World Health Organization
REGIONAL OFFICE FOR Europe

Discussion paper on economics and health inequalities

Review of social determinants of health and the health divide in the WHO European Region

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Text editing:
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Book design and cover design:
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Cover: iStockphoto

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Introduction

This report has three self-contained contributions: (1) an overall, conceptual piece on using economic evidence to support the case for action to tackle health inequality, (2) a paper on the role of social capital as a determinant of health, including a review of the general evidence and an econometric analysis applied to a set of countries from the former USSR, taking particular care in assessing the causal nature of the relationship and (3) a paper estimating the cost of health inequalities in a subset of European countries. The overall report is structured as follows: two key messages from each paper, then one-page summaries and subsequently the full versions of the background papers.

Key messages

Key messages – Using economic evidence to support the case for action to tackle health inequality

1. Policy-makers are often concerned that action to tackle health inequality may hamper the achievement of other policy goals for which they are held accountable – such as sustainable economic growth, public expenditure control, delivering public services and the overall quality of life. Cost–effectiveness analysis and cost–benefit analysis studies of action for tackling health inequality can help to address such concerns about potential trade-offs between equity and efficiency by offering policy-makers clearer, more balanced and more evidence-informed understanding about the nature, size and importance of any policy trade-offs.
2. Economic burden studies of the human costs of health inequality can help bring the issue of health inequality to the attention of policy-makers outside the health sector. However, economic burden studies cannot support the case for or against specific policy actions, and studies that focus on financial burdens are a double-edged sword that may distract from more important burdens for human health and well-being.

Key messages – social capital as a determinant of health

3. There is good reason to seriously consider policies that can promote social capital in the WHO European Region as one way to improve health. To the extent that health-enhancing social capital can be promoted at a comparatively low cost, this may well prove a cost-effective way of improving health and possibly health equity in this Region.
4. Bonding and linking-type social capital appears to be far more important for health than the bridging type, at least in the former USSR countries studied. If this is the case, then social capital will primarily operate either through collective action to capture resources (through the linking-type social capital) or through social support, trust, participation, information-sharing and stress-reducing attributes (bonding social capital). Solidarity and collective action within the bridging-type social capital appear to play a much lesser role, at least in these countries.

Key messages – cost of health inequalities

5. Some research has documented that reducing health inequalities between countries may well have significant economic benefits – in the form of more rapid economic growth. The evidence comes from both high-income countries in the OECD and from countries in eastern Europe and central Asia. However, the scientific debate continues about the extent to which the health and growth nexus truly reflects a causal relationship. As extensive research shows, the adverse economic effects of ill health are much less controversial at the individual level. Since, within countries, lower socioeconomic groups have worse health and should thus incur greater economic losses (in the form of earnings loss and labour supply), this is one basis for arguing that health inequalities probably impose a substantial economic burden on society.
6. The true economic burden of health inequalities, however, lies in the value people attribute to the lives lost as a result of socioeconomic differences. That value is hard to measure but certainly by far exceeds any narrow (and possibly non-existent) economic gains in the form of additional earnings or health-care cost savings (which are unlikely to be feasible). Our results suggest that the potential economic benefits if only the health inequality scenarios could be realized are very sizeable. Even the least ambitious scenario would provide monetized benefits to countries ranging from €0.643 billion in Denmark (0.3% of GDP) to €60.026 billion in Italy (4.3% of GDP).

Summaries

Using economic evidence to support the case for action to tackle health inequality

Advocates of action to tackle health inequality generally couch their arguments in terms of social justice or human rights and are often wary of economic evidence and the utilitarian ways of thinking that underpin such evidence. However, economic evidence and arguments are often influential in policy-making circles. Clearly understanding how economic evidence can – and cannot – be used to support the case for action to tackle health inequality is therefore important for those seeking to influence policy-makers.

Economic burden studies

Economic burden studies of the human and financial costs of health inequality can be used to raise awareness about the general need for action, especially among policy-makers outside the health sector, who may not see health inequality as relevant to them. However, studies focusing on financial costs may divert attention away from more important concerns. What matters to people is not the level of public expenditure or even the rate of economic growth but their own health and well-being. Further, economic burden studies only address the policy-maker's initial question: "why should I care about health inequality?" and not the follow-up question: "what should I do about health inequality?". Addressing this question requires economic evaluation studies of the costs and benefits of specific policy actions.

Economic evaluation studies

There are two main kinds of economic evaluation study:

- cost–effectiveness analysis of health sector interventions, which converts all important outcomes into a common currency of health units; and
- cost–benefit analysis of interventions with important non-health outcomes, which converts all important outcomes into a common currency of monetary units.

Standard cost–effectiveness analysis and cost–benefit analysis evidence is utilitarian in the sense that it focuses on overall population health and well-being (or efficiency) and does not incorporate concern for unfair inequality in the distribution of health and well-being (or equity). Methodological research is underway to incorporate the effects of health inequality into economic evaluation. In the mean time, however, standard evidence from cost–effectiveness analysis and cost–benefit analysis can be used to address policy-makers' concerns that action to tackle health inequality may hamper efforts to achieve other policy objectives such as sustainable economic growth and improved overall population health.

- Economic evidence can sometimes be used to identify win-win policies that improve both efficiency and equity. For example, cost–effectiveness analysis studies suggest that some primary care programmes to prevent cardiovascular disease may improve both efficiency and equity within a few years, and cost–benefit analysis studies suggest that some intensive preschool programmes may improve both efficiency and equity within a few decades.
- Economic evidence can also sometimes be used to show that the trade-offs between equity and efficiency are not as large or important as policy-makers would otherwise believe. For example, policies that weaken work incentives or profit motives may limit economic growth – but this effect may not be as large or harmful as some lobbying groups claim.

Credible evidence from cost–effectiveness analysis about policies to prevent ill health is increasingly easy to access via online repositories, such as WHO-CHOICE (global), the National Institute for Health and Care Excellence (England), Assessing Cost-Effectiveness in Prevention (Australia) and the Preventive Services Task Force (United States of America). Credible cost–benefit analysis evidence about policies outside the health sector is less easy to access, but one useful online public repository of cost–benefit

analysis studies oriented towards the United States of America is the Washington State Institute for Public Policy.

Social capital as a determinant of health

Social capital has been proposed as a potentially important and hitherto underestimated contributor to health, and yet most of the existing research tends to ignore the challenge of assessing causality in this relationship. We review the literature on social capital and health and analyse data from nine former USSR countries using a unique multicountry household survey specifically designed for these countries collected in 2010. Although many definitions of social capital exist, all definitions refer directly or indirectly to social connections or social networks as elements of social capital.

Related literature and mechanisms by which social capital may determine health

Some authors (Guiso et al., 2008, 2010; Putnam, 1993) point to the role of social capital as a catalyst of coordination and cooperation, serving as an essential device to achieve better social and economic outcomes. Cooperation enables transaction costs to be reduced to overcome difficulties due to incomplete or asymmetric information and to establish efficient transactions in the presence of incomplete contracts (Alesina & La Ferrara, 2002).

By favouring cooperation, social capital could indirectly also benefit individual health. Several mechanisms may account for the potential positive influence of social capital on individual health.

The most intuitive one is the easier access to health-relevant information, which is related to the intensity of social interaction: the frequent meeting of friends and relatives, participation in social events and meetings, membership in formal and informal organizations, etc. (Berkmann & Glass, 2000). The more individuals are involved in continual social interaction, the easier and less expensive their access to information on diseases, remedies, past experiences with hospitals, health personnel, doctors or drugs tends to be. When asymmetric information between health suppliers and consumers is pervasive – as is common in health-care markets – obtaining better and more complete information does matter, as it enables people to carefully choose the most suited health care. Beyond health care, the influence of the social network may also affect the extent to which (more or less) healthy behaviour within a community has been adopted (Christakis & Fowler, 2007).

A second mechanism relates to providing informal health care and/or psychological support in case of illness. Even in high-income countries, where formal health care is ubiquitous, there is still substantial demand for informal assistance, housing services and babysitting in case of temporary illness. Even financial support may be occasionally required to cover the out-of-pocket costs of health care. The market or the public health system are usually unable to provide such services, either because of the short duration of the illness periods, which makes organization difficult, or because the costs of provision might exceed available budgets. Therefore, people tend to agree on informal and tacit rules, such as reciprocal assistance between neighbours or between friends. Those mechanisms act as risk-sharing devices that supplement formal health insurance. Reciprocal support and assistance tend to arise only in a context of reciprocal trust, since there is no enforceable contract guaranteeing obligations. It has also been suggested that individuals from a disadvantaged socioeconomic background stand to reap greater health benefits from social capital than wealthier individuals, because the former tend to be at a comparative loss in acquiring and understanding relevant health information and obtaining social support (Scheffler & Brown, 2008).

Social capital may facilitate people's lobbying efforts and coordination to obtain health-enhancing goods and services from public authorities, including health infrastructure, traffic regulations and sports facilities.

Not all the effects of social capital on health have to be unambiguously positive, however. Social relationships may even increase susceptibility to infectious diseases or to adopting unhealthy behaviour, driven by existing norms among peers (Kawachi & Berkman, 2001).

Although most of the above potential mechanisms suggest that social capital improves health, the actual net impact remains to be empirically assessed.

A major challenge in the literature on assessing the health impact of social capital has been that of trying to overcome the potential bias resulting from endogeneity in the relationship between social capital and health. In our analytical work, we use various instrumental variable estimations to overcome this challenge. Our findings are as follows.

On the whole, we find a fairly robust causal influence of several dimensions of individual social capital (especially trust, lack of social isolation and membership in organizations) on both general and mental health. This finding is consistent with earlier results on a similar set of countries and with our findings in related research (using slightly different methods) in higher-income European countries (Rocco et al., 2011).

There is thus good reason to seriously consider policies that can promote social capital in the WHO European Region as one way of improving health. Whether this is a cost-effective way of improving health remains to be examined.

At the same time, we found some relevant nuances to our main finding that call for caution in implementing social capital interventions. For instance, we found that being trustful of others is not more strongly related with general health in communities with a higher aggregate level of trust. And untrusting people who lived in communities with a higher aggregate level of trust were even less likely to experience good health than untrusting people living in the reference communities. Thus, interventions to strengthen social capital can potentially cause some unintended negative consequences for people who do not "belong" to the community in which they live.

In general, bonding and linking types of social capital appear to be far more important for health than the bridging variety, at least in the countries studied. Hence we may infer that, in the former USSR countries, social capital primarily operates either through collective action to capture resources (through the linking type of social capital dimension), or through social support and trust, participation, information-sharing and stress-reducing attributes (bonding social capital). Solidarity and collective action within the bridging type of social capital appear to play a much lesser role.

Although it may be plausible to assume that social capital interventions could benefit most the lower socioeconomic groups, we have not come across work that examines this aspect nor have we been in a position to explore this aspect in our work.

The economic benefits of reducing health inequalities in the WHO European Region

Health inequalities exist between and within countries. The Commission on Macroeconomics and Health made the point that there may be a considerable cost in terms of foregone economic growth as a result of some countries having a much lower level of overall health than other countries. Much of this work, however, was related to low- and middle-income countries outside the WHO European Region. However, some very recent work that focuses on low- and middle-income countries cautions against – and indeed reverses – the expectation of major growth dividends from improved health, arguing that most of the previous work on the subject has not properly addressed endogeneity in the relationship between health and economic growth (Acemoglu & Johnson, 2007; Ashraft et al., 2008).

There is comparatively little work on health and growth in high-income countries. Three studies used health expenditure as a proxy for health in OECD countries and found a positive association between health expenditure and economic growth or income levels (Beraldo et al., 2005; Rivera & Currais 1999a, b). Two studies looked at a sample of 22 high-income countries between 1960 and 1985 and found that health – measured by life expectancy – did not significantly affect economic growth or per capita income levels (Knowles & Owen, 1995, 1997). Does this mean that, above a certain level of economic development, further health gains may either have no impact or even reduce subsequent economic growth?

No final answer to this question is in sight. Other recent research (Suhrcke & Urban, 2010), taking considerable care in overcoming the endogeneity problem using a dynamic panel approach and focusing on a health proxy that displays greater variation between high-income countries than does life expectancy, found a very robust causal impact on per capita growth rates in a sample of 26 high-income countries from 1960 to 2000. In one representative estimate, a 10% reduction in cardiovascular mortality was associated with a one percentage point increase in growth of per capita income, a seemingly small amount but one that has a large effect when summed over the long term. The debate on the true effects of health on economic growth is far from settled, however.

