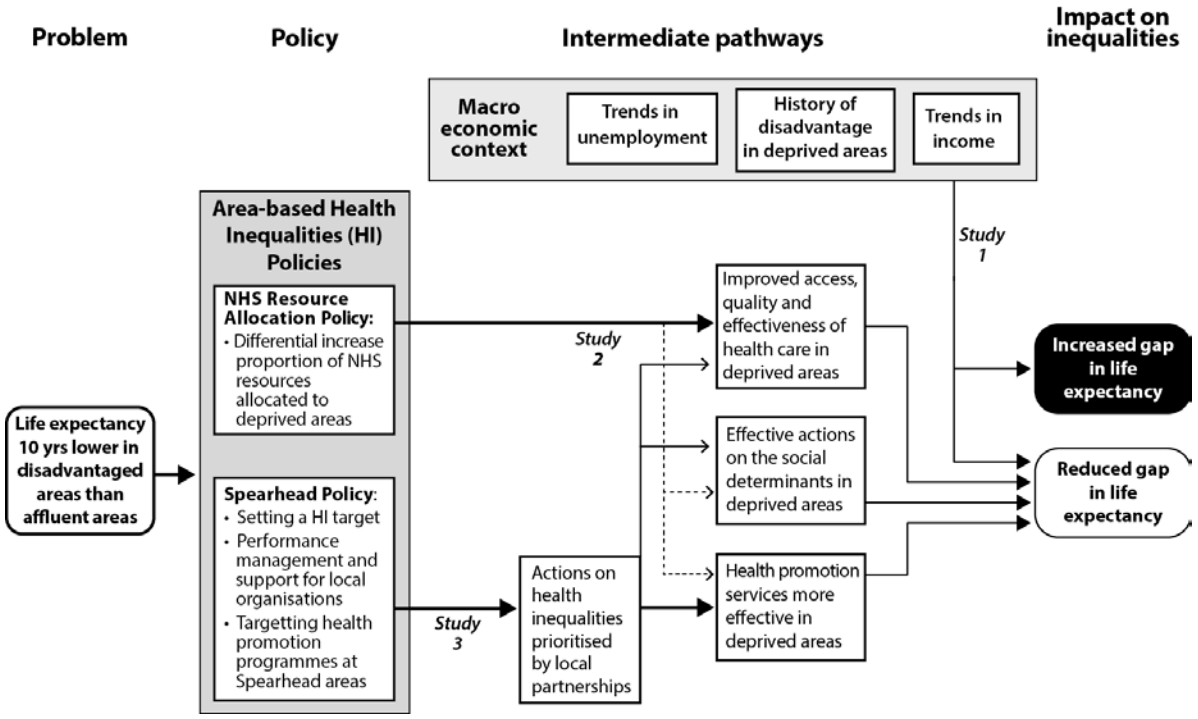
What was the natural policy experiment? Starting around the year 2000, the British government introduced the most comphensive strategy to date in Europe explicitly aimed at reducing social inequalities in health. Two overarching health inequalities targets were set for the public services, of which the first was concerned with reducing inequalities in life expectancy by level of deprivation:

"From 1997-99 baseline:
Starting with local authorities, by 2010 to reduce by at least 10% the gap in life expectancy between the fifth of local authorities with the worst health and deprivation indicators (the 'Spearhead' group) and the population as a whole". (DH, 2003).

An ambitious programme of action was implimented, which relied heavily on a wide range of area-based interventions, focussing resources and effort differentially on the most disadvantaged areas in England, including economic, social and employment regeneration projects; SureStart early years children's centres; and primary and secondary prevention services, all focused on "improving the health of the worst off fastest" to reduce the health gap between disadvantaged areas and the average for England as a whole. The English Strategy can be conceptualised, therefore, not as a single intervention, but as a series of natural policy experiments nested within the overall programme of action, which has implications for the evaluation design.

The logic model for the evaluation: In DEMETRIQ, we developed a logic model for two of the most prominent area-based components of the Strategy, depicted in Figure 2. The first was the Government's policy which ran from 2001 to 2011 of increasing National Health Service (NHS) funding to a greater extent in deprived areas of England compared with more affluent areas with the stated aim "to contribute to the reduction of avoidable health inequalities" (DH, 2000). The variation in exposure to the policy, constituting the natural policy experiment, was the difference in trends in NHS funds allocated to local areas resulting from the resource allocation policy introduced in 2001. Over the same period, there was a second natural policy experiment – the 'Spearhead' policy targeted at the 10% of local authorities with the worst health and deprivation from 2004 to 2010 - which involved setting local targets for reduction of geographic inequalities in life expectancy, performance management and support for local organisations, and targetted health promotion programmes. The logic model in Figure 2 shows the programme logic for these two initiatives, with the potential pathways between the interventions, their intended effects on determinants of health in disadvantaged areas and final effect on inequalities in life expectancy.

Figure 2: Logic model of impact on life expectancy of area-based health inequalities policies, England 2001-2011



The evaluation studies: Taking into account external trends. Evaluation of any change in the gap in life expectancy between areas had to take into account the external factors operating over the same period, especially the overarching macro-economic trends, which included a sustained period of rising prosperity up to 2008, followed by economic recession, and could be predicted to influence the intended outcomes. The impact of these trends, however, was not uniform across the country, but varied by deprivation. Study 1 in the model, therefore, was designed to assess the impact on the gap in life expectancy of rising prosperity in different local authority areas by their baseline level of deprivation. The findings from this study were then used to adjust for macroeconomic influences in studies 2 and 3. Study 2 evaluated the health inequalities impact of the NHS resource allocation policy, and study 3 the Spearhead policy, both of which were hypothesized to operate through intermediate pathways of improved access and quality of health care in disadvantaged areas, local action on the social determinants of health, and intensified health promotion services in disadvantaged areas.

NHS resource allocation policy results. For study 2, the variation in exposure to the policy was measured as the differential in trends in NHS funds allocated to local areas resulting from the resource allocation policy introduced in 2001. Analysis of trends in mortality amenable to health care compared with trends in non-amenable mortality showed that geographical inequalities in mortality from causes amenable to healthcare declined in absolute terms during the 10 year period in which the policy operated. In relative terms, however, inequalities remained fairly constant. Most of the observed reduction in absolute health inequality over this period can be explained statistically by this health inequalities policy. Each £ 1 of additional NHS resource allocated to the most deprived areas was associated with greater absolute improvements in mortality amenable to healthcare than each £ 1 of additional NHS resources invested in more affluent areas. These results held after

adjustment for differentials in local economic trends (using results from study 1), and after tests for specificity and consistency.

Spearhead policy results. In study 3 on the logic model, we investigated whether the English strategy was effective at reducing absolute inequalities in mortality between more deprived areas and the country as a whole (i.e. was moving towards the national target), taking into account previous trends in health inequalities (from study 1) and using a **difference-in-differences** approach. We found that absolute inequalities in premature mortality increased in the period prior to introduction of the English strategy and declined after the strategy was introduced. We used propensity score matching to compare populations in areas targeted by the strategy (so-called **Spearhead** areas) to comparable populations in non-targeted areas. We found that those in Spearhead areas experienced a greater decline in premature mortality after 2006, suggesting that the actions specific to Spearhead areas after this time contributed to some additional narrowing of absolute inequalities on top of the effect of policies introduced prior to 2006.

How does progress in England compare with other countries? A cross-country comparative study using a difference-in-difference-in difference approach

In a further study we took advantage of the fact that England was the only country in Europe where such a well-resourced national strategy was pursued. This enabled us to compare trends in health inequalities in England to those in three other European countries (Finland, the Netherlands, and Italy), using educational inequalities in self-reported health measures as the outcome and employing a difference-in-difference-in-differences approach. In this analysis we found significant improvements in some health indicators among low-educated people after the implementation of the English strategy, but trends in health inequalities in 2000-2010 in England were not more favourable than those observed in the period 1990-2000. For most health indicators, changes in trends of health inequalities after 2000 in England were also not statistically significantly different from those seen in the other countries. This analysis therefore provided no clear evidence for an impact of the English strategy to reduce inequalities in self-reported health outcomes between educational groups. Findings of Studies 2 and 3 above, however, were more positive and indicated that these components of the English Strategy might have had some impact on inequalities in premature mortality.

For more information, see detailed reports on DEMETRIQ website:

A.1 Natural policy experiments and their impact on health inequalities: a guide for evaluation. *Whitehead et al.*

A.2 Assessing the health inequalities impact of Natural Policy Experiments: how to apply the most commonly used analytical methods? *Hu et al.*

A.3 The impact of NHS resource allocation policy on health inequalities in England 2001-11: longitudinal ecological study. *Barr et al.*

A. 4 Spearhead Revisited: Investigating the impact of the English health inequalities strategy; a difference-in-differences, propensity matched control study. *Barr et al.*

A.5	Did the English strategy reduce health inequalities? A difference-in-difference-in-differences analysis comparing England with three other European countries. *Hu et al.*

3.2 Trend in health inequalities

Longitudinal database

In DEMETRIQ we have collected, harmonised and analysed data on trends in health inequalities from a large number of countries (17 countries for mortality, 21 countries for self-reported health issues) over a period of between 2 and 4 decades. Some of these data have been used for analyses of policy impacts which will be reported below, but these data have also been used to give an overview of general trends in health inequalities as a background to these policy impact analyses. We distinguish between two broad outcomes: mortality by cause of death, and self-reported morbidity and risk factors. In the case of mortality by cause of death, we have focused on all-cause mortality and four (groups of) causes of death that are of particular importance to DEMETRIQ: smoking-related causes, alcohol-related causes, amenable causes, and breast cancer. The results can be summarized as follows.

All-cause mortality

We see that in both men and women, all-cause mortality has decreased in almost all countries with the exception of some countries in the East. Although relative inequalities in mortality have increased almost everywhere, absolute inequalities in all-cause mortality have decreased in most countries in the North, the West and the South, both among men and women. Absolute inequalities have increased in most countries in the East (but not in Slovenia and Poland). Variable trends for absolute inequalities in mortality, and a generally upward trend for relative inequalities in mortality are also seen for most specific causes of death. This implies that if there are any policy impacts, they are more likely to be found for absolute than for relative inequalities in mortality. In a separate analysis of long-term (1970-2010) trends in inequalities in mortality in six European countries (England/Wales, Finland, France, Italy (Turin), Hungary, and Norway) we again found that relative inequalities in all-cause mortality went up everywhere, whereas trends in absolute inequalities were more variable.