The evidence that ill health has adverse economic consequences is far more conclusive at the microeconomic or individual level. Substantial research has examined the microeconomic consequences of adult health on labour market outcomes. Research shows that ill health reduces labour productivity measured by earnings in several cases (Contoyannis & Rice, 2001) and documents the importance of health in shaping labour supply (Gannon, 2005). Good health, for instance, raises the probability of working in the first place. Health even emerges as the main, if not sole, determinant of labour supply by older workers in a significant branch of the literature (Currie & Madrian, 1999).

We have previously carried out extensive work documenting the economic impact of ill health on labour market outcomes (as well as on economic growth) in eastern Europe and central Asia (summarized in Suhrcke et al., 2007).

Although the latter microeconomic body of evidence does not directly measure the economic consequences of health inequalities, it is nevertheless the basis on which one could argue that health inequalities probably have a substantial cost, because individuals with lower socioeconomic status tend to have worse health and thus likely incur greater economic losses than the individuals with higher socioeconomic status.

Few studies have, however, carried out a full economic valuation of the costs of health inequalities. (Among other factors, one reason is that the appropriate counterfactual is not clear.) Two relevant studies in this field are by Mackenbach et al. (2007) on the EU25 countries (the 25 EU members joining by 2004) and Dow & Schoeni (2008) on the United States of America. Mackenbach et al. (2007) pursued two approaches in measuring the economic costs of health inequalities in one year, 2004: for the EU25 as a whole, the estimates of inequality-related losses to health as a capital good (leading to less labour productivity) seem to be modest in relative terms (1.4% of GDP) but large in absolute terms (€141 billion). They also valued health as a consumption good – an approach we also follow here in principle that involves applying the concept of the value of a statistical life.

From this more comprehensive perspective, the economic impact of socioeconomic inequalities in health may well be large: about €1000 billion, or 9.5% of GDP.

A third study had been carried out for the Marmot review (Mazzuco et al., 2010). This study also used estimates of the value of a statistical life to convert the health inequalities into monetary values. In the authors' preferred scenario, those that assume that only part of the mortality gradient would be reduced, they find that, for the adult population as a whole, the economic gains would be on average between about £98 and £118 billion (in 2002 prices) in England and Wales. Since we leave out parts of the population and ignore any non-fatal conditions or diseases, the estimates are very likely to represent the very lower bound of the true benefits that could result.

For the purpose of this report focusing on the European Region, we use a survey that has at least some coverage of European countries: the Survey on Health, Ageing and Retirement in Europe (SHARE). We use longitudinal data from the SHARE survey to estimate the age- and sex-specific mortality rates by socioeconomic status for 11 European countries with the aim of studying the benefits of reducing mortality in the most disadvantaged social classes. We start with

the accurate description of existing inequalities by estimating the influence of total household net worth (used as a proxy of socioeconomic status) on mortality between waves using Cox survival regression models. In a second step, we construct life tables for each combination of country, sex and socioeconomic status and we estimated the number of actual deaths in the population. Then, inequality-reduction scenarios are depicted by reducing the socioeconomic status gradient for each country and providing an estimate of the hypothetical life-years saved.

The life-years saved are then valued in monetary terms to obtain estimates of the expected economic benefits resulting from reducing health inequalities.

Our results suggest that the economic benefits of realizing solely the health inequalities scenarios are very sizeable. Even the least ambitious scenario would provide monetized benefits to countries ranging from €0.643 billion in Denmark (0.3% of GDP) to €60.026 billion in Italy (4.3% of GDP).

Using economic evidence to support the case for action to tackle health inequality

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Acknowledgements
We gratefully acknowledge support for this background paper to the WHO Regional Office for Europe as part of the review of social determinants of health and the health divide in the WHO European Region. We are grateful for the comments received from Lorenzo Rocco, Cristina Hernández-Quevedo and Helen Weatherly. All remaining errors are entirely those of the authors.

1 Introduction

There are large and important social gradients in health across the WHO European Region, both within and between countries. These social gradients have significant human and financial costs. One role for economic analysis is to count these costs: the costs of doing nothing. Economic burden studies of the costs of health inequality can help to support the general case for action to tackle health inequality, especially when addressing sceptical audiences such as finance ministers and other public policy-makers outside the health sector who do not see health inequality as their primary concern. A second and more ambitious role for economic analysis is to evaluate the costs and benefits of specific public policy decisions that may modify social gradients in health. In this second role, economic evaluation studies can help both (1) to give priority to and refine policies intended to reduce social gradients in health and (2) to avoid or redesign policies that may have the unintended consequence of increasing social gradients in health.

The tools of cost–effectiveness analysis can be used to evaluate policies for preventing ill health in the health sector. Although social and economic policies outside the health sector are central to tackling social gradients in health, health sector prevention and treatment policies also need to be considered, and strong evidence indicates that implementing effective health care more systematically can also help to reduce health inequality (Sheldon, 2011). In 2008, for example, the National Institute for Health and Clinical Excellence (2008) in the United Kingdom used cost–effectiveness analysis to support the publication of guidance on primary care interventions for preventing cardiovascular disease that are likely both to improve population health and to reduce health inequality.

Useful public repositories of credible cost–effectiveness analysis information about health sector prevention policies include:

- WHO-CHOICE (http://www.who.int/choice/en);
- the Australian ACE Prevention project (http://www.sph.uq.edu.au/bodce-ace-prevention);
- NICE public health guidance for England (http://www.nice.org.uk/Guidance); and
- the United States Preventive Services Task Force (http://www.uspreventiveservicestaskforce.org).

The tools of cost–benefit analysis can be used to assess broader public policies with important health and non-health effects. In 2010, for example, Nobel laureate James Heckman et al. (2010) published a careful reanalysis of the long-term costs and benefits of the intensive Perry Preschool Project in the United States of America from 1962 to 1967 for improving health, well-being and development among disadvantaged children, finding that the long-term benefits substantially outweighed the short-term costs. Public repositories of cost–benefit analysis information tend to focus on specific policy sectors, and health effects are rarely incorporated in cost–benefit analysis outside the policy sectors of transport and the environment. The Society for Benefit–Cost Analysis based at the Evans School of Public Affairs of the University of Washington (http://benefitcostanalysis.org/resources) provides a list of cost–benefit analysis resources in various policy sectors oriented towards the United States of America. One potentially useful repository of cost–benefit analysis information about policies that may influence social gradients in health across a wide range of policy sectors (including crime, employment, education and early years) is the Washington State Institute for Public Policy (http://www.wsipp.wa.gov), although again this is oriented towards the United States of America. Comparisons of cost–benefit analysis findings between countries must be treated with caution, since the costs and benefits of specific policy actions will depend importantly on the institutional setting, wages and prices, policy objectives and a variety of other country-specific contextual factors. Nevertheless, the information contained in high-quality cost–benefit analysis studies conducted in one country can be a helpful starting-point for assessing likely costs and benefits in a different country, in helping to identify the range of costs and benefits likely to matter to policy-makers, the kinds of evidence and assumptions and social value judgements required to assess those costs and benefits and the main areas of uncertainty.

An important limitation to this evidence is that cost–effectiveness analysis and cost–benefit analysis studies typically focus on overall population health and well-being, and rarely provide any information about health inequality effects. This is partly because of data limitations: evidence about health inequality effects is extremely limited. This also results from methodological limitations: standard methods of cost–effectiveness analysis and cost–benefit analysis focus on the benefits and costs for the "average" person rather than the socioeconomic distribution of the benefits and costs. Methodological research is underway to incorporate concern for health inequality into economic evaluation (Cookson et al., 2009; Griffin et al., 2012). In the mean time, however, standard evidence from cost–effectiveness analysis and cost–benefit analysis can be used in two ways to support the case for action to tackle health inequality. First, it can be used to help to identify win-win actions likely both to improve population health and well-being and to reduce unfair health inequality. Second, it can be used to help to address policy-makers' concerns about potential trade-offs between equity and efficiency: between reducing health inequality (equity) and improving population health and well-being (efficiency). Such trade-offs may arise, for example, in relation to programmes designed to foster health behaviour changes that are easier for advantaged groups to make or programmes that weaken work incentives or profit motives and may thereby limit economic growth. In such cases, credible cost–effectiveness analysis and cost–benefit analysis evidence can help to allay policy-makers' concerns that action to reduce health inequality may result in large sacrifices to population health and well-being.

This paper describes the main different types of economic burden and economic evaluation evidence and assesses what more can usefully be done with evidence of this kind. We argue that useful practical progress can be made right now using standard economic tools and evidence. Further practical progress will be possible in the future, once the standard tools have been refined and developed to overcome the important but not insurmountable methodological challenges in this field – in particular, the challenge of incorporating health inequality effects into economic evaluation.

2 Making a case for concern about health inequality – economic burden studies

Citing economic studies about the overall human and financial costs of health inequality may be helpful in making a case for concern about health inequality. Evidence of this kind may be especially helpful in addressing finance ministers and other policy-makers outside the health sector, who do not see health inequality as their primary concern. We call these studies economic burden studies, to distinguish them clearly from economic evaluation studies that compare the costs and the benefits of specific policy actions and are discussed in the next section. Other authors use the term economic impact studies (Chisholm et al., 2010), but we use the term economic burden to dispel any potentially misleading implication that such studies attempt to identify the causal effects or effectiveness of interventions for tackling health inequality: they do not. Economic burden studies can only be used to highlight the magnitude and importance of health inequality as a policy problem; they cannot help to make the case for specific policy solutions.

Two types of evidence may be useful for this purpose:

- burden-of-disease studies, which quantify the cost of health inequality in human terms – for example, in terms of premature death and reduced life expectancy; and
- cost-of-illness studies, which quantify the cost of health inequality in monetary terms and involve setting a monetary value on health outcomes, typically reflecting the intrinsic monetary value of individual life and health as well as more narrowly monetary effects on economic production and government budgets.

The WHO Global Burden of Disease project (World Health Organization, 2011) popularized burden-of-disease studies. The main difference in this case is that the cause of ill health to be eradicated is health inequality rather than a particular disease. Another difference is that, to date, studies of the burden of health inequality have tended to focus on mortality rather than morbidity burdens. However, the morbidity burden could in principle also be incorporated into the analysis – for example by drawing on the methods of the Global Burden of Disease project, which uses the disability-adjusted life-year (DALY) as an overall measure of health burden that combines both mortality and morbidity. In principle, one could also examine scenarios involving gradual mitigation of health inequality over time rather than the counterfactual scenario of immediate and complete eradication.

Economic burden studies have proliferated in recent decades and are often used to make a general case for action to combat a particular disease or health threat (Chisholm et al., 2010). The difference is that, in this case, the threat to health is not a specific disease or risk factor but the more general problem of health inequality. In addition to the methodological challenges of estimating the health burdens of inequality, cost-of-illness studies face the further problem of setting a monetary value on the health burden. In practice, this may simply be a matter of selecting a suitable monetary value for the relevant unit of health loss. Numerous off-the-shelf monetary values of life and health exist, including estimates based on crude but convenient benchmarks – such as convention or GNP per capita – as well as estimates based on economic theory and evidence from market transaction data (such as labour market data on how far people are willing to accept higher occupational health risks in return for higher earnings), survey data (such as how much people say they are willing to pay for small reductions in the risk of death) and health expenditure and outcome data (such as data on how far increased local health care expenditure reduces mortality). Many off-the-shelf monetary values exist. One dilemma, however, is which monetary value(s) to use for supranational assessment. The values suitable for national decision-making in high-income countries are higher than the values suitable for national decision-making in middle-income countries.

One option is to apply a common high-income country value to all countries. More conservative but potentially more ethically objectionable options are to apply a common average value to all countries or to apply country-specific values. In addition to using a monetary value of life, it is also possible separately to examine more narrowly monetary effects on (1) economic productivity and (2) government budgets. Evidence of this kind is more problematic, however, for two reasons. First, the value of economic productivity – such as earning income and supporting a household – is arguably already incorporated into standard monetary values. Second, there are potential monetary savings to government budgets from health inequality – such as savings in health care, social security and pension budgets arising from the premature death of economically inactive individuals – as well as potential financial burdens such as lost tax revenues from morbidity and premature death among economically active individuals. So it is not clear whether eradicating health inequality would increase or reduce overall public expenditure. In any case, the question of how far health inequality contributes to overall public expenditure is arguably not a very interesting or important economic question. What matters to people is not the overall level of public expenditure but the overall level of health and well-being.