Smoking-related mortality

For smoking-related mortality we see that among men, while relative inequalities have often increased, absolute inequalities have gone down almost everywhere, suggesting that long-term reductions in smoking, partly as an effect of tobacco control policies, are paying off in terms of smaller absolute inequalities in mortality. Among women, however, absolute and relative inequalities in smoking-related mortality have increased nearly everywhere. In an in-depth analysis of the contribution of smoking to inequalities in mortality, using the recently developed Preston-Glei-Wilmoth method, we found that among men smoking has become less important as a determinant of socioeconomic inequalities in total mortality in many countries.

Alcohol-related mortality

For alcohol-related mortality we see very different patterns. In many countries in the North and East there has been a strong rise in absolute inequalities in alcohol-related mortality, due to a rise of both average alcohol-related mortality and relative inequalities in alcohol-related mortality. This suggests that alcohol control policies may have been insufficient to contain inequalities in excessive alcohol use in these countries.

Causes of death amenable to medical intervention

For causes of death amenable to medical intervention we see a decline of absolute inequalities in most countries, with the exception of the East where they have increased. The decline of absolute inequalities seen in most parts of Europe reflects greater absolute declines in amenable mortality among the lower educated, and implies that improved access or quality of medical care has contributed to a narrowing of absolute inequalities in mortality in many countries in the North, West and South. Similar results were found in an analysis, reported in a separate paper, for one of these amenable causes, tuberculosis.

Breast cancer mortality

The social patterning of breast cancer incidence is exceptional – it is the opposite of many other diseases in that incidence and mortality tend to be higher among more advantaged women than among those who are disadvantaged. Among women who have developed breast cancer, however, the chances of survival for 5 years or more are higher in more advantaged women. For breast cancer mortality we see a decline of average mortality in many countries in the North, West and South, probably as a result of earlier diagnosis and better treatment, but this decline has generally been stronger among high educated than among low educated women, so that differences in mortality between high and low educated groups have gradually been disappearing. This suggests that improvements in early diagnosis and treatment have been of more benefit to women with higher education in most countries.

Self-assessed health

For self-reported morbidity (in the form of less-than-good self-assessed health) we see a rise of relative inequalities over time in most countries, but a variable picture for absolute inequalities, with absolute education-related inequalities increasing in many countries and absolute occupation-related inequalities remaining stable. Compared to the average performance of all countries, Finland, England, the Netherlands, Italy, Spain and Portugal had relatively favourable trends in inequalities in self-assessed health.

Other survey measures

Relative inequalities in smoking have increased in most countries, both among men and among women, but absolute inequalities in smoking prevalence show a more variable pattern, with stable inequalities in many countries among men, due to the compensating effects of a decline of the average prevalence and a rise of relative inequalities. To the extent that declines in smoking prevalence reflect effects of tobacco control policies, our results suggest that these policies may have contributed to a reduction of smoking in lower socioeconomic groups among men, but at the

expense of larger relative inequalities. Over time there has been no clear tendency for relative inequalities in breast cancer screening participation to become smaller, and as a result of increasing average participation rates and stable relative inequalities, absolute inequalities favouring the higher educated have increased rather than decreased in several countries.

For more detailed information, see detailed reports on DEMETRIQ website:

B.1 Trend analysis

B.2 Data legacy and its documentation

B.3 Long-term trends in socioeconomic inequality in mortality in 6 European countries. de *Gelder et al.*

B.4 Progress in reducing inequalities in mortality: a study of 10 European countries. *Mackenbach et al.*

B.5 Changes in the contribution of smoking to socio-economic inequalities in mortality in 13 European countries. *Gregoraci et al.*

B.6 Inequalities in alcohol-related mortality in 16 European countries: large variations, unfavourable trends. *Mackenbach et al.*

B.7 Educational inequalities in tuberculosis mortality: long-term trends in 13 European countries. *Nagavci et al*.

B.8 Trends in socioeconomic inequalities in self-assessed health in 16 European countries between 1990 and 2010. *Hu et al*

3.3 Economic change and social protection

Flexicurity as a natural policy experiment

There has been a longterm concern of many European countries that employment rates are low among working-age people with chronic illness and disabilities, and that this situation is more pronounced among lower skilled and unskilled workers. Furthermore most European countries have been experiencing a longterm decline in employment rates among people with disabilities and low skill/education. This has led to pronounced inequalities in employment chances between disabled people with low skills and those with higher education. These inequalities are getting wider, as employment rates continue to decline among the groups with disabilities and low skills, while other groups have improved. Countries have addressed this issue with varying policy initiatives around altering labour market flexibility and financial security, which has provided the variation in policy exposure needed for a natural policy experiment.

Employment chances and flexicurity: a case study

Work Package 4 investigated the impact of flexicurity policies on social inequalities in the chances of being in employment for people with and without limiting longstanding illness (LLI). The European Commission defines the set of policies as *"Flexicurity is about striking the right balance between flexible job arrangements and secure transitions between jobs so that more and better jobs can be created. The idea is that flexibility and security should not be seen as opposites but as complementary*." (EC, 2007, p.11).

In reality, flexicurity has been interpreted differently in different countries. A case study approach is, therefore called for, which investigated the policy context in a small number of countries in great depth. WP4 took a case study approach to study the effects of different components of flexicurity in different countries, as well as how specific components operate in different contexts.

In this first study, a matrix design was used and countries were selected that exhibited contrasting policies along the two key dimensions of flexibility and security from 1990 to 2010. Denmark and The Netherlands represented high flexibility (i.e, low employment protection) combined with high financial security systems; Sweden represented a low flexibility (i.e. high employment protection) combined with high financial security system; and the UK typified a high flexibility coupled with low security system. (No countries were found with the fourth possible combination of low flexibility and low security). The results indicated that high security was associated with better employment chances for people with limiting longstanding illness (LLI) and low education, irrespective of the level of flexibility in the labour market. In contrast, the poorest employment chances were found in the UK – with low security and high flexibility – which also had the largest inequalities in employment rates between high and low educated LLI groups. The case study also showed the importance of other factors for employment chances of disabled people with low education, for example, the value of social services for improving employment chances, particularly for this doubly disadvantaged group.

In addition, the case study approach was used to examine risks of poverty for people by disability and education in the different systems. Measures to improve the economic security of people outside the labour market seem to have an important impact on risks of poverty. In the countries studied, the proportion at-risk of poverty among people with LLI was lowest in the Netherlands and Denmark (where expenditure on passive labour market policies and sickness benefits were highest), and highest in the UK where expenditure was lowest. In Sweden, which initially had very high rates of economic security, the restrictive social insurance changes implemented in 2008 coincided with a substantial increase in the proportion of persons with LLI outside the labour market at-risk of poverty, rising from 15 per cent in 2005 to 35 per cent in 2011, illustrating the negative effect of reduction in security.

Return to work for people with disabilities

WP4 also used the technique of Qualitative Comparative Analysis (QCA) to examine, across 24 European countries, how different combinations of policies relevant to flexicurity were associated with return-to-work for people with disabilities and low education levels. Using QCA, two combinations of policies were found to be associated with relatively high levels of return to work. In all cases this involved a high average employment rate coupled with less strict employment

protection legislation. One group of countries (Sweden, Denmark, Finland and the Netherlands) combined these policies with high expenditure on active labour market policies and social services. A second group (the Czech Republic, the UK and Estonia) combined them with low social protection expenditure. These two routes might be considered the 'high' road and the 'low' road, or 'carrot' vs. 'stick'. The low road is cheaper but less effective, producing on average a return to work rate of 18% compared to 26% for the 'high road' route. The countries were also rated in terms of how equitable their success in getting long term sick and disabled people back to work was, i.e. how well the less well educated people with disabilities fared compared to the higher educated. The results suggest that security is more important than flexibility for addressing the social differential in return to work among people with long-term illness or disability.

Further in-depth case study work found that employment rates for people with disabilities and low education had declined – from 1990 to 2010 – suggesting that any temporary benefits from low levels of employment protection might be outweighed in the longer term by such policies making it easier to fire, as well as hire, people. Over time, policies in many of the studied countries have tended to reduce benefits in order to incentivise return to work. However this policy seems not to be effective in the group with disabilities and low skills. Indeed, it may further damage the health of people who were already sick, in a downward spiral. Alternative policies are needed to address the issue.

Changes in mental distress among women in and out of work

In a separate analysis the impact on inequalities in mental distress among women in and out of work was determined over the period of the Swedish recession. Results indicate that levels of mental distress increased in all groups over the period 2006 to 2010, but more so among groups outside the labour market, resulting in a widening of inequalities in mental distress between women in work and those out of work. This widening coincided with the introduction of stricter eligibility criteria and lowering of benefit levels, which may lead to a deterioration in living standards among those not working, which, in turn, may damage health and lead to a rise in inequalities in mental distress.

Poverty reduction programs in the EU

Work Package 5 performed a review of literature on poverty reduction and health, and developed logic models to describe the potential pathways linking poverty reduction programmes and health outcomes. This showed that the overall effect could be either positive or negative dependent on a series of potentially countervailing effects. Several research papers included in the literature review recognised the multi-dimensional nature of poverty, yet the majority of analyses were based on income definitions. We also chose an income-based approach, but identified several important mediating and proximal factors for inclusion in statistical analyses. The review highlighted the roles of real and perceived financial strain as central mediating factors in the poverty-health relation, and also found dietary and behavioural risk factors to be key proximal risk factors (mostly negative), whereas access to healthcare was a positive risk factor.

To complete this step, we retrieved National Action Plans for Social Exclusion for the latest available year, at the time for 2012, from the European Commission. We scanned these policy documents to map poverty reduction programmes in Europe and identify candidate Natural Policy Experiments for further study. The results of this exercise showed initiatives in five main domains: minimum wages,

unemployment insurance, disability benefits, pensions, and child benefits. Nearly all EU countries for which these data were available had significant programmes in place to reduce poverty. However, these programmes varied markedly in their depth, breadth, and height of poverty reduction coverage. This variation created potential to perform a series of natural experiment research designs, and we chose to focus on those areas with the greatest variation in structure and design, i.e., National Minimum Wage policies.

Minimum wage

WP5 evaluated the health effects of wage increases from the implementation of the National Minimum Wage in the UK in April 1999, by comparing an intervention group with two matched control groups. The intervention group experienced an increase in their income due to the minimum wage. One control group did not receive the minimum wage because incomes were already above the minimum wage threshold. Another control group did not receive the minimum wage because their firms did not implement the policy. This matching design enabled us to control confounding factors. We detected a strong, significant relationship between income increases attributable to the introduction of the National Minimum Wage and a reduction in perceived financial strain. There was no impact on dietary, tobacco, or alcohol behaviour detectable in the dataset. However, we did identify that the improvement in financial strain corresponded to a significant improvement in probable caseness for depression (in a magnitude similar to the effect size of antidepressant medications). While this may have helped to alleviate inequalities in mental health, the policy was not sufficiently implemented across the UK to impact population-wide inequalities in mental health. Although the results of this analysis can be interpreted as support for a recommendation to introduce a national minimum wage, it is important to be aware that there may be other ways to achieve better incomes at the bottom of the income distribution, as illustrated by the fact that the Nordic countries have low levels of poverty despite the absence of a minimum wage legislation.

Pensions

Based on our logic models, we hypothesized that greater pension entitlement could potentially increase health care access, especially in systems where cost might be a barrier to access. We evaluate the effects of additional pension spending across countries on access to care by income quintile. The results demonstrated that greater pension entitlement increased access to care in all groups of persons over age-65; however, the benefits were greatest amongst those who were in lower income quintiles. Our results therefore suggest that pensions not only reduce poverty's association with unmet health needs but also narrow population inequalities in lack of healthcare access. We then simulated alternative pension futures for the likely impact on old-age inequalities in healthcare access across European nations.

The mental health impact of the Work Capability Assessment in England

Doctors, particular GPs, have been raising concerns that welfare reforms are having a negative effect on the health of their patients and increasing their workload. In England, a recent reform has introduced a tougher medical assessment of pre-existing claimants of Incapacity Benefits - the Work Capability Assessment. We investigated whether prescribing rates for antidepressants have increased more in those areas where this reassessment process had proceeded at a faster rate. We found that each additional person reassessed in each area using the Work Capability Assessment

was associated with an increase, on average, of one additional antidepressant item prescribed per 100,000 population. This indicates that this policy may have adverse consequences for health.

For more detailed information, see detailed reports at DEMETRIQ website:

C.1 Report of Work Package 4

C.2 What is the impact of flexicurity on the chances of entry into employment for people with low education and activity limitations due to health problems? A comparison of EU countries using Qualitative Comparative Analysis (QCA). *Backhans et al.*

C.3 Do 'flexicurity' policies work for people with low education and health problems? *McAllister et al.*

C.4 Economic recession and policy– impact on employment chances and risk of poverty among low-educated persons with a chronic illness in Sweden, Denmark, United Kingdom and the Netherlands 2005-2012. *Burström et al.*

C.5 or Increasing health inequalities between women in and out of work – the impact of recession policy change? A repeat cross-sectional study in Stockholm county, 2006 and 2010. *Blomqvist et al.*

D.1 Report of Work Package 5

D.2 Austere or not? UK coalition government budgets and health inequalities. *Reeves et al.*

D.3 Does investment in the health sector promote or inhibit economic growth? *Reeves et al.*

D.4 The political economy of austerity and healthcare: cross-national analysis of expenditure changes during the Great Recessions in 27 European nations 1995-2011. *Reeves et al.*

D.5 Do Employment Protection Policies Reduce Inequalities Between Healthy and Unhealthy People? A natural experiment of the Great Recessions in Europe. *Reeves et al.*

D.6 Introduction of a National Minimum Wage reduced depressive symptoms in low-wage workers: a natural experiment in the UK. *Reeves et al.*

D.7 Economic shocks, resilience, and male suicides in the Great Recession: cross-national analysis of 20 EU countries. *Reeves et al.*

D.8 The attack on Universal Health Coverage in Europe: recession, austerity, and unmet needs. *Reeves et al.*

D.9 Financing universal health coverage: effects of alternative tax structures on public health systems in 89 low- and middle-income countries. *Reeves et al.*

D.10 The mental health impact of the Work Capability Assessment in England: a longitudinal cross-local authority study. *Barr et al.*

3.4 Population-wide behavioural change

Tobacco control policies in Europe

Work package 6 has assessed the impact of tobacco control policy (TCP) on social inequalities in smoking in Europe. The evidence base suggests that at least some aspects of TCP may be expected to contribute to a reduction in inequalities in smoking. In the past 20-25 years there has been a very substantial increase in the development of TCP in many countries, although the nature and extent of this development varies between countries. First, WP6 undertook a descriptive analysis of trends in prevalence of cigarette smoking and in smoking-related inequalities across 21 European countries during the 1990s and 2000s. There was a significant reduction in smoking prevalence in 18 countries among men, and in six countries among women, and a significant reduction in smoking prevalence among the low educated in eight countries among men, and in two countries among women. There was no country in which there was a statistically significant reduction in relative or absolute inequalities in smoking, either among men or women.

WP6 also conducted a series of multivariate analyses to investigate the relation between TCP and smoking inequalities after taking account of other factors thought to influence smoking prevalence and its social distribution. The results suggest that various aspects of TCP development may be associated with reductions in total smoking prevalence for men but this is not the case for women. There is also the possibility that TCP development may be indirectly associated with reductions in smoking among the lowest educated groups of men only through its impact on overall prevalence. However, there is a marked absence of evidence to support the proposition that TCP development may help to reduce absolute and/or relative inequalities in smoking, whether measured as gradients or gaps.

A comparison of tobacco control in four countries

The second part of WP6's investigation has focused on a more detailed comparison of the experience of four countries that began the period 1990-2010 at a similar stage of the smoking epidemic and with broadly similar patterns of social inequalities in smoking, but have different experiences of TCP development. The four countries are England, Finland, Ireland and The Netherlands. We have examined trends in smoking inequalities in these four countries using different measures of socio-economic position (SEP), including income and occupation as well as educational attainment. The results support our previous conclusion that at best there is only very slim support for the proposition that TCP has a beneficial impact on reducing inequalities in smoking in Europe.

One possible reason for a lack of effect is that there are countervailing forces at work in Europe that undermine those components of TCP - such as tax rates and policies on prices of tobacco products - most likely to have impact on inequalities in smoking. Likely candidate explanations include the widespread smuggling of cigarettes and the marketing strategies of tobacco companies that have had the effect of reducing market prices, especially in disadvantaged communities, and thus may have largely or totally offset the potential positive impact of public policy on social inequalities in smoking. Another possible reason is that policies have not been implemented on a sufficiently comprehensive basis, and that the amount, quality and consistency of TCP implementation in several

countries have been exaggerated by available measures of TCP development. However, consideration should also be given to the possibility that TCP itself may have only modest potential for reducing inequalities in smoking in the absence of more general public policies that successfully achieve improvements in the material and social circumstances of disadvantaged groups.

Alcohol tax pricing policy

Work Package 7 investigated the impact of a Finnish Natural Policy Experiment in which, in 2004, alcohol prices were significantly reduced following a reduction in the tax on alcohol brought about by the EU's rules on free movement of goods and cross-border trade. Specifically, the study explores alcohol-related hospitalization according to socio-economic status (SES) before and after the price change. The pricing study, exploited the marked change in price of alcohol in Finland in 2004. The study found an increase in relative and absolute terms in hospitalization attributable to alcohol after the reduction in alcohol prices for men with a basic and secondary and for women with a basic and secondary education. Alcohol attributable hospitalizations remained quite unchanged among men and women with a tertiary education. There was a clear gradient across educational levels among men and women both before and after the reduction in alcohol prices, which got steeper as a result of the policy change. The age-adjusted risk ratio for hospitalization associated with basic education versus upper tertiary education was 5.1 before and 6.4 after the reduction in prices among men. The corresponding relative risks were 5.4 and 7.2 among women. However, after adjusting for the long-term trend these effects were not statistically significant. The observed association between education and hospitalization attenuated to some extent but did not disappear when adjusted for economic activity and household income.

Alcohol affordability and the impact of minimum price legislation

A second sub-study focused on minimum prices and affordability of alcohol and their health effects by socioeconomic status. The study aimed to investigate the association between minimum prices and affordability of alcohol and alcohol-related mortality across three different educational categories of men and women, for alcohol overall and by beverage type in Finland and Sweden. The data for Finland suggest an inverse association between higher minimum prices and alcohol-related mortality among men with a low level of education in particular, that is in the group with the highest level of alcohol-related mortality. This association among men with basic education and women with a secondary education was found for minimum prices of distilled spirits, intermediate alcoholic products, and strong beer, but not wine. Affordability analyses indicate weaker effects overall and an effect only observed for secondary educated men and no effects in Sweden.

For more information, see detailed reports at the DEMETRIQ website:

E.1 Report of Work Package 6

E.2 Temporal trends in social inequalities in smoking in 21 European countries, c.1990-2010. *Platt et al.*

E.3 Tobacco control policy and social inequalities in smoking prevalence in Europe, circa 1990-2010: an observational, repeat cross-sectional study. *Judge et al.*

F.1	Report of Work Package 7
F.2	Educational inequalities in hospitalization attributable to alcohol: a population-based longitudinal study of changes over the period 2000 to 2007. *Herttua et al.*
F.3	Minimum prices for alcohol and educational disparities in alcohol-related mortality: a time-series analysis. *Herttua et al.*
F.4	Income Differences in Life Expectancy. The Changing Contribution of Harmful Consumption of Alcohol and Smoking. *Martikainen et al.*
F.5	The effects of alcohol prices on social class differences in alcohol related harm: evidence from Finland. *Mäkelä et al.*
F.6	Non-Employment Histories of Middle-Aged Men and Women Who Died from Alcohol-Related Causes: A Longitudinal Retrospective Study. *Paljärvi et al.*
F.7	Life Course Trajectories of Labour Market Participation among Young Adults Who Experienced Severe Alcohol-Related Health Outcomes: A Retrospective Cohort Study. *Paljärvi et al.*

3.5 Access to universal services

Compulsory schooling

Work Package 8 has built on a previously conducted study of the impact of a school reform that was implemented in Sweden in 1949-1962 through a quasi-experimental approach. The school reform consisted of a new 9-year compulsory education increasing the lowest educational level by one year, but it also meant the end of early tracking into lower secondary school and that more children became qualified to enter upper secondary school. Swedish register data were used to identify all Swedish children born in 1943-55 in 900 municipalities, where 491,148 were exposed to an additional year (exposed) and 756,719 went through the old system (controls). The design ensured that there are exposed and control groups in all municipalities and all cohorts. Regression discontinuity analyses showed clear evidence for causal effects of education on mortality.