The Philip Morris economic burden study of smoking in the Czech Republic – a cautionary tale

Perhaps the most infamous economic burden study ever conducted was the "public finance balance analysis" of smoking in the Czech Republic funded by the tobacco company, Philip Morris (Arthur D. Little International, 2000). The study concluded that smoking overall made a positive net financial contribution to the Czech public budget in 1999, after taking account of tax revenues from the tobacco industry as well as public health care expenditures due to active and passive smoking. One of the most controversial aspects of the study was that it explicitly analysed financial impacts due to premature death from smoking – including the "positive" impact of savings in health care, social care, pensions and housing costs (totalling CZK 1192 million) as well as the "negative" impact of lost income tax revenue (totalling CZK 1367 million). Interestingly, the report found that the lost tax revenue from premature death slightly outweighed the public expenditure savings, so incorporating the financial effects of premature death into the analysis if anything slightly weakened the pro-smoking conclusion of the report. Nevertheless, the report caused widespread public outrage – in particular, the idea that premature death can have a "positive" impact – and the CEO of Philip Morris was forced to apologize.

We can draw at least two lessons from this episode. First, burdens to the public finances are less important to politicians and the public than burdens to human health and well-being. Or, as the director of an antismoking group, Action on Smoking and Health, put it: "This is flawed economics: taxes are just a recycling of money in the economy. If there were no smoking in the Czech Republic, consumers would be spending their money on other things (which would also be taxed)." (Bates, 2001). Second, evidence about the financial burden of premature mortality – whether due to smoking or health inequality or anything else – can be a double-edged sword, because it raises awkward and controversial questions about potential savings in public health care, social care, pensions and housing costs. Such questions may distract policy makers' attention from what really matters – i.e: the undoubted health and well-being burdens of premature mortality.

A third kind of economic burden study, known as benefit incidence analysis, can also help to make a general case for action to tackle health inequality. This examines how far different social groups benefit from public expenditure and can be useful in highlighting cases in which advantaged groups – such as affluent people, people in urban areas, men and specific ethnic groups – benefit disproportionately from different kinds of public expenditure. This kind of analysis can help make a general case for redistributing the benefits of public expenditure towards more disadvantaged groups. However, like other economic burden studies, benefit incidence analysis does not pinpoint the specific actions needed to redistribute public service benefits nor does it provide information about how far any such redistribution will achieve a more equal distribution of health.

The limitations of economic impact studies

Imagine you are addressing a minister responsible for a large public sector budget. You want to persuade the minister to take a specific action to tackle health inequality. Imagine, further, that the action will require additional expenditure from the ministers' budget over the next few years. You want to make three arguments:

1. The action will reduce health inequality.
2. The action will improve overall health and well-being.
3. The action will save money and reduce public expenditure.

Can evidence on the cost or burden of health inequality help to make any of these arguments? Unfortunately not. Argument 1 requires effectiveness evidence about the impact of the action on the health of different social groups. Information about the size and importance of the health inequality problem is not enough – the minister wants to know how this specific action will influence health inequality. Argument 2 requires cost–effectiveness analysis or cost–benefit analysis evidence about the net impact of the action on overall health and well-being – that is, the overall benefit minus the overall opportunity cost in terms of how the minister's budget could have otherwise been spent. Argument 3 requires evidence about how this specific action will save money and reduce public expenditure. Evidence that health inequality in general imposes high costs on public budgets is not enough. The Minister wants to know what impact this specific action will have on public budgets – and, in particular, on minister's own budget.

The same logic applies to any kind of action in any policy area. It also applies to cases in which you want to persuade the minister to avoid taking a specific action that will increase health inequality. In that case, the minister wants to know how the specific action to be avoided will increase health inequality, how it will harm overall health and well-being and how it will waste money and increase public expenditure in the long run. General evidence about the costs of health inequality does not address the minister's concerns about this specific action.

3 Making a case for action to tackle health inequality – economic evaluation studies

Two main types of economic evaluation study can be distinguished: cost–effectiveness analysis and cost–benefit analysis. Each of these broad types can come in many shapes and sizes and can yield different results depending on the data sources and assumptions used and the methodological decisions made (Drummond et al., 2005).

Cost–effectiveness analysis examines the costs and health outcomes of policies to prevent ill health in the health sector. It is only applicable when the costs of policy action mainly fall on the health sector and when the benefits are mainly health outcomes. In effect, cost–effectiveness analysis estimates the net health effects of a policy on overall population health.

It does this by first estimating the magnitude of the health benefits of the policy and then subtracting the health opportunity costs of the policy. Health opportunity costs arise if the policy increases costs. Since public health care budgets are finite, a cost increase implies diverting resources from alternative possible uses in the health sector that would otherwise have delivered health benefits.

Broader public policies outside the health sector, and indeed policies with important non-health outcomes within the health sector, require cost–benefit analysis. Cost–benefit analysis aims to compare a range of benefits in the single common currency of money. One school of thought within economics – sometimes known as the Paretian or Hicks-Kaldor school of thought – argues that monetary valuation of the benefits of a policy action should aim to measure the individual people's total unadjusted willingness to pay for the policy action. A supposed advantage of this view is that it avoids having to interpret costs and benefits as units of well-being or social good that can be added up and compared between individuals. Instead, it relies on what is known as the Hicks-Kaldor compensation test: if the winners from the policy could compensate the losers and still have some money to spare, then the policy must be a good idea. However, a disadvantage of this view is that it has an in-built bias in favour of people with more money: valuation based on unadjusted willingness to pay tends to favour the interests of individuals with high ability to pay. We therefore adopt the alternative view that monetary valuation of the benefits of a policy action should indeed aim to represent units of individual well-being that can be compared and added up between individuals to yield a measure of overall population well-being or social good. Ours is a reasonably (and perhaps increasingly) common school of thought within economics, and Broome (1991) and Hausman & McPherson (2006) present philosophically sophisticated defences of this school of thought.

Our view is compatible with the classical utilitarian philosophy of Bentham. However, we do not necessarily adopt Bentham's interpretation that equates well-being or utility with experiences of pleasure and pain. Instead, our interpretation is compatible with a variety of different interpretations of well-being, including pluralistic multidimensional interpretations of well-being such as Sen's capability approach – so long as one is willing to combine the multiple dimensions of individual well-being into a single overall index. Our view has no in-built bias towards people with more money. Instead of the maxim "one euro, one vote", we adopt the maxim "one person, one vote". Or, as Bentham put it, "each is to count for one and only one".

There are ways of converting unadjusted data on individual willingness to pay into an estimate of well-being using a system of weights inversely proportional to individual income; for example, the United Kingdom Treasury recommends using such a system. Confusingly, these are sometimes referred to as distributional weights. However, distributional weights of this kind merely adjust for differences in ability to pay to produce a measure of individual benefit that does not depend on ability to pay. They are quite different from equity weights, which allow for concern about fairness in the distribution of benefits: for example, by giving more weight to health benefits for relatively disadvantaged individuals. The idea of equity weights has been discussed in the methodological literature, and some pilot work has been done to estimate such weights based on the views of the general public, but such weights are rarely if ever used in applied cost–effectiveness analysis or cost–benefit analysis studies.

In fact, very few cost–effectiveness analysis or cost–benefit analysis studies provide any information about health inequality effects. This is partly because of data limitations: evidence about health inequality effects is extremely limited. This also results from methodological limitations: standard methods of cost–effectiveness analysis and cost–benefit analysis focus on benefits and costs for the average person rather than the socioeconomic distribution of benefits and costs. Methodological research is under way to incorporate concern for health inequality into economic evaluation

(Cookson et al., 2009; Griffin et al., 2012). In the mean time, however, standard evidence from cost–effectiveness analysis and cost–benefit analysis can be used to address policy-makers' concerns about the potential opportunity costs of action to tackle health inequality and to identify win-win actions that are likely to improve population health and well-being and reduce unfair health inequality. For example, evidence indicates that intensive preschool programmes can help improve the life chances and earning prospects of children from disadvantaged families and also save money for the public purse in the long term through reduced costs of crime and welfare programmes (Heckman et al., 2010).

Public policies that may help to reduce social gradients in health might include:

- health system reforms that succeed in expanding access to health care and financial protection among more disadvantaged individuals and communities;
- early education programmes focusing on disadvantaged families and communities;
- educational interventions that focus on improving the development of children and adolescents from more disadvantaged families and communities;
- labour market interventions that improve access to good jobs for more disadvantaged individuals and communities;
- tax and benefit system reforms that redistribute income and reduce poverty;
- infrastructure investment that improves transport, housing, green space and social capital among more disadvantaged neighbourhoods; and
- use of taxes, subsidies, minimum price regulations and other financial incentives to promote healthy lifestyles, such as discouraging smoking, drinking and poor diet and encouraging physical activity.

Public policies that may have the unintended consequence of increasing social gradients in health might include:

- health system reforms that focus on containing costs and improving efficiency;
- mass-media health promotion programmes and universal screening programmes;
- education interventions that mostly improve the development of children and adolescents with relatively wealthy and/or "pushy" parents;
- labour-market interventions that improve access to good jobs for well-qualified and well-motivated individuals in advantaged areas of the country;
- tax and benefit system reforms that reward healthy and enterprising individuals but penalize individuals with disabilities or impairments;
- infrastructure investment that improve transport, housing, green spaces and social capital for advantaged families who can afford high house prices; and
- public health interventions that prevent ill health and promote healthy lifestyles among advantaged individuals and communities.

Lorenc et al. (2013) reviewed literature on intervention-generated inequalities and tentatively conclude that downstream interventions focusing on individual-level behaviour change are generally more likely to increase inequalities than upstream interventions focusing on social policy and price incentives. However, this is not always the case. Upstream interventions in social and economic policy are often undertaken in pursuit of policy objectives unrelated to health, and some such interventions may have unintended consequences for population health and/or social gradients in health. Evidence from cost–effectiveness analysis and cost–benefit analysis can help to avoid and redesign such interventions. Even interventions with explicit health improvement objectives can sometimes have the unintended consequence of increasing social gradients in health, since more advantaged individuals and communities tend to be more responsive to universal public health information messages and more active users of universal public health services. If so, economic evaluation can help to redesign interventions to focus more intensively towards more disadvantaged individuals and neighbourhoods in accordance with the principle of proportionate universalism.

Public decision-makers can intervene at the supranational, national and subnational levels in a variety of different ways. Typically, interventions that may modify social gradients in health involve:

- multiple components;
- multiple causal pathways that depend on human behaviour;
- complex social systems that may radically alter the effects of any particular component;
- long-term investment that imposes short-term costs to deliver long-term benefits and cost savings, often over decades rather than years;
- important non-health outcomes, such as outcomes relating to consumption, employment, education, poverty, crime and happiness; and
- important costs outside the health sector, such as costs paid by households, firms and a wide range of government budgets.

These distinctive characteristics all make social gradients in health interventions more difficult to evaluate than health-care technologies, such as the use of a new medicine, which typically involve (a) a single active ingredient that works in a similar way on all humans in all institutional, cultural and economic settings, (b) short-term investment that can be justified by short-term health gains to the person taking the medicine (sometimes within weeks and rarely over decades) and (c) no important non-health outcomes or costs falling outside the health sector.

Social gradients in health interventions have potentially important non-health outcomes. In relation to educational interventions, labour market interventions, tax and benefit reforms and infrastructure investment, public decision-makers may be more concerned with non-health outcomes than with improving population health and reducing social gradients in health. In these policy areas, public decision-makers cannot and should not be expected to focus single-mindedly on health outcomes to the exclusion of non-health outcomes. Rather, the aim is to persuade decision-makers to redesign and modify such interventions, paying appropriate attention to the effects on social gradients in health as well as non-health outcomes. A related point applies to health-related interventions such as health-care reforms, early-years interventions and public health interventions. These all have important objectives for improving average population health and do not always exclusively focus on reducing social gradients in health. So in practice, social gradients in health interventions are rarely designed exclusively to reduce social gradients in health but typically have other important objectives as well. We are interested in the broad group of social gradients in health interventions that may modify social gradients in health, for better or worse, and not just the narrow subgroup of such interventions undertaken with the exclusive intention of reducing social gradients in health.

Economic evaluation of social gradients in health interventions is not just a simple accounting exercise involving totalling the short-term financial costs of the intervention: the costs of doing something. It also involves three tasks that are more difficult:

- estimating the health and non-health benefits – preferably including the size of any reductions in social gradients in health;
- estimating the long-term cost savings, which depend crucially on the health and non-health benefits; and
- comparing and combining all the relevant and important benefits and costs – again, including any beneficial reductions in social gradients in health – to provide decision-makers with a small number of summary indicators of how far the intervention offers value for money compared with other interventions.