In a further analysis, conducted within the framework of the DEMETRIQ project, the impact on intelligence and emotional control was determined for 320182 boys at military conscription. Results showed a positive effect of the reform on intelligence corresponding to an increase of 1.48 IQ points per year in school. The effect of the reform on emotional control was negative in that emotional control got worse with the reform, while work and the pre-reform school structure, or both, seemed more favourable in this respect. Both effects differed by socio-economic background so that sons of farmers and unqualified manual workers benefited the most in intelligence and were less negatively affected in emotional control. The results therefore suggest that longer compulsory schooling reduced inequalities in cognitive skills between children of advantaged and disadvantaged

families. Of course, it is important to note that even if an extra year of schooling 50 years ago had measurable positive effects on cognitive abilities and life expectancy, there are no guarantees that adding an extra year today would have similar effects.

Review of education policies

In fact, a second study conducted as part of WP8 suggests that an extra year of schooling today would not have a marked effect, and that it may be measures that improve quality in schools that are likely to be the best option now. A critical review was undertaken, where the primary focus was to review education policies other than increments in years that may influence both access to educational opportunities and educational outcomes in order to suggest how education policies might be related to health/health inequities. The review shows that changes in education content may be as relevant, or more relevant, for reducing inequalities in health than changes in length of education. The review also argues that, if another year should be added, it may be better today to add it early rather than late, that is to start schooling one year earlier rather than adding an extra year at the end.

The impact of expansion of higher education on health inequalities

By looking at the proportion low and high educated in different age groups and different countries we get a wide array of educational distributions in which people with different educational levels live in. The exposure to these different 'educational contexts' then can be seen as a 'Natural Policy Experiment', that provides us with opportunities to analyse the wider consequences of expanding higher education on health inequalities. In a fixed effects regression analysis based on the DEMETRIQ longitudinal dataset WP8 tested the hypothesis that a smaller proportion of low educated people in the population leads to a larger relative mortality excess in this group, and that a larger proportion of high educated people leads to a smaller relative mortality advantage in this group. Our findings confirm the first part of this hypothesis, but not the second: the relative mortality advantage of the high educated is actually larger in settings with a larger proportion of high educated.

These results help to understand how over the last decades, when important shifts in the educational distribution occurred, relative inequalities in mortality increased. While educational expansion is likely to have contributed to improved population health, and to measurable extra gains in cognitive resources and longevity among the least educated, as a mass phenomenon educational expansion may have contributed to widening relative inequalities in health and mortality rather than to reductions in health inequalities. Why this has been the case is not clear. One possibility is that while the opportunity to get a higher education has increased for everyone, the relative chances to obtain a higher education for children from different social backgrounds have remained quite stable, leaving the social structure more or less intact. This, in turn, should be expected to leave inequalities in health largely intact as well, albeit on higher levels of material conditions and longevity for all. Another possibility is that increased selectivity of educational achievement with regard to personal characteristics conducive or non-conducive to health may have played a role.

Breast cancer screening

Work Package 9a focused on breast cancer screening. If access to diagnosis and care is equal, social gradients in mortality from breast cancer should be the same as those in breast cancer incidence. Because breast cancer screening programmes have a pro-active approach and enter test-positive women into evidence-based pathways of care, the question arises what the impact has been of breast cancer screening programmes on inequalities in breast cancer mortality. The variability of breast cancer screening programmes across Europe through time represented a good Natural Policy Experiment (NPE), with the potential of understanding how different strategies, different timing of implementation and different levels of coverage can affect health inequalities in different populations. The objective of this study was to estimate the impact of the implementation of a breast cancer screening programme and of its characteristics on inequalities in breast cancer mortality. In England/Wales, Finland, France, Italy-Turin, and Norway, population-based breast cancer screening programmes have been introduced, and coinciding with the introduction, favourable changes in the trend of breast cancer mortality were found. These changes were generally stronger among women with middle and lower education than among women with higher education. This suggests that breast cancer screening programmes have been of more benefit to lower educated women.

Breast cancer treatment

Because breast cancer screening programmes, besides improving the early detection of breast cancer, also introduce evidence-based pathways of care, WP9 conducted an evaluation of inequalities in quality of breast cancer treatment by SES in Turin, Italy, among women who have had cancer detected through the screening. The analysis shows that among all screen-detected women substantial improvements on several dimensions of treatment quality have occurred over time, possibly as a result of the introduction of regional treatment guidelines. Inequalities in treatment quality between socioeconomic groups are absent or small, which can be seen as evidence on the effectiveness of the screening programme in reducing disparities in access to good quality treatments, possibly because of its capability to enter screen-detected women into a protected pathway of care.

Public investment in health care, primary care and inequalities in amenable mortality

WP9b investigated the health inequalities impact of increased public investment in healthcare, and the role of access to primary care. A number of studies have indicated that increased investment in healthcare, particularly in primary health care, is associated with improved health outcomes at the population level, but few, if any, have investigated the impact that this policy has on health inequalities. In addition, several cross-country comparative studies have shown the importance of good access to primary care for improved population health, however very few studies have empirically demonstrated, which characteristics of primary care have the greatest impact on health inequalities. This study investigated the relationship between government spending on healthcare and mortality from amenable conditions, whether this effect differs between educational groups, and whether the accessibility of a country's primary care system modified any inequalities effect. Using country-fixed effects models we found that, on average, increased government spending on health care overall was associated with reductions in male mortality from amenable conditions, but not female. On average across all countries, increased investment was not associated with a

reduction in inequalities. However, the level of accessibility to primary care modified this effect: in countries with more accessible primary care systems additional investment reduced inequalities in amenable mortality, and the more accessible the primary care system the greater the reduction in inequalities for a given increase in investment. The results suggest that increased government spending in health systems with accessible primary care can reduce inequalities, but this increased investment is unlikely to be effective when primary care is not accessible.

Primary care reforms in CCE countries

WP9 then went on to study variation in primary care reforms in 4 Central and Eastern European (CEE) countries. This study takes reforms to strengthen primary health care (PHC) in CEE countries between 1990 and 2005 as a Natural Policy Experiment, utilising the variation in the reforms to compare and contrast developments in a set of case study countries. A detailed chronology was developed outlining the main policies that transformed primary care during this transition period. Primary Care Monitor indicators and data on investment and accessibility to health care were used to characterise each country's PHC system following these reforms.

Data on mortality from causes amenable to medical intervention, by gender and education, were obtained from the longitudinal database developed by the DEMETRIQ project. The PHC transformation took between 5 and 11 years. In all four CEE countries, inequalities in amenable mortality widened during the reforms designed to strengthen primary health care. Our previous analysis outlined above indicated that both public investment and primary care accessibility are necessary for health systems to reduce health inequalities. Our analysis of the CEE PHC reforms supported this finding. Whilst reasonable levels of accessibility to primary care were reported following the reforms, the level of public investment in health care did not generally increase during this time, which may be one reason why the reforms had little impact. The dramatic changes to the macro-economic environment during transition to a market economy in these countries may also have overshadowed any effects of the more modest changes to the primary care systems that were taking place. There were also indications from analysis of trends in out-of-pocket expenditure for healthcare that some of the reforms to the healthcare systems may have worsened access to primary health care for the poorer groups, rather than strengthened it.

For more detailed information, see appendix G, H and I:

G.1 Report of Work Package 8

G.2 Education Promotes Intelligence but May Weaken Emotional Control: A Quasi-Experiment on 320 182 Swedish Boys. *Lager et al.*

G.3 The relationship between school quality, educational quality, and health inequalities: A critical, synthetic review. *Garcy.*

G.4 Educational expansion and inequalities in mortality: an exploratory analysis. *Ostergren et al.*

H.1 Report of Work Package 9a

H.2 The impact of the implementation of breast cancer screening programmes on inequalities in mortality across Europe. *Spadea et al.*

H.3	Absence of socioeconomic inequalities in access to good quality breast cancer treatment within a population-wide screening programme in Turin (Italy). *Zengarini et al.*
I.1	Report of Work Package 9b
I.2	The health inequalities impact of public investment in healthcare. Does access to Primary Care matter? A time trend analysis. *Barr et al.*
I.3	Primary health care transformation and health inequalities in some Central and Eastern European countries. *Godycki-Cwirko et al.*

3.6 Public involvement in health inequalities research

Approach

Public involvement (PI) in research is considered good practice by UK and European funders, however evidence of its research impact is sparse, particularly in relation to health inequalities. The original EU call that DEMETRIQ responded to asked for "Research is further needed on how people most affected by social determinants of health can be most effectively involved in the design, implementation, and evaluation of research methods".

This project, carried out by WP4, was concerned to involve people who represented and understood the concerns of people in vulnerable positions on the labour market, as the natural policy experiment evaluated by WP4 was concerned with the differential impact of flexicurity policies. It engaged blue-collar unions, but also made a comparison with other representatives of the public/users of research, including employers' associations, unemployment agency staff, local politicians and policy-makers.

Insights

The union representatives offered their explanations for the deteriorating trends in employment and poverty for disabled people with low education in Sweden. In doing so, they provided insights into the complexity and variation in the consequences of national policies on labour market regulation and financial security for different groups in the population. Sweden could no longer be said to be a high security country for blue-colour workers, for instance, with both the national policies and specific collective agreements between unions and employers operating in such a way that they increasingly favoured professionals over less skilled workers. The union representatives gave a range of insights that not only enriched understanding of why the labour market policies produced the results that WP 4 found, but also they generated ideas for future research to dig deeper into important mechanisms producing both positive and negative effects for inequalities. In effect, the unions participated in conceptualising the next phase of the research: they were right in at the beginning of the future research programme for this research team.

Comparisons between the 4 groups drawn from the general public/user of the research revealed some important contrasts in interpretation of what lay behind the observed trends in employment and poverty by socioeconomic status. These contrasts served to emphasise the need to consider carefully who to engage when seeking to involve "those most affected by social determinants of

health". It is not sufficient to select members of the general public as though they all had a similar perspective. To our knowledge, this is the first time that such a comparison has been conducted for public engagement in research on health inequalities.

For more information, see detailed report on DEMETRIQ website:

J.1 Impact of public involvement in interpreting the effect of labour market policies on inequalities in employment and health outcomes. *Anderson de Cuevas et al.*

3.7 Conclusions and recommendations

Methodology

The first objective of DEMETRIQ was to develop, evaluate and refine methodologies for assessing the effects of social, economic and health policies on the pattern and magnitude of health inequalities among socioeconomic groups. We have learnt:

1. Drawing from various sources and disciplines it has been possible to create a 'tool-box' for evaluating Natural Policy Experiments for their impact on health inequalities. Important tools are: a new architecture of study-design, 'programme logic' and other tools for policy analysis, and a set of quantitative techniques partly borrowed from econometrics. Some of these tools have been used in various studies conducted within the DEMETRIQ project, and have been proven very useful.

2. Policies in different countries can have different names and appear very different on the surface, but share common purpose and mechanisms for achieving their objectives. We have explored ways of typifying policies for comparative purposes to allow cross-country comparative analysis – e.g. DEMETRIQ studies of 'flexicurity'.

3. Conversely, the policies that governments devise can have similar objectives to cope with a common problem (e.g. dealing with recession across Europe) but devise very different ways of dealing with that problem, which can be exploited for evaluation purposes. E.g. the ways that different governments have responded to recession over the decades provide fertile ground for comparative evaluation – see the DEMETRIQ studies of policy responses to recession.

4. When designing evaluations of Natural Policy Experiments it is important to develop 'logic models' of how the policy will work to bring about the intended outcomes. These logic models can be used to set up the evaluation at points along the putative pathways and to test the programme theory. This approach has been applied in a number of DEMETRIQ evaluations, e.g. those of breast cancer screening and breast cancer treatment quality and of poverty-reduction strategies.

5. There is a need to assess potential adverse effects of policies, and not just whether the stated/intended objectives of a policy have or have not been achieved. This viewpoint has been applied in the DEMETRIQ study of the effect of changes in the Finnish alcohol tax on alcohol-related health damage. The EU Finnish government did not set out to damage health with its policy of abolishing tourist import quotas nor did the Finnish government with its pricing policy, but that has been the unintended side-effect.

6. There is a need to examine the existence and impact of countervailing forces working against public health policies, and to take these into account when interpreting findings. This need has been highlighted in the DEMETRIQ Tobacco Control Policy evaluations, which has suggested a possible role for the countervailing tactics of the tobacco industry (e.g. countering the tobacco taxation policy with differential pricing policy of their own).

7. There are many examples, both within DEMETRIQ and elsewhere, of policy learning from past events, such as the analyses of the health impact of government policy responses to previous economic recessions which hold lessons for current recessions. However, as the effect of policies on health and health inequalities, particularly those addressing upstream determinants, will often be seen only after considerable time, these evaluations sometimes run the risk of being obsolete in relation to present day's needs and policy debates and need to be selected with present-day relevance in mind. On the other hand, historical studies may have a pivotal role to play in distinguishing the effects of changes in the social determinants of health from the effects of medical interventions. In recent decades, social determinants of health and medical interventions have been in operation at the same time, so it is difficult to identify the effect of each separately. Historical studies, before the introduction of effective medical interventions, provide the opportunity to gauge the separate effect of social determinants of health such as sanitation and clean water supply in a particular setting. This evidence can then provide insights for current settings, where there may be a complex web of interventions to unpick.

8. It is clear from our project that the standard categories of study design used in intervention research are inadequate for our purposes and that more radical thinking is required. What is needed is a new architecture of study design, which encompasses the many different factors that need to be taken into consideration in deciding how best to evaluate the complex policies and systems that influence the social determinants of health inequalities. What we have come up with is a process of assessment and decision-making that leads to the most appropriate design for a NPE in its specific context.

9. DEMETRIQ's experiences with public involvement in research on health inequalities policies suggest that inputs of stakeholders may help to re-shape interpretation of findings in subtle ways and to generate ideas for a future research agenda.

10. Borrowing from econometrics we have identified a number of quantitative techniques that appear to be particularly useful for evaluating Natural Policy Experiments. As these techniques have only rarely been applied to assess differential policy impacts by socioeconomic position, we had to devise new ways to apply them, and have created practical guidance for these applications. Techniques that we found to be particularly useful, based on experiences in a number of DEMETRIQ evaluation studies, include panel regression with country fixed effects models; difference-in-differences analysis; and interrupted time series analysis.

11. The health inequalities literature emphasizes that one should look at both relative and absolute inequalities in health, and this is what we have also done in DEMETRIQ. However, the trend analyses of inequalities in mortality and self-reported morbidity show that while reductions in relative inequalities in health are rare, reductions in absolute health inequalities are much more common. This suggests that policy evaluations are more likely to find positive effects on absolute health inequalities than on relative health inequalities. Levels and trends of mortality and morbidity

in lower socioeconomic groups should also be studied directly as an important outcome for policy evaluation.

Policy impacts

The second objective of DEMETRIQ was to assess the differential health effects by socioeconomic group of 'Natural Policy Experiments' in the fields of unemployment and poverty reduction; tobacco and alcohol control; and access to education and preventive health care. We have learnt:

1. It was easier to find Natural Policy Experiments that made matters worse, rather than ones that improved the situation and had the potential to narrow health inequalities. Because DEMETRIQ aimed to find ways to reduce health inequalities, we were looking in particular for natural policy experiments with the potential to reduce social inequalities in health and their social determinants, but these were difficult to find. Nevertheless, evidence of the adverse effects of policies, as in the case of the alcohol tax policies, is still valuable for informing future public health strategy.

2. For many Natural Policy Experiments that in theory should have narrowed inequalities, we were unable to identify a clear inequalities reducing impact of the policies in practice. This applies to flexicurity, modern tobacco control efforts, expansion of higher education, and primary care reform in CCEE. Important lessons can be learned from these „negative" results, including that we are still a long way from having a rich arsenal of effective policies to reduce health inequalities.

3. Several studies conducted as part of the DEMETRIQ project pointed to the positive impacts of policies that promoted financial security and employment opportunities for disadvantaged groups. These included: the beneficial impact of legislation and arrangements to maintain adequate wages, for example, evaluation of the National Minimum Wage in the UK; the beneficial role of employment protection policies in reducing the adverse effects of recession; the beneficial contribution of active labour market programmes in countering economic shock and in helping people with chronic illness/disability into work; the beneficial importance of social protection/high financial security in labour market policies that improved the employment chances of people with chronic illness and low education. Although only few of these evaluations directly assessed whether these policies reduce inequalities in health between socioeconomic groups, we believe that such effects are at least plausible.

4. Although there is little evidence that modern tobacco control efforts have reduced inequalities in smoking, long term trends in inequalities in smoking-related mortality are more favourable than has previously been assumed. Due to the long-term declining trend in smoking among men in many countries in the North and West of Europe, absolute inequalities in smoking-related mortality are declining, and are a welcome contributor to declining absolute inequalities in all-cause mortality. This implies that in the long run, attempts to reduce smoking, even if they have not specifically targeted lower socioeconomic groups, have been successful in reducing absolute inequalities in mortality.

5. Alcohol-related conditions play an increasingly important role in generating inequalities in mortality in many European countries. Countering increases in alcohol-related mortality in lower socioeconomic groups is essential for reducing inequalities in mortality. Fortunately, such increases have not occurred in all European countries suggesting that it is possible to avoid them. The „negative" policy experiment of reducing the price of alcohol in Finland, which showed that as a

result of these price reductions inequalities in absolute alcohol-related harm may have increased (although evidence for increase in relative differentials is more modest). This suggests that increasing the price of alcohol could be an important instrument in reducing inequalities in alcohol-related harm in some contexts, but more studies, e.g. from countries with different alcohol cultures, are necessary to corroborate and refine these findings.

6. Natural Policy Experiments with compulsory education, i.e. by raising the minimum age of leaving school, show that a higher level of education reduces mortality. However, this does not necessarily reduce inequalities in mortality between education groups. Actually, our studies suggest that expanding higher education leads to larger inequalities in mortality. We believe that, in view of the health benefits of higher levels of education at the individual level, such negative side-effects are acceptable. Nevertheless, it is important to look for education reforms that may help to reduce health inequalities. One possible candidate is expanding pre-school education for children from lower socioeconomic groups.

7. The evaluation of the English NHS resource allocation policy of increasing NHS funding to a greater extent in deprived areas of England compared with more affluent areas showed that this policy has led to a reduction in geographic inequalities in mortality amenable to health care. This suggests that increased funding to health care in deprived areas can be an effective means to reduce inequalities in mortality. The cross-country study of the association between increased public health care expenditure and reductions in inequalities in amenable mortality provides further support for this conclusion, and also suggests that increased spending is more effective in reducing inequalities in health care systems with strong primary care components.

8. DEMETRIQ has also contributed to the evaluation of the English strategy to reduce health inequalities (1997-2010). Two studies focusing on area-based policies in the strategy, had positive results and indicated that these components of the English Strategy might have had some impact on narrowing geographic inequalities in premature mortality. A separate study, focusing on the Strategy as a whole and measuring inequalities in self-reported health between educational groups, found no evidence for a stronger reduction of educational inequalities in self-reported health in England as compared to other countries. Further study is necessary to elucidate these findings.