Carrying out these tasks carefully and systematically requires building a formal decision analytical model that synthesizes different types of evidence and opinion from different sources. It also requires clarity and transparency about the potentially contestable social value judgements that will inevitably be required to construct and use this model to produce summary indicators of value for

money. These tasks raise several important methodological challenges, because of the distinctive characteristics of interventions related to the social determinants of health compared with simple health-care technologies. Four of the greatest challenges are: (1) how to estimate causal effects of complex interventions using observational data and modelling to disentangle complex causal pathways and behavioural feedback loops, (2) how to compare diverse health and non-health outcomes and costs in a common currency (such as money or happiness or capability) to produce summary indicators of value for money, (3) how to measure reductions in social gradients in health (or, more generally, how to conceptualize and measure unfair health inequality (inequity)) and (4) how to compare reductions in unfair health inequality with improvements in average health and non-health outcomes.

Economic evaluation is a time-consuming exercise requiring specialized and costly skills. It cannot be done for all possible decisions by all possible public decision-makers. So difficult judgement calls are required to decide whether and when to conduct economic evaluation. Further judgement calls are then required about how much to spend on the evaluation and how far to incorporate effects on social gradients in health. (If you like, one must do an informal cost–benefit analysis of when and how to conduct a formal cost–benefit analysis.) But why ever go to that trouble? Why ever conduct an economic evaluation that incorporates effects on social gradients in health? There are four main reasons:

- to help public decision-makers to identify comparatively effective and cost-effective interventions for reducing social gradients;
- to help public decision-makers identify and redesign interventions that may have the unintended consequence of increasing social gradients;
- to help public decision-makers think through systematically what information they need to turn general recommendations for action into specific, well-designed interventions in their own particular supranational, national or subnational decision-making context; and
- to help hold public decision-makers to account by identifying and publishing the factual assumptions and social value judgements underpinning their decisions.

The first and second reasons are perhaps the most important. Public decision-makers need to identify comparatively effective ways of tackling social gradients in health that do not impose excessive opportunity costs in terms of other important social objectives. Decision-makers know the short-term financial costs of actions to reduce social gradients in health but do not know the long-term benefits and cost savings. When faced with a list of recommended actions for tackling social gradients in health, they will therefore be tempted:

- option 1: to pursue no action whatsoever to tackle social gradients in health;
- option 2: to pursue cheap policy gimmicks with negligible benefits; or
- option 3: to pursue expensive pet projects that may be wasteful and ineffective.

The first and second options are particularly tempting in the current European fiscal climate of public sector spending restraint. Public sector budget holders are constantly bombarded with requests to spend money on actions of all kinds to pursue social objectives of all kinds, many of which have little to do with reducing social gradients in health.

Putative demands on public budgets far exceed the available resources. Long-term investment to reduce social gradients in health is therefore difficult for public decision-makers to justify without a credible analysis of long-term benefits and cost savings. Even if long-term benefits are impossible to predict with any accuracy, the decision-maker still needs to know what assumptions about long-term benefits are required to justify the investment – and then to consider the plausibility of these assumptions. Economic evaluation can then be thought of as a what-if analysis: if we assume that the long-term health and non-health effects are of this size and shape, would the investment then be worthwhile?

Policy objectives other than reducing health inequality – an example from the United Kingdom

The programme for government published in 2010 by the incoming coalition government in the United Kingdom (HM Government, 2010) proposes action in the following areas: banking, business, civil liberties, communities and local government, consumer protection, crime and policing, culture, Olympics, media and sport, defence, deficit reduction, energy and climate change, environment, food and rural affairs, equalities, europe, families and children, foreign affairs, government transparency, immigration, international development, jobs and welfare, justice, national security, national health service, pensions and older people, political reform, public health, schools, social action, social care and disability, taxation, transport, universities and further education.

Numerous policy objectives are endorsed, but reducing health inequality was mentioned just once. On page 28, it states: "We will investigate ways of improving access to preventative healthcare for those in disadvantaged areas to help tackle health inequalities."

The foreword" by Prime Minster David Cameron and Deputy Prime Minister Nick Clegg highlights three main policy objectives.

1. "We will support sustainable growth and enterprise, balanced across all regions and all industries, and promote the green industries that are so essential for our future."
2. "We both want a Britain where social mobility is unlocked; where everyone, regardless of background, has the chance to rise as high as their talents and ambition allow them."
3. "We have a shared ambition to clean up Westminster and a determination to oversee a radical redistribution of power away from Westminster and Whitehall to councils, communities and homes across the nation."

This second objective is related to reducing health inequality but is importantly different. Increased social mobility need not necessarily reduce health inequality: the upwardly mobile may become healthy while the downwardly mobile sink into ill health.

At the very end of this document, on page 35, the following message was highlighted in large white letters on a green background: "The deficit reduction programme takes precedence over any of the other measures in this agreement, and the speed of implementation of any measures that have a cost to the public finances will depend on decisions to be made in the Comprehensive Spending Review."

The third reason for conducting economic evaluation is to help public decision-makers tailor social gradients in health interventions to their own particular decision-making context. General recommendations for action need to be turned into specific and well-defined interventions that public decision-makers can implement in their own subnational, national or supranational context. The process of conducting economic evaluation, or even just thinking through how economic evaluation might be conducted, can be extremely helpful in this regard. For example, imagine that the general recommendation for action is to encourage reading to young children from disadvantaged families based on evidence that this can substantially improve reading skills, thereby bringing lifelong benefits in terms of educational development, employment and overall well-being. This general recommendation needs to be translated into a specific and well-defined intervention for increasing current rates of reading to young children from disadvantaged backgrounds – for example, through social marketing campaigns, school-based reading programmes, community-based outreach programmes providing support and incentives to encourage disadvantaged parents and

caregivers to read to their young children, or indeed an intervention package comprising all three elements. The process of conducting economic evaluation might focus attention on the important pieces of information needed to design this intervention: for example, current rates of reading in the relevant population, the effectiveness of alternative ways of encouraging reading in different populations and settings and so on.

The fourth and final reason for conducting economic evaluation has to do with transparency and accountability. Public decision-makers often give lip service to virtuous-sounding objectives such as tackling health inequalities while actually pursuing more venal objectives. If economic evaluations are published, they can help to hold public decision-makers to account for their actions by shedding light on the factual assumptions and social value judgements underpinning public decisions.

The economic way of thinking about the costs and benefits of social determinants of health interventions can be contrasted with two commonly held but misguided alternative ways of thinking. In his classic 1974 book, *Who shall live?*, Victor Fuchs (2011) memorably dubbed these the romantic and the monotechnic viewpoints, respectively. The romantic viewpoint denies that resources are scarce and that resource allocation decisions have opportunity costs in terms of alternative beneficial uses of scarce resources. The romantic believes that resources can be found for their own favoured cause without impinging on other people's favoured causes – for example, by making efficiency savings, by diverting resources from disfavoured causes (such as defence spending) or by clamping down on the high pay and tax avoidance behaviour of the super-rich. Fuchs criticizes this viewpoint, writing that: "Because some of the barriers to greater output and want satisfaction are clearly man-made, the romantic is misled into confusing the real world with the Garden of Eden." He goes on: "Confronted with an obvious imbalance between people's desires and the available resources, the romantic-authoritarian response may be to categorize some desires as 'unnecessary' or 'inappropriate', thus protecting the illusion that no scarcity exists." By contrast, the monotechnic viewpoint fails to recognize the legitimate plurality of individual and social objectives. The monotechnic fixates on a single objective and is unconcerned if allocating additional resources to this objective imposes opportunity costs in terms of other objectives. According to Fuchs, the monotechnic view is "frequently found among physicians, engineers, and others trained in the application of a particular technology". He goes on to write: "The desire of the engineer to build the best bridge or the physician to practice in the best-equipped hospital is understandable. But to extent that the monotechnic person fails to recognize the claims of competing wants or the divergence of his priorities from those of other people, his advice is likely to be a poor guide to social policy."

4 Conclusions and recommendations

Reducing health inequality is never the only goal of policy-makers nor should it be in a democratic and pluralistic society. Policy-makers therefore need to be persuaded that action to tackle health inequality will not impose substantial sacrifices in terms of the many other policy goals for which they are held accountable – such as sustainable economic growth, public expenditure control, public service performance and the overall quality of life. Economic evaluation evidence can help to substantiate the claim that action to tackle health inequality will not impose large and harmful opportunity costs on society and to counter misleading claims by powerful right-wing lobby groups who argue that action to tackle health inequality will have all sorts of terrible effects. It can do so by giving policy-makers a clearer, more balanced and more evidence-informed picture of the nature, timing and size of trade-offs between reducing health inequality and other important policy goals.

Our recommendations for improving the use of economic evaluation evidence to support the case for action to reduce health inequality are as follows.

- Those seeking to make the case for specific policy actions to tackle health inequality should consider using existing public repositories of credible cost–effectiveness analysis and cost–benefit analysis evidence to address potentially exaggerated claims that such policies have large and harmful opportunity costs.
- Those using findings from cost–effectiveness analysis or cost–benefit analysis studies should consider not only the reputation of the publisher and authors of the study but should also check the provenance of the underpinning effectiveness evidence and consider the generalizability of findings from one country or decision context to another.
- Analysts conducting cost–effectiveness analysis and cost–benefit analysis studies should more systematically apply methods of evidence synthesis to improve the credibility of their findings.
- European countries should invest in developing quality-controlled public repositories of credible cost–benefit analysis evidence about public policies outside the health sector that may influence social gradients in health, with contextual information about the potential transferability of findings to different European settings.
- Research-funding bodies should fund methodological research to incorporate health inequality effects within economic evaluation of policies that may influence social gradients in health.

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Social capital as a determinant of health: brief evidence review and a case study in nine former USSR countries

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Acknowledgements
We gratefully acknowledge the support from the WHO Regional Office of Europe as part of the review of social determinants of health and the health divide in the WHO European Region as well as from all members of the Health in Times of Transition Project (HITT) study teams who participated in coordinating and organizing the collection of the underlying survey data used. The HITT project itself was funded by the European Union's 7th Framework Programme; project HEALTH-F2-2009-223344. We are grateful for the comments received from Cristina Hernández-Quevedo and Helen Weatherly. All remaining errors are entirely those of the authors.

Background – related evidence

One important reason to explore the causal link between social capital and health is the potential to promote better population health (Borgonovi, 2010). If social capital indeed positively affects health, an argument could be developed for investment that increases social capital, especially if such investment proved cost-effective compared with other preventive or curative health interventions.

This article contributes to the literature by exploring the causal link between social capital and two dimensions of health status – general and mental health – in former USSR countries. This region provides a valuable opportunity to study this phenomenon, since the disintegration of formal social support systems and deterioration of the health-care system in the early 1990s left many people in dire need of help from alternative sources, such as reliance on various informal networks (Cockerham, 1999; Rose, 2000). At the same time, adult health in many former USSR countries is comparatively poor by international standards, especially among men (Suhrcke et al., 2007).

The concept of social capital, initially developed by Jacobs (1961), Loury (1977) and Bourdieu (1986) and further operationalized by Coleman (1988), has been defined in various ways but is commonly understood to encompass a combination of norms, trust and social support (d'Hombres et al., 2011) that smooth the social interaction of individuals in a community and thus contribute to economic growth and development. There are several potential mechanisms by which social capital can contribute to better health. For example, it may promote the spread of information on healthy behaviour, encourage collective action to accumulate health-related resources through political channels and help to reduce stress through more active social participation and providing psychological support (Giordano and Lindstrom, 2011; Kawachi and Berkman, 2000).

Currently, three main forms of social capital are distinguished: bonding, bridging and linking. The bonding type reflects horizontal ties between similar people. It promotes health by enhancing social support and trust, thus facilitating the sharing of information on healthy behaviour (Kawachi et al., 1999). On the other hand, bridging social capital reflects ties that exist between people who do not judge themselves to be very similar and may contribute to better health through solidarity and collective action (Powell-Jackson et al., 2011). Finally, linking social capital constitutes ties between groups at different hierarchical levels. Again, it may benefit health by improving the mobilization of health-promoting resources (Habibov & Afandi, 2011).

At the same time, some researchers have suggested scenarios in which social capital may have an ambiguous or even negative effect on health. For example, some homogeneous communities may score highly on several social capital measures and yet their members may either be intolerant of deviant behaviour or of people from other ethnic or religious groups (Almedom, 2005; McKenzie et al., 2002). As a result, only people belonging to the majority group may take advantage of a greater social capital stock.

Some of the more widely used measures of social capital include trust and membership in certain organizations. In general, trust has been consistently found to be significantly positively associated with self-assessed health. Thus, Poortinga (2006) found that, in England, the effect of aggregate social trust on self-reported health remained positive even after controlling for sociodemographics and individual levels of social support. Subramanian et al. (2002) found that community-level aggregate trust was associated with lower probability of having poor health. Controlling for individual characteristics, baseline self-rated health and individual social trust, Snelgrove (2009) found that, in Great Britain, area-level social trust was associated with self-rated health.