Recommendations for further study

While DEMETRIQ has achieved an extraordinary amount over the past 3 years, as evidenced by the range of supporting materials for this report, the findings also reveal a pressing research agenda that deserves further collective efforts on the part of the European research community. There are two main categories of research that need addressing to accelerate progress on researching the health inequalities impact of Natural Policy Experiments.

First, there is a programme of substantive evaluations of natural policy experiments to be carried out, using the methodologies and approaches developed in DEMETRIQ. As a prime aim, DEMETRIQ set out to evaluate potentially positive policies and the effect they might have on reducing health inequalities. However, in real life, we found very few policies that could be evaluated that were expected to make an improvement. It was more common to find natural policy experiments that were potentially damaging to the health of the poorest and therefore, we speculate, likely to widen health inequalities. That is why we recommend assessment of both negative and positive effects in

health and wellbeing of policy changes/reforms concerning the drivers of health inequalities. Some immediate candidate natural policy experiments include:

1. The different government policy responses to economic downturns. Are some components of the policy response less health-damaging than others? Are some more protective of the health of the worse-off than others? WP5 has made a start on this agenda, which would now benefit from a co-ordinated, cross-country effort.

2. The 'spoiling' tactics of vested commercial interests and their impact on efforts to reduce inequalities in health. A prime candidate for scrutiny in this respect is the tactics of the tobacco industry in responding to public health tobacco control measures. WP 6 flagged up evidence that tobacco companies were responding to governments' tobacco taxation and pricing policies by devising marketing strategies that protect the cheaper brands bought be poorer smokers, while passing the price rises on to the more expensive brands, smoked by people for whom price is less of a disincentive. The extent to which such commercial tactics offset the potentially positive effects of public policy needs to be the focus of intensive scrutiny.

3. The unintended side-effects of cross-border policies. WP7 revealed the dramatic impact of an EC policy designed to increase the free movement of goods across the countries of the EU. The effect on the price of alcohol in Finland in 2003 was instantaneous and precipitous, resulting in a 30% cut in alcohol excise duties almost overnight and off-setting decades of alcohol control policy in the country. This was certainly not a deliberate intention of the original EC policy, but it was one which required serious efforts to evaluate the consequences for the health of the public. This example raised the broader question of what unintended effects other pan-European policies might have and the need to assess health-related impacts, paying special attention to whether there are different impacts for different sections of the population within a country and what is happening to the worse off in society.

4. The impact of cancer screening programmes on inequalities in cancer mortality. WP9 found evidence suggesting that well-organized and population-based screening programmes have had a larger impact on breast cancer mortality among lower educated women. Further research would be useful to compare the (differential) trend (breaks) in countries with screening programmes to those in countries without screening programmes, as well as in populations attending the screening programmes compared to the non-attenders. This would allow a check that the observed changes are due to screening, and not to other factors (e.g., improvements in treatment).

5. Price policies may be an effective instrument to change inequalities in health-related behaviours, as shown by studies on the price of tobacco and alcohol. While DEMETRIQ, in its study of alcohol price changes in Finland, has found some tentative evidence to support the idea that higher prices may help to reduce inequalities in absolute alcohol-related harm, results for Sweden were less clear. Further research is necessary to determine whether, and under which conditions, raising the price of products like tobacco and alcohol helps to reduce inequalities in morbidity and mortality.

The second category of a future research agenda concerns further methodological development. In carrying out its own programme of methodological development, the DEMETRIQ project has identified the need for a number of sharper tools to investigate population-wide policies for their impact on health inequalities. The areas that require particular effort include:

6. Refinement and application of a systems approach to the evaluation of natural policy experiments that influence inequalities in health. In DEMETRIQ, we have begun to expose not only the complexity of the sorts of population-wide policies that influence population health, but also the dynamics of the context in which they are introduced. Rather than stand-alone entities, the outcomes of which can be evaluated in a standard way, these policies should be more appropriately conceptualised as components embedded in a wider system. As such, we need a systems approach to evaluation: one in which dynamic changes in the system over time are captured. There is much to be done to develop such an approach for the purposes of public health intervention research.

7. Development of ways of assessing policy context. Our programme of work in DEMETRIQ has tried to build in a consideration of policy contexts and processes and mechanisms, reflected in our logic models and study designs. Tools to measure context, however, are still at an early stage of development and there is much that we don't know about how, for example, political or cultural context influences both the form a specific policy takes and the way it is implemented over time. This is a whole area of intervention research ripe for development.

8. Approaches for prospective as well as retrospective evaluation. The DEMETRIQ work has been concentrated on the development of methods for the retrospective evaluation of policies. All the natural policy experiments that we identified for investigation had been in operation for a number of years: some, such as the national minimum wages in the UK and the alcohol pricing cuts in Finland, were introduced at a distinct point in time, while others, such as the flexicurity policies and national cancer screening programmes were implemented gradually over a period of years. DEMETRIQ made advances in devising study designs to capture impacts retrospectively. There may be (rare) occasions, however, when researchers have forewarning of the planned introduction of a policy and can seize the opportunity to carry out prospective evaluation. In such circumstances, there would be scope for incorporating other novel study designs and a range of sources of data, which could be the focus for further development.

We believe that there is an important role for the European Union in fostering this research agenda. Only a few countries have the capacity to seriously invest in these types of research, and to mobilize the scientific manpower to address these complex questions, while research supported by the European Union would benefit all European countries. Furthermore, Europe, with its diversity of policies and excellent data infrastructure, offers an unique 'natural laboratory' for such studies. We therefore urge the European Commission to allocate resources in its Horizon 2020 program to further research on health inequalities, their determinants, and ways to reduce them.

4. Potential impact, dissemination activities and exploitation of results

It is early days for any substantial impact of DEMETRIQ to have emerged, as findings are still in the process of being published. There are some early impacts for some of the outputs, however, which give an indication of the potential and far reach of the research undertaken in DEMETRIQ, as section 4.1 on early impact illustrates. Further impacts and the dissemination activities supporting them are described in sections 4.2 and 4.3.

4.1 Early impacts

4.1.1 An impact case study on evaluation of a resource allocation natural policy experiment

The natural policy experiment

In DEMETRIQ, we sought to evaluate an ambitious natural policy experiment in resource allocation that was introduced in England from 2001 to 2011, which was explicitly aimed at reducing geographic inequalities in health outcomes. In England, central funding for the National Health Service (NHS), raised through taxation, is allocated to local commissioning organisations that provide or purchase primary, community and secondary health services on behalf of their resident populations. These local commissioning organisations then decide on how these resources are used based on their assessment of the needs of their populations. The level of resources each commissioning organisation receives is determined by a formula, which distributes more than £80 billion per year (108 billion Euros). Since the 1970s several different formulae have been used, in an attempt to allocate these resources more equitably based on the level of need in the population.

In 1999 the UK government introduced a new objective for the allocation of resources in the NHS in England: 'to contribute to the reduction in avoidable health inequalities'.[6] To achieve this objective, a health inequalities component was introduced into the allocation formula in 2002, that would target more resources at deprived areas with poorer health.[6] Whilst this health inequalities component was retained by the current coalition government, the weighting was reduced from 15% to 10% in 2011. Overall the policy has meant that increases in allocations have tended to favour more deprived areas. The local NHS commissioning organisations in these areas were free to use these resources to purchase additional primary, secondary health care or public health services, to meet the needs of their populations.

The findings of the evaluation

The policy of using the resource allocation mechanism to reduce health inequalities is based on the assumption that additional healthcare expenditure translates into improved population health outcomes – with the greater benefit for the health of the more disadvantaged areas, thus reducing inequalities in population health between geographic areas. The question for the evaluation was whether the new health inequalities resource allocation policy had the desired effect on the health of populations in the areas receiving proportionately greater funding.

Following the approach to evaluation of natural policy experiments refined in DEMETRIQ, we used the difference in trends in NHS funds allocated to local areas throughout England resulting from the resource allocation policy as the variation in exposure to the policy that was needed for comparison purposes. Analysis of trends in mortality amenable to health care compared with trends in non-amenable mortality showed that geographical inequalities in mortality from causes amenable to healthcare declined in absolute terms during the 10 year period in which the policy operated. In relative terms, however, inequalities remained fairly constant. Most of the observed reduction in absolute health inequality over this period can be explained statistically by this health inequalities resource allocation policy. Each £ 1 of additional NHS resource allocated to the most deprived areas was associated with greater absolute improvements in mortality amenable to healthcare than each £ 1 of additional NHS resources invested in more affluent areas. In other words, investment of NHS resources in more deprived areas was associated with a greater improvement in health outcomes than investment in more affluent areas. These results held after adjustment for differentials in local economic trends.

The paper cautioned that any change in resource allocation policy that reduces the proportion of funding allocation to deprived areas (a move that had been mooted) may reverse this trend and widen geographical inequalities in mortality from these causes.

Impact of resource allocation policy research

The results were published in the BMJ in May 2014 (Barr et al, 2014) and disseminated through academic and policy presentations (see dissemination tables). The media picked it up and so did politicians, as the allocation of such a large NHS budget is a matter of continued political and public concern. This resulted in several key impacts:

- Nationally, from June to September 2014, the paper was scrutinised by the English Department of Health's Technical Advisory Group (TAG) for NHS resource allocation. The authors were questioned closely and responded fully to all the technical queries raised about the methodology and interpretation of results. The TAG was satisfied with the scientific quality of the study and passed the findings to the Government's standing Advisory Committee on Resource Allocation to inform their policy debates on the revisions of the health inequalities component of the NHS formulae.

- In October 2014, the Chief Executive of NHS England, Sir Simon Stevens, gave oral evidence to the House of Commons Public Accounts Committee in London, which was holding an inquiry into the funding of healthcare and making allocations to local areas. The Chief Executive cited the BMJ paper, naming the authors, as evidence that "having the inequalities focus in the NHS allocation formula was associated with closing the class inequality in death rates and life expectancy" (Stevens, 2014).

- Local commissioners of public health services have invited members of the DEMETRIQ team us to advise and review what they are doing to address health inequalities in the light of our findings on resource allocation and a further DEMETRIQ study on the health effect of intensive support for disadvantaged areas, including sitting on the Wirrral Health and Wellbeing Challenge panel, Challenge, January – February 2015.