The second frequently used proxy for social capital is membership in various associations, usually voluntary in nature. It is usually hypothesized that involvement in such associations can lead to higher participation in community affairs and thus greater ability of individuals to defend their interests (Lee et al., 2004). This measure of social capital appears to have a much weaker association with health than the trust indicator, particularly when measured on an individual level. For example, d'Hombres et al. (2010) found that being a member of a "Putnamesque" organization was not usually significantly related to good health. In addition, there have been several attempts to measure the effect of community-level membership on various outcomes. For example, Poortinga et al. (2006) defined a measure of community social capital by estimating a proportion of respondents who regularly joined two or more clubs or organizations. They did not find a significant association between aggregate civic participation and self-reported health in England when controlling for various measures of social support. In several papers, the measure of community social capital was also assessed separately from the individual survey responses. For example, the Petris Social Capital Index, inspired by Robert Putnam's Social Capital Community Benchmark Survey (Putnam, 2000), was defined as a proportion of the population in a community working as paid employees in community voluntary organizations (Brown et al., 2006; Scheffler & Brown, 2008; Scheffler et al., 2007, 2008). It was found, for example, that a statistically significant association between a one standard deviation increase in Petris Social Capital Index and the decrease in recurrence of acute coronary syndrome only held for low-income individuals (Scheffler et al., 2008). Brown et al. (2006) concluded that, although the overall Petris Social Capital Index measure had little association with the prevalence of smoking in the community, its religious group component was strongly associated with the number of cigarettes smoked. Using a similar approach to defining community social capital, Iveresen (2008) found that community-level membership in sports organizations was in fact negatively associated with self-reported health in a cross-sectional survey in Norway. Finally, Miller et al. (2006) found evidence for a positive association between the number of organizations in a community and self-reported health.

The evidence on the relationship between social capital and mental health has not been as extensive as for general self-reported health outcomes (Giordano & Lindstrom, 2011). In general, the association between individual-level cognitive social capital variables (such as trust) and mental health has been considerably stronger than between structural measures (such as organizational membership) and mental health (De Silva et al., 2005). Thus, Borgonovi (2010) found trust to be significantly negatively associated with the likelihood of depression, whereas membership and voting participation were not significantly associated with this outcome. On the other hand, Scheffler et al. (2007) found that a lagged Petris Social Capital Index measure was significantly negatively associated with non-specific mental distress among individuals whose income was below the median. Some researchers, however, have concluded that, overall, there is no sufficient basis to either support or refute social capital interventions as a means of promoting better mental health (Henderson & Whiteford, 2003). Therefore, more studies on this topic are warranted.

The great majority of studies on this topic are descriptive in nature. There are several exceptions, such as two studies by D'Hombres et al. (2010, 2011). Using the 2001 Living Standards, Lifestyles and Health data from former USSR countries, they identified the effect of individual trust, membership and social isolation on health by instrumenting them with community averages of these variables, calculated for each individual as the mean of all other individuals living in the same community. They found that trust and isolation were significantly related to self-reported good health in the predicted direction, while they mostly found nonsignificant associations between membership and self-reported good health. Similarly, applying a Granger causality approach, Sirven & Deband (2012) concluded that the effect of organizational membership on health was significantly weaker than the other way around. Ronconi et al. (2012) found a significant and positive association between social capital (defined by a measure of informal social interactions) and health in Argentina, arguing that access to transport was a valid instrumental variable for social capital. Folland (2007) established that social capital was significantly correlated with several health measures and that this finding was robust to the implementation of the instrumental variable model, in which employment rate, geographical latitude and state government contributions to colleges per capita were used as instruments for health. Finally, Kim et al. (2011) found that the country-level social capital, when instrumented with country-level corruption, the logarithm of population density as well as religious fractionalization scores, was significantly positively associated with individual self-rated health. In a more recent study, Fumagalli et al. (2013) assessed the causal relationship between health and social capital, measured by generalized trust, both at the individual and the community level, for a sample of 25 European countries. The strength of this paper is that it not only tackles the problems of endogeneity and reverse causation between social capital and health by estimating a simultaneous equation model but also explicitly accounts for misreporting of self-reported trust. The findings show that a causal and positive relationship between self-perceived health and social capital does exist and that it acts in both directions. In addition, the magnitude of the structural coefficients suggests that individual social capital is a strong determinant of health, whereas community-level social capital plays a considerably smaller role in determining health.

In addition to the studies by D'Hombres et al. (2010, 2011), several articles were specific to former USSR countries. Using 1998 Russian survey data, Rose (2000) found that trust in other people was significantly associated with both self-rated and mental health and that membership of trade unions and political organizations was not consistently associated with self-rated health. On the other hand, Roberts et al. (2010) found a significant association between lack of trust in people and mental distress among adults living in countries of the former USSR. As noted above, Habibov (2011) has also examined the situation in the transitional countries of the southern Caucasus region.

Methods

In this study, we used data from nationally representative household surveys with a total of 18 000 adult respondents (≥18 years old) in Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, the Russian Federation and Ukraine in 2010 as part of the Health in Times of Transition (HITT) study (www.hitt-cis.net). The HITT survey followed up on the 2001 Living Conditions, Lifestyles and Health survey conducted in the same countries as the HITT study (but not Azerbaijan). These surveys used standardized questionnaires on a range of health outcomes, health-behaviour and demographic, socioeconomic and environmental characteristics. In HITT, individual observations were supplemented by structured community-level observations in a subsample of 333 communities. The Annex provides full details on the data sources.

We started with the most basic, linear probability ordinary least squares (OLS) specifications:

$$Y^{j}_{isc} = \alpha_0 + \alpha_1 SC_{isc} + \alpha_2 Z_{isc} + \alpha_3 C_{sc} + \eta_c + e_{isc} \quad (1)$$

We ran this specification separately for two outcome variables: a good health dummy for person *i* living in community s located in country *c*(Y^1_{isc}) and a good mental health dummy (Y^2_{isc}). Good health was defined as an indicator, with one assigned to people who reported that they had good or very good health (on a 5-point scale), and zero otherwise. To define our good mental health outcome variable, we used responses to a self-reported mental health symptom questionnaire with 12 items. A score of one was assigned to people who reported no distressing mental health symptoms and zero to all those declaring at least one mental health symptom (the Annex provides further details).

On the right side, our model includes a vector of three individual social capital variables SC_{isc} – individual trust dummy, a dummy for membership in voluntary organizations as well as a social isolation dummy. Social capital is a contextual phenomenon that cannot be directly observed or quantified (Giordano & Lindstrom, 2011), so multiple proxies for it are necessary. Again, the Annex provides further details on the variable definitions.

Next, Z_{isc} is a vector of individual and household-level control variables that are likely to be determinants of both social capital and health status, including age, sex, three education categories (primary – primary, incomplete secondary or without education; secondary – completed secondary education including vocational and secondary special college; and tertiary – completed and incomplete higher education), religious affiliation, household financial situation, household size as well as the number of household members working; C_{sc} is a vector of community-level controls that may proxy for local infrastructure conditions, including dummies for living in the capital, in a village as well as the distance from the nearest medical facility. This specification also includes country dummies η_c.

Next, the logit model version for equation 1 was run, with odds ratios reported. Both OLS and logit models served as initial benchmark specifications, making the most restrictive assumption, that the variables on the right side of the model were uncorrelated with the error term e_{isc} in specification (1) above. After that, community fixed effects were added to the linear probability model to control for any factors that do not vary inside a specific community. Indeed, the omission of these factors may confound results: for instance, omitting community-specific infrastructure, which may affect both the outcome of interest and the main independent variables, could create a spurious correlation between the two.

Finally, we dealt with the complication that social capital may be endogenously determined (for example, because of health affecting social capital or because unobservable factors may affect both health and social capital that are not accounted for by the control variables and community fixed effects). We instrumented for individual social capital indicators, using a similar approach to d'Hombres et al. (2011). The three instruments for three endogenous variables are the community averages of these

variables, calculated for each individual as the mean of all other individuals living in the same community. This approach increases confidence that the correlation between the instruments and endogenous variables is not spurious (d'Hombres et al., 2010).

The justification for the use of these instruments was discussed in detail for the papers using the 2001 Living Conditions, Lifestyles and Health data (d'Hombres et al., 2010, 2011), but in short, their appropriateness depends on two main assumptions: that they are correlated with the endogenous individual social capital variables, and that, when a large set of community controls or community fixed effects are included into the model, they will affect the outcome variables only through their effect on individual social capital indicators and will not have an autonomous effect on individual health.[1] The first assumption is intuitive and easily testable. Thus, it is natural to expect that the greater the level of aggregate trust in the community, the greater the probability of cooperative behaviour, which will in turn reinforce the feeling of individual trust. Likewise, a greater supply of organizations in the community (reflected in a larger aggregate membership level) should make it easier for willing individuals to join them. Finally, greater average level of feeling socially isolated is likely to reflect the general lack of community cohesion (d'Hombres et al., 2010) and therefore also lead to a higher probability of feeling lonely.

Next, we expanded the list of instruments by adding some additional variables. This approach allows us to conduct further checks on instrument validity by testing for over-identifying restrictions within a generalized method of moments (GMM) framework. The additional instruments are community averages for the following variables: "Are you worried about suffering abuse because of your nationality"? for the good heath outcome variable, and "During the past 12 months, have you been a victim of physical violence?" for the mental distress outcome specification. Again, it is highly plausible to expect that people living in communities suffering from a higher level of abuse and violence will be less likely to communicate with each other, and therefore more of them can be expected to feel isolated and suspicious of others. Further, we instrumented for being trustful and lonely with two community-level variables (thus not derived from the individual social capital measures): the amount of graffiti and litter on the streets – two measures of underlying social disorder, as well as of neighbourhood quality and safety (Ferguson, 2004). The logic here is similar to the one we used for the community-level perception of abuse and violence: more litter on the streets and of graffiti on the walls may indicate run-down and dangerous communities, in which people may be less likely to socialize and therefore feel more lonely and less likely to trust each other. Note that these instruments were not used in the previous papers and thus represent an additional robustness check.[2]

Finally, we simultaneously controlled for any community-level unobserved variables as well as for additional confounders using a GMM–regional fixed effects approach (GMM-RFE). This is the most robust specification, which should help to control for any residual regional-level confounding.[3]

The HITT dataset provides a uniquely rich set of social capital variables. Therefore, we are also in a position to explore simultaneously the effect of three different types of social capital together – linking, bridging and bonding. Specifically, we expanded model (1) by adding the following variables: being trustful of government on a 10-point scale, with value of 1 assigned to those who rated it from 6 to 10,

[1] There is empirical support in the literature for the proposition that community social capital does not have any independent effect on health once individual social capital indicators are included – an important requirement for instrumental validity (see the discussion in d'Hombres et al. (2010) and the references therein).

[2] The exclusion condition for all these instruments rests on the fact that community characteristics are always included in the model. These would control for possible correlations between instruments and the local health environment.

[3] We are including regional fixed effects to the GMM specification, rather than community fixed effects, since the latter approach is incompatible with using our modified average community instrumental variables. Specifically, as the regular community-level average for our instruments will be wiped out when community fixed effects are included, we will observe a strong negative correlation between each social capital and its modified average used as an instrument. Therefore, we need to include a fixed effect on a higher level – a regional one in this case.

and 0 otherwise; past participation in demonstrations, meetings and strikes; being afraid of being harassed or threatened on the street; and being afraid to suffer abuse because of nationality. For each outcome variable, we ran two specifications: simple OLS followed by the community fixed effects model. We intentionally decided not to explicitly split these variables into linking, bonding and bridging groups, since such a classification may be controversial (for example, participation in strikes may be viewed as either bonding or bridging social capital proxy, depending on one's perspective).

Finally, we checked whether association between social capital variables and health differs by several sociodemographic characteristics. Specifically, we interacted every social capital variable with being female, living in a village as well as having higher education dummies. We also interacted being trustful of other people with living in a community where the average proportion of people who are trustful of each other is greater than 60%; and interacted being lonely with living in a community in which the proportion of people who are lonely is greater than 60%.

Main results

Descriptive statistics

Table 1 presents the main descriptive statistics. The proportion of people reporting good health is the highest in Azerbaijan (59%) and the lowest in Georgia (24%). This variable could not be directly compared with Living Conditions, Lifestyles and Health data, since the definition used was somewhat different.

The proportion of people with good mental health (those with no distress symptoms) varied from about 6% in Kyrgyzstan to about 33% in Azerbaijan. People were the most trustful in Armenia (59%) and the least trustful in Kyrgyzstan (43%). Membership in Putnamesque organizations was the highest in Belarus (13%) and the lowest in Azerbaijan (1%). The greatest proportion of socially isolated people lived in Armenia and the Republic of Moldova (45%) and the smallest in Azerbaijan (15%). Again, direct comparison with Living Conditions, Lifestyles and Health data is not possible because of the difference in variable definition, but in 2001, Armenia also was the top country in terms of people who are socially isolated.

Social capital and general health

Table 2 shows that our measure of trust is strongly and positively associated with good self-assessed health across all specifications.

Thus, a person who agrees that the majority of people can be trusted (giving a score of 6 or more on 10-point scale) is up to 6% more likely to report that they have good health, even controlling for education and other sociodemographic factors. The size of the effect is quite close to the one reported in the earlier paper using the 2001 Living Conditions, Lifestyles and Health data (d'Hombres et al., 2010), where the estimate was around 6%, although they defined trust differently.

Similar to the findings of Living Conditions, Lifestyles and Health analysis by d'Hombres et al. (2010), being a member of Putnamesque organizations was found to be nonsignificantly associated with good health in most specifications. Note that when being a member was restricted only to active membership, the association between this form of social capital and good health became positive in the OLS specification (not shown here), with around 6% higher probability of having good health for active participants in Putnamesque organizations.

Finally, being lonely was found to be negatively and significantly related to good health in OLS, logit and CFE specifications, although the parameters were about half the size of the ones estimated by d'Hombres et al. (2010). Moreover, they became nonsignificant in all three GMM models.

For the other parameters presented in Table 2, we can highlight the significance of education. The difference with d'Hombres et al. (2010) is that education has a U-shaped relationship with health, since those with primary and tertiary education are more likely to have better health than those with secondary education. This finding was not robust to including the squared age term, since the

Table 1
Average variable values, by country (2010)

	Armenia	Azerbaijan	Belarus	Georgia	Kazakhstan	Kyrgyzstan	Republic of Moldova	Russian Federation	Ukraine
Good health	0.54	0.59	0.35	0.24	0.44	0.53	0.37	0.35	0.33
Poor health	0.12	0.17	0.15	0.37	0.10	0.12	0.24	0.16	0.22
Good mental health	0.21	0.33	0.19	0.23	0.27	0.06	0.15	0.26	0.20
Trust	0.59	0.46	0.51	0.47	0.52	0.43	0.48	0.52	0.45
Membership	0.04	0.01	0.13	0.11	0.04	0.04	0.07	0.06	0.08
Being lonely	0.45	0.15	0.37	0.27	0.25	0.26	0.45	0.29	0.37
Female	0.54	0.53	0.56	0.64	0.53	0.52	0.56	0.60	0.58
Age (years)	40.42	38.69	43.06	46.18	40.59	38.54	43.48	45.38	46.04
Primary education	0.09	0.08	0.08	0.08	0.11	0.23	0.28	0.13	0.11
Secondary education	0.69	0.68	0.67	0.54	0.60	0.54	0.49	0.61	0.55
Tertiary education	0.22	0.25	0.26	0.38	0.29	0.23	0.23	0.26	0.34
Working	0.50	0.44	0.63	0.41	0.56	0.50	0.50	0.58	0.50
Good financial situation	0.28	0.26	0.23	0.05	0.32	0.35	0.26	0.18	0.17
Household size	4.49	4.35	2.90	3.80	3.95	4.73	3.13	2.91	2.96
Working household members	1.58	0.99	1.68	0.86	1.53	1.34	1.10	1.51	1.33
Distance to nearest medical facility	1.26	1.64	1.53	2.05	1.54	0.87	1.40	2.99	2.69
Living in rural area	0.23	0.44	0.27	0.52	0.44	0.54	0.62	0.27	0.30
Living in the capital	0.36	0.28	0.19	0.24	0.04	0.18	0.17	0.06	0.06
Religious	0.98	1.00	0.91	0.99	0.93	0.98	0.96	0.82	0.85
Total	1800	1800	1800	2200	1800	1800	1798	3000	2000

Source: Health in Times of Transition (HITT) dataset, 2010.

parameter on primary education became nonsignificant and was positive and marginally significant on tertiary education.

Similar to the paper that used the 2001 Living Conditions, Lifestyles and Health data, women are less likely to report good health, with the size of the coefficient being very similar, at about 8–9%. This is well recognized and, in large part, reflects selective survival (Andreev et al., 2003). Being employed is mostly unrelated to good health (except in the logit model), which is different from the positive association found in the previous study. Reporting good economic status continues to have a positive relationship with health, with the size of the parameter being very similar in the two studies. Household size has a small but significant negative association with good health, implying that each additional household member decreases the probability of having good health by up to 0.9% (in contrast to the previous study, which found no significant association). The number of working household members is positively associated with good health, with the size of the parameter very similar in both studies. Finally, distance from the nearest medical facility, living in the capital as well as the village dummy have mostly no association with health, which was also found in the previous study.

Table 2
Social capital and good general health

	(1) OLS	(2) Logit	(3) Community fixed effects	(4) GMM (set 1)	(5) GMM (set 2)	(6) Regional fixed effects – GMM (set 2)	(7) GMM (set 3)
Trust	0.0400***	1.241***	0.0322***	0.0635***	0.0624***	0.052**	0.426*
	(0.00728)	(0.0524)	(0.00755)	(0.0208)	(0.0209)	(0.024)	(0.253)
Membership	0.00603	1.012	0.0307**	–0.0713	–0.0703	–0.14**	–
	(0.0137)	(0.0805)	(0.0154)	(0.0435)	(0.0434)	(0.07)	–
Being lonely	–0.0572***	0.678***	–0.0641***	–0.0420	–0.0475	–0.06	–0.269
	(0.00753)	(0.0305)	(0.00798)	(0.0464)	(0.0461)	(0.062)	(0.344)
Age	–0.0111***	0.938***	–0.0111***	–0.0113***	–0.0112***	–0.011***	–0.0114***
	(0.000220)	(0.00140)	(0.000225)	(0.000243)	(0.000243)	(0.0003)	(0.00114)
Female	–0.0837***	0.637***	–0.0858***	–0.0851***	–0.0842***	–0.082***	–0.0871**
	(0.00702)	(0.0259)	(0.00698)	(0.00805)	(0.00809)	(0.009)	(0.0356)
Primary education	0.0471***	1.105	0.0359***	0.0474***	0.0488***	0.039***	0.0278
	(0.0105)	(0.0784)	(0.0109)	(0.0106)	(0.0107)	(0.01)	(0.0302)
Tertiary education	0.0509***	1.319***	0.0561***	0.0532***	0.0524***	0.055***	0.0391
	(0.00848)	(0.0616)	(0.00829)	(0.00862)	(0.00864)	(0.01)	(0.0297)
Working	0.00282	1.143***	0.000340	0.00279	0.00267	0.0004	–0.0304
	(0.00835)	(0.0535)	(0.00824)	(0.00855)	(0.00858)	(0.008)	(0.0269)
Good financial situation	0.183***	2.491***	0.145***	0.182***	0.182***	0.17***	0.0752*
	(0.00939)	(0.124)	(0.00968)	(0.00986)	(0.00988)	(0.01)	(0.0449)
Household size	–0.00535**	0.988	–0.00893***	–0.00513*	–0.00545**	–0.01***	–0.0112
	(0.00224)	(0.0126)	(0.00242)	(0.00277)	(0.00278)	(0.003)	(0.0127)
Number in the household working	0.0110**	1.078***	0.00917**	0.0113**	0.0117***	0.012***	0.0157
	(0.00439)	(0.0267)	(0.00446)	(0.00445)	(0.00448)	(0.004)	(0.0125)
Distance to nearest medical facility	–0.00109	0.994	–0.00358	–0.000832	–0.000599	–0.001	0.00206
	(0.000994)	(0.00628)	(0.00435)	(0.00102)	(0.00101)	(0.001)	(0.00570)
Living in rural area	–0.00819	0.978	–	–0.00881	–0.00926	–0.008	0.0233
	(0.00997)	(0.0568)	–	(0.00996)	(0.0100)	(0.01)	(0.0389)
Living in the capital	0.00958	1.032	–	0.00756	0.00988	–0.106	–0.0214
	(0.0142)	(0.0827)	–	(0.0141)	(0.0141)	(0.07)	(0.0477)
Observations	17 332	17 332	17 332	17 330	17 151	17 151	2 678
R^2	0.276	–	0.223	0.274	0.274	0.221	0.110
Excluded instruments *F*-test				1 988***	1490***	407***	
				177***	133***	72***	13.6***
				194.2***	150.5***	64***	11.13**
Hansen J *P* value	–	–	–	n/a	0.38	0.90	n/a
Country dummies	Yes	Yes	No	Yes	Yes	No	Yes
Community fixed effects	No	No	Yes	No	No	No	No
Regional fixed effects	No	No	No	No	No	Yes	No

Source: HITT dataset (2010).
*$P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$.
The outcome variable is good self-assessed health. Cluster-robust standard errors reported.
Column 2: odds ratios reported.
IV set (1): community-averaged trust, membership, loneliness.
IV set (2): community-averaged trust, membership, loneliness, being worried about suffering abuse because of nationality.
IV set (3): community-level instruments used (amount of litter and graffiti on the streets). In addition, the following community control variables were used in column 7, for IV set (3): proportion of homes that have electricity, hot and cold water, garbage collection by authorities, central heating as well as the number of derelict homes and quality of roads in the neighbourhood.
Excluded instrument *F*-statistic refers to each of the three endogenous social capital variables in turn.

Social capital and mental health

Table 3 shows the results for the next outcome variable: good mental health. People who are trustful of others are up to 3% more likely to report no distressing symptoms.

Moreover, people who trust others also have 4% lower probability of experiencing 10 or more mental distress symptoms (not shown here). Being lonely is even more strongly negatively related to having good mental health: lonely people are up to 56% less likely to report no mental symptoms than the reference group. Unlike the results in Table 2, being a member was now significantly negatively related to good mental health in three GMM specifications, which is a rather surprising finding. Age, being female, having a functional limitation, having tertiary education and household size, were all more or less consistently negatively associated with good mental health, while reporting a good financial situation and the number of working household members were positively associated with good mental health.

Distance to the nearest medical facility, being religious, working status, village dummy as well as living in the capital, were mostly unrelated to good mental health. The social capital parameters were also relatively insensitive to alternative choices of cut-offs for the good mental health outcome (such as zero; no more than one; no more than two distressing symptoms etc. – results not shown here).

Using the results presented in Tables 2 and 3, we can also test whether social capital and human capital have effects that are independent of each other. Indeed, we see that the parameters on social capital indicators and on education are significant in the general health model and that the parameters on these variables change little across specifications. Incidentally, this finding supports the composite theory, which posits that both human capital and social capital are important determinants of health (Rose, 2000).

One potential criticism of our instruments is that they are constructed from individual data rather than sampled independently, and therefore any first-stage correlation may be spurious to a certain degree (d'Hombres et al., 2010). To deal with this issue, we used two alternative instruments for two individual social capital indicators: being trustful and being lonely. Specifically, we took advantage of community-level data on such variables as the amount of graffiti and litter in the community (the value of 1 was assigned to people living in communities with considerable graffiti or considerable litter on a 4-point scale). One potential concern here is that community-level instruments such as the amount of litter and graffiti on the streets may have an independent effect on health, and the problem arises because we cannot include community fixed effects in specifications where instruments have no community-level variation. However, we deal with this by including several community-level variables that reflect the availability of infrastructure, amenities and quality of life in general.

The seventh columns of Tables 2 and 3 present our findings. Our results indicate that trust was significantly and positively associated with good general health, but its relationship with good mental health became nonsignificant. Although the size of the association of trust with good health appears to be too large, the fact that the association still remains in the predicted direction and statistically significant is reassuring. On the other hand, being lonely is not significant (although negatively correlated) when the outcome is good health but is statistically significant and has the predicted negative sign in the specification when the outcome is good mental health.

Additional checks

Table 4 explores the effect of different types of social capital on self-reported general and mental health, simultaneously.