- International interest in conducting cross-country comparisons of the impact of resource allocation strategies has been stimulated. The Swedish research funding body, FORTE, has made an award to Professor Bo Burström of the Karolinska Institute to conduct a three-year study of "Equity aspects of patient choice in primary care on Stockholm County Council – impact on need-based resource allocation, primary care doctors and health care utilization in disadvantaged areas" which started in January 2015, with collaboration with Ben Barr and Margaret Whitehead on an Anglo-Swedish comparison.

4.1.2 Impact case study on health impact of austerity measures and economic security

The natural policy experiments

We see poverty as one of the powerful drivers of health inequalities and poverty reduction policies, therefore, as potential contributors to the reduction of health inequalities in Europe. DEMETRIQ studies have sought to find ways of evaluating such policies, taking two main perspectives in this respect. First, we have looked at what policies might prevent or ameliorate the adverse health effects of global recession. Many European countries have been facing economic downturns in recent years, but they vary in the way they respond to recession. We see these varying policy responses of Governments as providing the conditions for natural policy experiments to be evaluated for their health and health inequality impact.

Second, we have reviewed poverty-reduction programmes across the European Union and identified purposeful attempts to improve economic security for the worst off in society that can be evaluated as natural policy experiments. Specific policies include the introduction of a national minimum wage in the UK and pensions policy. Our research question was: does improving financial security reduce health inequalities?

Findings of evaluations

Comparing differing policy responses to recession: During recession, better job security – higher regulation of the labour market – reduces some of the adverse effects of recession. For example, helping to maintain people in employment who are in vulnerable positions on the labour market, particularly those with chronic illness or disabilities and low socioeconomic status, brings them closer to better off groups during a recession.

Also, during periods when budgets are tight, there is a temptation to lower public spending e.g. by reducing healthcare and welfare budgets. But reducing spending in this way limits access to services and removes financial support from vulnerable groups. In addition, our research finds that such a policy also hinders economic recovery because it takes money out of the economy.

In contrast, governments that invest in social protection or healthcare have better results all round. Such investment will keep money in the pockets of those who are most likely to spend it (those earning average wages and those who need to buy food and shelter) which, in turn, will help economic recovery. We estimate that Smart Public Investments in health and social protection

return up to 3 Euros for each 1 Euro of spending, thereby fostering economic recovery while helping to protect vulnerable groups (Reeves et al, 2013a; 2013b; 2013c; 2014a).

Improving financial security for the worst off: We evaluated the health effects of wage increases for the low-paid from the introduction of a National Minimum Wage (NMW) in the UK in 1999. Our results suggest that increasing wages of low-wage workers, such as by raising the national minimum wage, helps reduce socioeconomic inequalities in mental health. Specifically, the NMW improved mental health scores compared to comparator groups – with an effect of a similar magnitude to that produced by treatment with anti-depressants. In addition, people receiving the NMW also felt significantly less under financial stress than their comparators (Reeves et al, 2014b).

The key policy messages include the point that some recent social welfare and labour market reforms in Europe have had unintended adverse effects, falling most heavily on the most disadvantaged. There are ways of ameliorating impact, though. The differing policy responses of Governments to economic downturns, for example, demonstrate that Governments do have real policy options to deal with recession while protecting the worst off. That is why it is so important for changes in national policies to be assessed for their impact on the health and wellbeing of different socioeconomic groups in society – and adjusted/ameliorated if they are having adverse effects.

Early impacts of austerity and economic security research

In addition to 12 Academic presentations, the DEMETRIQ austerity and poverty reduction research from Work Package 5 has generated the following impacts:

i) Invited presentations to European and global policy forums on strengthening the evidence base, including:

- 'The financial crisis and health status', contribution to session on *Health systems in times of economic crisis* to members of DG SANCO, European Commission, 28 February 2013;

- 'Does the crisis make us sick?' contribution to session on *Strengthening health protection in times of economic crisis: increasing the evidence base* to SDTOA Unit, European Parliament, 21 February 2013 – participants included advocates and activists for health-related NGOs;

- 'Austerity and health inequalities' contribution to conference on *Sustainable health systems for inclusive growth,* Lithuanian Presidency of the Council of the European Union, 19-20 November 2013 – participants included health ministers, academics and NGOs;

- 'Disability, austerity and the labour market' contribution to *Disability Rights* seminar, London, December 2014 – participants included activists and advocates for disability, civil servants and other academics;

- *Global Health Forum*, Taiwan, November 2014, participants included national and international health policy analysts, NGOs, WHO, EC.

ii) Media impact in terms of stimulating public debate on health enhancing and health damaging economic policy and poverty alleviation, including:

- Invited posts on blogs, including the British Sociology Association blog summarizing results on the political economy of austerity and healthcare, 2013.

- Supplying empirical data on the impact of the crisis and austerity on health inequalities to the Financial Times Health Conference, Athens, 27 March 2014 – participants included academics, health professionals, health ministers, and civil servants.

- Twitter: Reeves A., Basu S., McKee M., Meissner C., Stuckler D., 2013. Does investment in the health sector promote or inhibit economic growth? Globalization & Health, 9:43: doi:10.1186/1744-8603-9-43. This paper has been tweeted 2,830 times from 1,917 accounts with an upper bound of ~2.5 million followers. Of the ~2.8 million articles followed by Altmetric, this article is ranked 118th for social media interest.

- Coverage in the popular media. Reeves A., Basu S., McKee M., Meissner C., Stuckler D., 2013. Does investment in the health sector promote or inhibit economic growth? Globalization & Health, 9:43: doi:10.1186/1744-8603-9-43. This paper was briefly covered in the New Scientist.

iii) Attraction of further research awards for evaluating natural experiments in a rigorous way, e.g. the granting of an EU Investigator Award to the Poverty reduction Work Package leader, Professor David Stuckler, for research on *"Health resilience and economic shocks: analysis of quasi-natural experiments using multi-level models"* Awarded Spring 2013.

4.2 Potential further impacts

Looking further forward, as more DEMETRIQ outputs are published and disseminated, the potential impact on the field is substantial. The following points give an indication of the range of potential impacts of the research on highly policy-relevant natural experiments and their effect on health inequalities:

- Impact on the structure and nature of a new national commissions on social determinants of health. For example, Professor Olle Lundberg, WP 8 leader, is using DEMETRIQ findings to inform the development of the Swedish Commission on Health inequalities at an event on 3rd February 2015 and beyond.

- Impact concerning public involvement in research on heath inequalities: Professor Bo Burstrom, WP4 leader, is building on his WP public involvement activities with blue-collar labour unions in Autumn 2014, to ensure that the unions' special knowledge is used to help frame a new research agenda on economic security and labour market policies for people with disabilities.

- Trend analyses (Work Package 3): DEMETRIQ's in-depth analyses of trends in the magnitude of health inequalities have highlighted the need to distinguish between relative and absolute inequalities. Absolute inequalities are more likely to narrow in response to policies tackling health inequalities, than relative inequalities which widen almost universally. We expect

these findings to influence both the setting of targets for reducing health inequalities, and the measures used for monitoring health inequalities in different European countries.

- Tobacco control (Work Package 6): DEMETRIQ's analyses have shown that modern tobacco control efforts are unlikely to contribute to a narrowing of inequalities in smoking. This has highlighted the need for developing and strengthening policy components that do have a larger impact on disadvantaged smokers. We expect these findings to motivate policy makers to more systematically apply an equity lens to tobacco control efforts. We also expect that more research will be stimulated to examine the existence and impact of countervailing forces in society working against public health policies, highlighting the need to take these into account when interpreting findings. This need has been highlighted in the DEMETRIQ Tobacco Control Policy evaluations, which have suggested a possible role for the countervailing tactics of the tobacco industry (e.g. countering the tobacco taxation policy with differential pricing policy of the industry on its own).

- Alcohol control (Work Package 7): DEMETRIQ's analyses of alcohol pricing policy have shown that lowering the price of alcohol, as happened in Finland in response to the EU's rules on free movement of goods and cross-border trade, may widen inequalities in alcohol-related harm. This is a warning against such price reductions, and more generally against the unintended side effects of EU and national policies in some countries. We expect these findings to lead to a greater awareness of these effects among policy makers, and to support the need for health inequalities impact assessment.

- Education (Work Package 8): DEMETRIQ's analyses have shown that while higher education is likely to have a beneficial effect on individual health, expansion of higher education at the country level may paradoxically contribute to a widening of health inequalities between education groups. We expect these findings to lead to less simplistic ideas among researchers and policy makers about the potential contribution of education policies to reducing health inequalities, and to contribute to a drive to focus on the quality, not the quantity, of education.

- Preventive health care (Work Package 9): DEMETRIQ's analyses have shown that well executed prevention programmes, such as breast cancer screening programs which reach high proportions of lower socioeconomic groups and harmonize quality of care across the whole population, may contribute to a narrowing of health inequalities. We expect these findings to lead to a greater awareness among policy makers of the potential role of prevention programmes in tackling health inequalities, and of the conditions under which this potential will be realized.

- Professor Giuseppe Costa has been appointed by the State Regions Conference in Italy as Chair of the working group on Equity in Health and Health Care, a group that has been requested to provide the State-Regions governments with an Italian review on health inequalities and on policies to tackling them. The review was published in December 2014 and during 2015 the working group has the task of consulting with the main stakeholders (ministries, regions, municipalities, unions, enterprises, voluntary sector, health professionals) to engage them in communities of practice using the best available evidence

on what works most effectively to tackle health inequalities under their responsibility. The DEMETRIQ results are the main and most updated source of evidence for this ongoing work.

- Advancing methodology for future evaluation of the health inequalities impact of natural policy experiments (all Work Packages): We expect that the 'Guide for Evaluation of Natural Policy Experiments for their Impact on Health Inequalities' will support researchers around Europe in developing higher quality, more robust evaluations and research proposals in the health inequalities field. We also expect this Guide to help motivate research funding bodies in public health to consider funding evaluations of natural policy experiments to a greater extent than they currently do.

4.3 Further dissemination and exploitation of results

4.3.1 Dissemination

Dissemination is underway or planned for research, policy, practice and civil society stakeholders.