Columns 1 and 3 refer to OLS specification and 2 and 4 to CFE. For easiness of interpretation, we only present the results of the main parameters. Most indicators related to more formal, collective action-oriented networks, facilitating interaction between people who want to protect their economic and political interests (participation in strikes, demonstrations and being a member) have

Table 3
Social capital and good mental health

	(1) OLS	(2) Logit	(3) Community fixed effects	(4) GMM (set 1)	(5) GMM (set 2)	(6) Regional fixed effects – GMM (set 2)	(7) GMM (set 3)
Trust	0.0354*** (0.00869)	1.244*** (0.0687)	0.0325*** (0.00844)	0.0345 (0.0245)	0.0338 (0.0245)	0.0794*** (0.0256)	–0.110 (0.168)
Membership	–0.0220 (0.0143)	0.875 (0.0846)	0.00488 (0.0148)	–0.113** (0.0469)	–0.112** (0.0469)	–0.106* (0.0623)	– –
Being lonely	–0.131*** (0.00751)	0.364*** (0.0226)	–0.108*** (0.00765)	–0.295*** (0.0497)	–0.296*** (0.0498)	–0.350*** (0.0664)	–0.398** (0.178)
Age	– (0.000246)	0.986*** (0.00160)	–0.00274*** (0.000243)	– (0.000264)	– (0.000265)	–0.00214*** (0.000264)	–0.000452 (0.000648)
Female	– (0.00699)	0.655*** (0.0281)	–0.0620*** (0.00689)	– (0.00833)	– (0.00832)	–0.0515*** (0.00916)	–0.0506** (0.0231)
Functional limitation	–0.140*** (0.00824)	0.329*** (0.0233)	–0.127*** (0.00831)	–0.129*** (0.00893)	–0.129*** (0.00894)	–0.118*** (0.00876)	–0.169*** (0.0372)
Primary education	–0.0137 (0.0116)	0.818** (0.0778)	–0.00356 (0.0113)	–0.00702 (0.0118)	–0.00732 (0.0118)	–0.00572 (0.0108)	–0.0480* (0.0276)
Tertiary education	–0.00112 (0.00892)	0.984 (0.0516)	0.0141 (0.00863)	0.000182 (0.00912)	0.000270 (0.00914)	0.0134 (0.00865)	–0.0151 (0.0211)
Working	–0.000960 (0.00843)	1.036 (0.0525)	0.0120 (0.00813)	–0.00846 (0.00881)	–0.00834 (0.00882)	–0.00984 (0.00851)	–0.0484** (0.0225)
Good financial situation	0.0746*** (0.0113)	1.494*** (0.0877)	0.0696*** (0.0103)	0.0658*** (0.0118)	0.0659*** (0.0118)	0.0528*** (0.0111)	0.0536 (0.0333)
Household size	–0.00391 (0.00256)	0.991 (0.0158)	–0.00569** (0.00260)	– (0.00329)	– (0.00330)	–0.0151*** (0.00372)	–0.0112 (0.00989)
Number in the household working	0.0120*** (0.00465)	1.076*** (0.0299)	0.0194*** (0.00448)	0.0105** (0.00475)	0.0104** (0.00475)	0.0148*** (0.00465)	0.0158 (0.0126)
Distance to nearest medical facility	–0.000944 (0.00137)	0.995 (0.00899)	–0.00378 (0.00434)	–0.000547 (0.00141)	–0.000533 (0.00144)	0.000455 (0.00125)	– (0.00297)
Living in rural area	0.00897 (0.0118)	1.068 (0.0811)	– –	0.00964 (0.0118)	0.00923 (0.0118)	–0.0141 (0.0100)	0.0208 (0.0432)
Living in the capital	0.00578 (0.0166)	1.034 (0.104)	– –	0.00702 (0.0165)	0.00776 (0.0166)	–0.0594 (0.0811)	–0.00401 (0.0470)
Being religious	0.000514 (0.0139)	0.975 (0.0821)	–0.00633 (0.0147)	0.00118 (0.0140)	0.00265 (0.0140)	0.00531 (0.0144)	–0.0599* (0.0309)
Observations R^2	14 361 0.114	14 361	14 361 0.105	14 359 0.082	14 317 0.082	14 317 0.04	2 235 0.023
Excluded instruments *F*-test				1,794*** 171*** 164***	1350*** 131*** 122***	336*** 67*** 48***	13.67*** 21.3***
Hansen J *P* value	–	–	–	n/a	0.11	0.063	n/a
Country dummies	Yes	Yes	No	Yes	Yes	No	Yes
Community fixed effects	No	No	Yes	No	No	No	No
Regional fixed effects	No	No	No	No	No	Yes	No

Source: HITT dataset (2010).
*$P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$.
The outcome variable is good self-assessed health. Cluster-robust standard errors reported.
Column 2: odds ratios reported.
IV set (1): community-averaged trust, membership, loneliness.
IV set (2): community-averaged trust, membership, loneliness, being worried about suffering abuse because of nationality.
IV set (3): community-level instruments used (amount of litter and graffiti on the streets). In addition, the following community control variables were used in column 7, for IV set (3): proportion of homes that have electricity, hot and cold water, garbage collection by authorities, central heating as well as the number of derelict homes and quality of roads in the neighbourhood.
Excluded instrument *F*-statistic refers to each of the three endogenous social capital variables in turn.

Table 4
Linking, bridging and bonding social capital

	(1) Good general health (OLS)	(2) Good general health (CFE)	(3) Good mental health (OLS)	(4) Good mental health (CFE)
Trust in government	0.0348*** (0.00852)	0.0395*** (0.00871)	0.0383*** (0.00891)	0.0302*** (0.00894)
Participation in demonstrations	0.0116 (0.0165)	–0.00249 (0.0170)	–0.0407** (0.0176)	–0.012 (0.0168)
Participation in strikes	0.00074 (0.0187)	–0.0154 (0.0190)	0.0358 (0.0236)	–0.0104 (0.0198)
Being a member	0.00509 (0.0146)	0.0336** (0.0165)	–0.0180 (0.0153)	–0.0012 (0.016)
Abuse because of nationality	0.00274 (0.0119)	0.0106 (0.0127)	–0.0058 (0.013)	–0.013 (0.013)
Being harassed on the street	–0.0345*** (0.00867)	–0.0430*** (0.00930)	–0.0322*** (0.01)	–0.025** (0.01)
Trust	0.0343*** (0.00764)	0.0282*** (0.00797)	0.0282*** (0.01)	0.034*** (0.01)
Being lonely	–0.0548*** (0.00780)	–0.0625*** (0.00833)	–0.128*** (0.0079)	–0.104*** (0.008)
Observations Community FE R^2	15 857 No 0.278	15 857 Yes 0.223	13 164 No 0.116	13 164 Yes 0.105

Source: HITT dataset (2010).
*$P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$.
Cluster-robust standard errors reported.
Only the main parameters are presented. All specifications also contain the same control variables as in previous specifications.
Columns 1 and 3 refer to OLS specification and 2 and 4 to CFE.
The first group (trust in government) represents linking social capital. The second group (participation in demonstrations, strikes and being a member) refers to bridging social capital. The third group refers to bonding social capital.

little or no relationship with either general or mental good health. However, this is not true when the variables of interest proxy for social capital of a more intimate type: trust, loneliness or fear of abuse because of nationality and of being harassed on the street, all of which (except abuse of nationality) are consistently and strongly associated with both health outcomes.

Finally, in Tables 5 and 6, we test for interactions between social capital indicators and five other variables (all specifications include community fixed effects).

Table 5 shows that there is an interaction between sex and the membership dummy: the nonsignificant association between membership and good health found previously appears to be driven by the fact that this association is significant and positive among men and is much weaker and mostly nonsignificant among women. There is also an interaction between education and being trustful: the effect of a trust dummy on good health is significantly stronger for people who have higher education than for those with secondary and primary education. The negative association between being distrustful of others and good health is significantly stronger in communities in which the majority of people are trustful of each other. All these three interactions were only weakly significant, and these findings should therefore be treated with caution. There is no difference in the effects of social capital indicators between rural and urban areas. Table 6 tests the same interactions for the case when the outcome is mental health. This time, the effect of being lonely is significantly weaker for women than for men (although it still remains negative).

Table 5
Effect of interaction parameters on good general health

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Trust	0.0396*** (0.0108)	0.0246*** (0.00852)	0.0442*** (0.00966)	0.0235** (0.00931)	0.0400*** (0.00728)	
No trust						–0.0334*** (0.0106)
Being a member	0.0590*** (0.0220)	0.0239 (0.0184)	0.00516 (0.0190)	0.00698 (0.0136)	0.00596 (0.0137)	0.00715 (0.0136)
Being lonely	–0.0756*** (0.0120)	–0.0580*** (0.00886)	–0.0544*** (0.00955)	–0.0574*** (0.00753)	–0.0506*** (0.00834)	–0.0571*** (0.00753)
Female * trust	–0.0127 (0.0133)					
Female * member	–0.0498* (0.0280)					
Female * lonely	0.0183 (0.0142)					
Tertiary education * trust		0.0273* (0.0149)				
Tertiary education * member		0.0218 (0.0280)				
Tertiary education * lonely		–0.0208 (0.0167)				
Rural * trust			–0.0104 (0.0148)			
Rural * member			0.00204 (0.0267)			
Rural * lonely			–0.00750 (0.0148)			
Trust * ctrust				0.0204 (0.0158)		
Lonely * clonely					–0.0346 (0.0214)	
No trust * ctrust						–0.0654** (0.0273)
Observations Community fixed effects R^2	17 332 Yes 0.223	17 332 Yes 0.223	17 332 No 0.276	17 332 No 0.277	17 332 No 0.276	17 332 No 0.277

Source: HITT dataset (2010).
*$P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$.

Cluster-robust standard errors reported.
Only the main parameters and interactions are presented. All specifications also contain the same control variables as in previous specifications.
Ctrust has a value of 1 for people living in communities in which the average proportion of people who are trustful of each other is greater than 60% and 0 in which it is smaller than 60%; clonely has a value of 1 for people living in communities in which the average proportion of people who feel lonely is greater than 60% and 0 in which it is smaller than 60%.

Table 6
Effect of interaction parameters on good mental health

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Trust	0.0430*** (0.0122)	0.0374*** (0.00954)	0.0422*** (0.0104)	0.0227** (0.0112)	0.0356*** (0.00868)	
No trust						–0.0308*** (0.0113)
Being a member	–0.0157 (0.0217)	0.00438 (0.0173)	–0.0137 (0.0185)	–0.0202 (0.0142)	–0.0206 (0.0144)	–0.0200 (0.0142)
Being lonely	–0.132*** (0.0116)	–0.110*** (0.00866)	–0.133*** (0.00939)	–0.131*** (0.00751)	–0.130*** (0.00838)	–0.131*** (0.00747)
Female * trust	–0.0183 (0.0135)					
Female * member	0.0358 (0.0262)					
Female * lonely	0.0373*** (0.0134)					
Tertiary education * trust		–0.0166 (0.0156)				
Tertiary education * member		–0.00001 (0.0265)				
Tertiary education * lonely		0.00560 (0.0160)				
Rural * trust			–0.0176 (0.0183)			
Rural * member			–0.0208 (0.0286			
Rural * lonely			0.00613 (0.0162)			
Trust * ctrust				–0.00974 (0.0176)		
Lonely * clonely					0.0266 (0.0198)	
No trust * ctrust						–0.0198 (0.0276)
Observations Community fixed effects R^2	14 361 Yes 0.106	14 361 Yes 0.105	14 361 No 0.114	14 361 No 0.115	14 361 No 0.114	14 361 No 0.115

Source: HITT dataset (2010).
*$P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$.

Cluster-robust standard errors reported.
Only the main parameters and interactions are presented. All specifications contain community fixed effects. All specifications also contain the same control variables as in previous specifications.
Ctrust has a value of 1 for people living in communities in which the average proportion of people who are trustful of each other is greater than 60% and 0 in which it is smaller than 60%; clonely has a value of 1 for people living in communities in which the average proportion of people who feel lonely is greater than 60% and 0 in which it is smaller than 60%.

Discussion and conclusions

Our study makes several contributions to the literature on the association between health and social capital. First, it updates the earlier study for the same region that used 2001 data (although, since good health was defined slightly differently, the difference in results should be interpreted with caution). We found that the studies differed little in the association between trust and membership indicators on the one hand and good health on the other. At the same time, the new study halved the association between social isolation and good health. Whether this reflects a genuine reduction in the probability of poor health for lonely people (which could be due, for example, to a reduction in potentially harmful coping behaviour, such as excessive alcohol consumption or better organized welfare services) is difficult to determine, but the finding is nevertheless encouraging. We have also added new evidence to a small set of studies examining the association between social capital and mental health (being one of very few papers that attempt to find a causal association between social capital and mental health (De Silva et al., 2005, and even of a smaller subset of studies that did this in the context of the former USSR). Our findings on an apparently causal relationship between cognitive dimensions of social capital and mental health are especially important, given the lack of evidence on this issue (Giordano & Lindström, 2011; Henderson & Whiteford, 2003). Uniquely in this region, the study also includes objectively assessed measures of the environments in which people live, adding to the growing literature on the environmental determinants of health. Using this information, we found that several individual and community characteristics can moderate the relationship between social capital indicators and health, which may have potentially important policy implications.