For knowledge exchange with the research community, there are 8 published academic papers and a further 28 in the pipeline. We will see all of these (and almost certainly more papers) through to publication and disseminate them through academic conferences and seminars. The Guide to evaluation has been developed and will be disseminated to researchers and policy advisors through conferences, seminars and workshops, but also through the production of a summary journal paper, to be submitted to a medical journal in the first instance. The aim of the paper would be to raise awareness to a broader scientific audience of the factors that need to be taken into account when designing evaluations of natural policy experiments for their impact on health inequalities. A longitudinal dataset on inequalities in mortality, morbidity and health-related behaviours in 22 European countries, produced for the DEMETRIQ project, has been prepared for archiving. This will form a data legacy from DEMETRIQ to researchers around Europe who wish to use this unique dataset to carry out future analyses concerning inequalities in health. All these academic products will be available and publicised through the DEMETRIQ website and through the authors' Twitter accounts.

For knowledge exchange with policymakers and practitioners, we have organized a final conference in October 2014 in Leiden (the Netherlands). This was designed as a two-day consultation and feedback event with policy advisors and civil society members from around Europe. We also plan for targeted distributions of selected journal papers to our relevant policy and practice networks, nationally and internationally. We have produced 4 policy briefs on key findings from the DEMETRIQ evaluations, which will be distributed electronically through appropriate networks to reach policy advisors who have a potential interest in the subject matter. We have an extensive range of invited presentations and policy dialogues, past and planned, including bodies associated with the EU, the WHO, the Global Health Forum.

For public involvement and knowledge exchange with civil society and special interest advocates, we have generated considerable media interest in published DEMETRIQ research, and plan to continue stimulating media coverage with press releases, selected blogs and Twitter as specific findings are published, as well as in presentations and dialogues with civil society organisations and advocacy groups.

4.3.2 Exploitation of results

The DEMETRIQ-project has not, and will not, result directly in commercially valuable knowledge. The project was never expected to do so. Rather, the information generated has great potential for societal gains through informing efforts to devise more effective national and international action to reduce inequalities in the health and their social determinants. In addition, inequalities-related losses to population health account for 15% of the costs of social security systems, and for 20% of the costs of health care systems per year in the European Union as a whole, so it is clear that Member States cannot afford to do nothing about the issue.

In this sense, the exploitation of the project results shall not, therefore, be seen as a direct exploitation (in terms of potential revenues) of the results achieved, which will be public, but mainly as an exploitation in terms of knowledge generated. The project partners will mostly use the acquired knowledge to further focus their research activities in coming years, and to stimulate the realisation of joint research projects. Policy-makers may make use of the acquired knowledge as a guide for policy evaluation, development and implementation on this important public health issue. The public will ultimately derive benefit from the acquired knowledge through improvements in population health and reduction of health inequalities resulting from the use of these research findings.

5. Contact information

Prof. dr. Johan P. Mackenbach
Department of Public Health
Erasmus MC, University Medical Center Rotterdam
P.O. Box 2040
3000 CA Rotterdam
The Netherlands
j.mackenbach@erasmusmc.nl

Prof. Margaret M. Whitehead
W.H. Duncan Professor of Public Health
Department of Public Health and Policy
University of Liverpool
Whelan Building
The Quadrangle
Liverpool L69 3GB
United Kingdom
mmw@liverpool.ac.uk

6. List of detailed reports available at project website

A. Detailed reports of Work Packages 1, 2 and 10 (Methodology)
- A.1 Natural policy experiments and their impact on health inequalities: a guide for evaluation. *Whitehead et al.*
- A.2 Assessing the health inequalities impact of Natural Policy Experiments: how to apply the most commonly used analytical methods? *Hu et al.*
- A.3 The impact of NHS resource allocation policy on health inequalities in England 2001-11: longitudinal ecological study. *Barr et al.* 2014.
- A.4 Spearhead Revisited: Investigating the impact of the English health inequalities strategy; a difference-in-differences, propensity matched control study. *Barr et al.* 2015.
- A.5 Did the English strategy reduce health inequalities? A difference-in-difference-in-difference analysis comparing England with three other European countries. *Hu et al.*

B. Detailed reports of Work Package 3 (Trends in health inequalities)
- B.1 Trend analysis
- B.2 Data legacy and its documentation
- B.3 Long-term trends in socioeconomic inequality in mortality in 6 European countries. *de Gelder et al.*
- B.4 Progress in reducing inequalities in mortality: a study of 9 European countries. *Mackenbach et al.*
- B.5 Changes in the contribution of smoking to socio-economic inequalities in mortality in 13 European countries. *Gregoraci et al.*
- B.6 Inequalities in alcohol-related mortality in 16 European countries: large variations, unfavourable trends. *Mackenbach et al.*
- B.7 Educational inequalities in tuberculosis mortality: long-term trends in 13 European countries. *Nagavci et al.*
- B.8 Trends in socioeconomic inequalities in self-assessed health in 16 European countries between 1990 and 2010. *Hu et al.*

C. Detailed reports of Work Package 4 (Unemployment protection)
- C.1 Report of Work Package 4
- C.2 What is the impact of flexicurity on the chances of entry into employment for people with low education and activity limitations due to health problems? A comparison of EU countries using Qualitative Comparative Analysis (QCA). *Backhans et al.*
- C.3 Do 'flexicurity' policies work for people with limiting long-standing illness? A comparison of the contemporary development of labour market policies and employment rates in Denmark, the Netherlands, Sweden and the United Kingdom. *McAllister et al.*
- C.4 Economic recession and policy– impact on employment chances and risk of poverty among low-educated persons with a chronic illness in Sweden, Denmark, United Kingdom and the Netherlands 2005-2012. *Burström et al.*
- C.5 Increasing health inequalities between women in and out of work – the impact of recession or policy change? A repeat cross-sectional study in Stockholm county, 2006 and 2010. *Blomqvist et al.*

D. Detailed reports of Work Package 5 (Poverty reduction)
- D.1 Report of Work Package 5
- D.2 Austere or not? UK coalition government budgets and health inequalities. Journal of the Royal Society of Medicine. *Reeves et al.* 2013.
- D.3 Does investment in the health sector promote or inhibit economic growth? *Reeves et al.* 2013.
- D.4 The political economy of austerity and healthcare: cross-national analysis of expenditure changes during the Great Recessions in 27 European nations 1995-2011. *Reeves et al.* 2014.
- D.5 Do Employment Protection Policies Reduce Inequalities Between Healthy and Unhealthy People? A natural experiment of the Great Recessions in Europe. *Reeves et al.* 2014.
- D.6 Introduction of a National Minimum Wage reduced depressive symptoms in low-wage workers: a natural experiment in the UK. *Reeves et al.* Under review.
- D.7 Economic shocks, resilience, and male suicides in the Great Recession: cross-national analysis of 20 EU countries. *Reeves et al.* 2014.
- D.8 The attack on Universal Health Coverage in Europe: recession, austerity, and unmet needs. European Journal of Public Health. *Reeves et al.*
- D.9 Financing universal health coverage: effects of alternative tax structures on public health systems in 89 low- and middle-income countries. *Reeves et al.*
- D.10 The mental health impact of the Work Capability Assessment in England: a longitudinal cross-local authority study. *Barr et al.*

E. Detailed reports of Work Package 6 (Tobacco control)
- E.1 Report of Work Package 6
- E.2 Temporal trends in social inequalities in smoking in 21 European countries, c.1990-2010. *Platt et al.*
- E.3 Tobacco control policy and social inequalities in smoking prevalence in Europe, circa 1990-2010: an observational, repeat cross-sectional study. *Judge et al.*

F. Detailed reports of Work Package 7 (Alcohol control)
- F.1 Report of Work Package 7
- F.2 Educational inequalities in hospitalization attributable to alcohol: a population-based longitudinal study of changes over the period 2000 to 2007. *Herttua et al*.
- F.3 Minimum prices for alcohol and educational disparities in alcohol-related mortality: a time-series analysis. *Herttua et al.*
- F.4 Income Differences in Life Expectancy. The Changing Contribution of Harmful Consumption of Alcohol and Smoking. *Martikainen et al.*
- F.5 The effects of alcohol prices on social class differences in alcohol related harm: evidence from Finland. *Mäkelä et al.*
- F.6 Non-Employment Histories of Middle-Aged Men and Women Who Died from Alcohol-Related Causes: A Longitudinal Retrospective Study. *Paljärvi T et al.*
- F.7 Life Course Trajectories of Labour Market Participation among Young Adults Who Experienced Severe Alcohol-Related Health Outcomes: A Retrospective Cohort Study. *Paljärvi et al.*

G. Detailed reports of Work Package 8 (Education)
- G.1 Report of Work Package 8
- G.2 Education Promotes Intelligence but May Weaken Emotional Control: A Quasi-Experiment on 320 182 Swedish Boys. *Lager et al.*

G.3 The relationship between school quality, educational quality, and health inequalities: A critical, synthetic review. *Garcy*
G.4 Educational expansion and inequalities in mortality: an exploratory analysis. *Ostergren et al.*

H. Detailed reports of Work Package 9a (Cancer screening)
H.1 Report of Work Package 9a
H.2 The impact of the implementation of breast cancer screening programmes on inequalities in mortality across Europe. *Spadea et al.*
H.3 Absence of socioeconomic inequalities in access to good quality breast cancer treatment within a population-wide screening programme in Turin (Italy). *Zengarini et al.*

I. Detailed reports of Work Package 9b (Primary care)
I.1 Report of Work Package 9b
I.2 The health inequalities impact of public investment in healthcare. Does access to Primary Care matter? A time trend analysis. *Barr et al.*
I.3 Primary health care transformation and health inequalities in some Central and Eastern European countries. *Godycki-Cwirko et al.*

J. Detailed reports of Work Package 10 (Stakeholder involvement and policy briefs)
J.1 Impact of public involvement in interpreting the effect of labour market policies on inequalities in employment and health outcomes. *Anderson de Cuevas et al.*
J.2 The health inequalities impact of austerity measures in times of recession
J.3 Have tobacco control policies helped reduce social inequalities in smoking?
J.4 Do 'flexicurity' policies work for low-skilled workers with health problems?
J.5 The impact of health resources allocation policy on inequalities in health