The main finding of the paper is that a causal association seems to run from several dimensions of individual social capital to health, although this finding does not exclude the possibility that health may also affect various dimensions of individual social capital. For example, sicker people may be less likely to actively interact with others, which may increase the probability of being socially isolated. However, the use of the instrumental variable approach increases our confidence that social capital affects health, even taking into account the possibility of reverse causality.

The finding that individual trust was positively associated with good health (both general and mental) even after controlling for socioeconomic characteristics was consistent with most of the previous literature on the topic (Poortinga, 2006; Rose, 2000). The causal interpretation received particular support from instrumental variable specifications, which was also consistent with findings from a study using data collected in 2001 in former USSR countries (d'Hombres et al., 2010).

At the same time, in contrast to the findings of Subramanian et al. (2002), being trustful of others is not more strongly associated with general health in communities with a higher aggregate level of trust. However, similar to their findings, untrusting people who lived in communities with a higher aggregate level of trust were even less likely to experience good health than untrusting people living in the reference communities. The reasons for this finding will require more research, but one possible explanation is that, in more socially cohesive communities, a lack of individual trust may indicate a particularly high level of social isolation. In turn, this may lead to both mental problems, leading to deterioration in health as well as to exclusion from a network that may provide access to health-related resources. One important policy implication could be that interventions to strengthen social capital can potentially cause some unintended negative consequences for people who may feel excluded from the communities in which they live. Therefore, any expansion of community-level social capital should take into account the potential concerns of socially marginalized groups, such as vulnerable minorities.

The relationship between membership and general health was mostly similar to the one reported by d'Hombres et al. (2010). However, a significant interaction between

sex and membership was found: for women, the association between membership and self-reported good health was significantly weaker than for men (and this difference in effects was the most pronounced at ages 30–40 and 50–60 years). One hypothetical explanation for this finding is that greater availability of these community organizations may offer opportunities for men to spend less of their time drinking alcohol and to engage in enriching and satisfying activities. On the other hand, since most women living in the former USSR follow a traditional gender role of taking care of their children and family as a whole, the absence or presence of these organizations may make little difference for their health. Another study in Scotland (Ellaway, 2001) found a stronger link between the perception of community cohesion and mental health for men then for women. In contrast to the study by Rojas (2006), no interaction between education and membership was found for either outcome variable. Also, when membership was restricted to active participation only, it became significant in the OLS specification for the good health outcome.

Interestingly, the association between membership and mental health was mostly negative across specifications. A similar finding was made in relation to impoverished urban community-dwellers living in Alabama (Mitchell & LaGory, 2002), which the authors ascribed as potentially caused by the greater burden of distress associated with an increased number of obligations for active community participants (which can be particularly burdensome for people living in impoverished environments). Although the use of an instrumental variable approach reduces the plausibility of reverse causality explaining this finding (such as depressed people seeking the company of other people), the parameters are nonsignificant not only in OLS but also in CFE models, and our findings should therefore be treated with caution.

Being lonely was consistently negatively associated with either outcome variable, although the relationship between loneliness and good health was substantially weaker in the HITT than in the Living Conditions, Lifestyles and Health survey. The effect of being lonely on mental health was significantly stronger for men than for women, especially among those 30–40 and 50–60 years old (note how this difference between men and women at these age groups is similar to what we found for membership variable). Lonely men also appear more likely to have general health problems then women at around the age of 50 years (results available from the authors on request). Thus, the health of lonely middle-aged men may be particularly vulnerable to a lack of social capital.

The finding that trust in government is strongly related to good general and mental health is interesting and is consistent with a study that used another dataset from three former USSR countries: Armenia, Azerbaijan and Georgia (Habibov & Afandi, 2011). The mechanism for this association is unclear, but it can be hypothesized that a higher level of political trust can contribute to better interaction between people living in the same area, to better information about community-wide health problems (Islam et al., 2006), as well as, in some countries, to a higher level of participation in the political process.

Our findings also suggest that, in the former USSR countries, social capital primarily operates through social support and trust, participation, information-sharing and stress-reducing attributes. In contrast, dimensions of social capital that may facilitate solidarity and collective action appear to play a much lesser role for better health, at least in these countries.

Both social and human capital variables played independent roles in the model, which supports the composite theory (Habibov & Afandi, 2011; Rose, 2000). It also appears that the cognitive dimension of social capital (referring to the perception of trust, support and reciprocity) plays a more important role for general health than the structural one, although this has to be qualified by the finding of important interaction between sex and such structural variables as membership. Also, consistent with previous research (Borgonovi, 2010; De Silva et al., 2005; Giordano & Lindstrom, 2011; Roberts et al., 2010), the relationship between mental health and the cognitive dimensions of social capital (such as being trustful and lonely) was considerably

stronger than between mental health and structural measures (such as membership). We also found that more educated people are more likely to benefit from trusting others and that they are also less likely to suffer mental distress as a result of being lonely. Thus, human capital and social capital appear to complement each other, which further supports the composite theory.

One limitation of our study is that our constructed community instruments (special community averages of individual-level social capital variables) may have an independent effect on health, even after controlling for individual social capital. However, we have dealt with this complication by including community-level fixed effects, and it is reassuring that the parameters on most variables of interest did not change very much.

An additional concern with using community fixed effects with community-level instruments is that they can be weak. However, since all of our F-tests of excluded instruments were not only highly significant but also of considerable size, again this is not a serious issue here.

In conclusion, the findings from our study suggest a causal association running from several dimensions of individual social capital to general health and to mental health. Our findings are also robust to a range of different specifications, including the use of instrumental variables. Our findings also show that not all social capital is equally important to health (both general and mental): indicators of social support and trust seem to be more important for health than the dimensions that facilitate solidarity and collective action. The next step in the research agenda is to explore the (cost–) effectiveness of actual interventions aimed at improving social capital.

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Annex: Data sources

We used data from household surveys undertaken in nine former USSR countries in 2010 as part of the Health in Times of Transition (HITT) study. These surveys used standardized questionnaires in the nine countries on a range of health outcomes, health behaviour and demographic, socioeconomic and environmental characteristics.

Nationally representative cross-sectional surveys were conducted with adult respondents (aged ≥18 years) in Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation and Ukraine. Multi-stage random sampling with stratification by region and rural versus urban settlement type was applied. Within each primary sampling unit (about 100–200 per country, except Russian Federation, with 329 primary sampling unit, and Ukraine, with 435 primary sampling units), households were selected by random route procedures. Within each of the selected households, one person was chosen (based on nearest coming or last birthday). If after three visits (on different days and times), no one was home, the next household on the route was selected. Some prespecified quota control was used in Belarus, Kazakhstan, Republic of Moldova and Ukraine (a combination of region, area, sex, age and/or education level).

The surveys were conducted between March and May 2010, except in Kyrgyzstan, where data were collected between March and May 2011 due to the political violence there in 2010. Face-to-face interviews were conducted by trained fieldworkers in the respondents' homes. Response rates varied from 47% in Kazakhstan to 83% in the Republic of Moldova. There were 1800 respondents in each country, except in the Russian Federation (n = 3000) and Ukraine (n = 2200) to reflect their larger and more regionally diverse populations, and in Georgia (n = 2200), where a booster survey of 400 additional interviews was undertaken in November 2010 to ensure a more representative sample.

Everyone gave informed consent before inclusion in the study. Quality control procedures included reinterviews to assess the work of both the interviewers and the interviewers' supervisors. The research was approved by the ethics committee of the London School of Hygiene and Tropical Medicine and was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

The draft questionnaire was forward and backward translated into each of the languages in which it was administered and then piloted before being finalized. Except in the Russian Federation and Belarus (where all interviews were conducted in Russian), respondents were given the choice of answering in Russian or a national language.

The two key outcomes of interest for this paper were self-reported general health and mental health. For general health, a five-point scale was used (very good, good, fair, poor and very poor),with a value of one assigned to people who reported that they had good or very good health and zero assigned to those who reported only fair, poor or very poor health. For mental health, we used an instrument consisting of a set of 12 items on mental distress symptoms, as described previously (Cockerham et al., 2006; Roberts et al., 2010). Each respondent was asked whether he or she had recently experienced the symptom (giving yes or no responses). The 12 symptoms includes: (1) feelings of stress, (2) feeling lonely, (3) inability to concentrate, (4) insomnia, (5) feeling constantly under strain, (6) feeling you couldn't overcome your difficulties, (7) losing confidence in yourself, (8) often shaking or trembling, (9) frightening thoughts coming into your mind, (10) getting spells of exhaustion or fatigue, (11) feeling an impossibility to influence things and (12) feeling that life is too complicated. The instrument was forward- and back-translated and piloted in each of the study countries and showed good reliability, with a Cronbach's alpha score of 0.82. To define our good mental health outcome variable, a score of one was assigned to people who reported

no distressing mental health symptoms and zero to everyone declaring at least one mental health symptom.

The three social capital measures used in this paper are:

- a trust dummy equal to one when a person reports a score of six or higher on a 10-point scale his agreement with the following statement: "the majority of people can be trusted";
- a dummy for membership in Putnamesque organizations (involving horizontal egalitarian relationships, rather than Olsonian organizations involving vertical hierarchical relationships); and
- a social isolation dummy, equal to one when a person reports feeling alone often or sometimes, and zero otherwise.

The choice of social capital measures was dictated by the desire to make comparisons with the earlier papers that used similar data (from the Living Conditions, Lifestyles and Health surveys) collected in 2001 (d'Hombres et al., 2010, 2011). Note that the social capital indicator definitions for both trust and social isolation are somewhat different from those used in these earlier papers; direct comparison of the results should therefore be taken with caution. Moreover, pooling the two surveys to run specification 1 is not possible for the same reason.

Additional community-level observations were also recorded in a subsample of 333 primary sampling units randomly selected from the primary sampling units used in the main household surveys. The community-level observations were measured using a standardized community observation form in which trained data collectors systematically records aspects of the environment relating to general socioeconomic situation (such as litter and graffiti), nutrition and physical activity (such as food environment and walkability) and tobacco and alcohol (such as availability and advertising), which was based upon the Prospective Urban and Rural Epidemiology Study's Environmental Profile of a Community's Health (EPOCH) instrument. Thirty community profiles were conducted in each country, except the Russian Federation (73 profiles) and Ukraine (50 profiles) to reflect their larger and more regionally diverse populations.

The economic benefits of reducing health inequalities in 11 European countries

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Acknowledgements
We gratefully acknowledge support for this background paper from the WHO Regional Office for Europe as part of the review of social determinants of health and the health divide in the WHO European Region. We are grateful for the comments received from Lorenzo Rocco, Cristina Hernández-Quevedo and Helen Weatherly. All remaining errors are entirely those of the authors.

1 Introduction

In recent years, interest has been growing in studying the socioeconomic inequalities in health in many European countries (Mackenbach et al., 2007). Reducing these health inequalities has become an important policy objective, from a purely moral or social justice standpoint. However, on the top of the social justice argument, an economic argument can potentially be added to add weight to the objective of reducing health inequalities.

Few studies have estimated the economic benefits of reducing health inequalities (or the cost of not doing so). Mackenbach et al. (2007) pursued two different approaches in measuring the economic costs of health inequalities in one year, 2004: for the EU25 (the 25 EU members joining by 2004) as a whole, the estimates of inequality-related losses to health as a capital good (leading to less labour productivity) seem to be modest in relative terms (1.4% of GDP) but large in absolute terms (€141 billion). They also valued health as a consumption good, which involves applying the concept of the value of a statistical life. From this more comprehensive perspective, the economic impact of socioeconomic inequalities in health may well appear large: about €1000 billion, or 9.5% of GDP.[4]

Dow & Schoeni (2008) have applied the approach of the value of a statistical life to the United States of America, finding a large potential benefit of improving the health of disadvantaged residents: improving the health of all residents of the United States of America to that of college-educated Americans would result in annual gains of just over US$ 1 trillion worth of improve health as of 2006.

The Marmot review (2010) used the same approach for the United Kingdom: if everyone in England had the same death rates as the most advantaged, a between 1.3 million and 2.5 million extra years of life would be enjoyed by those dying prematurely each year as a result of health inequalities. The economic benefits would total between about £98 billion and £118 billion.

This study sought to provide similar estimates for other European countries, derived from survey data. In particular, we used data from SHARE (Survey of Health, Ageing and Retirement in Europe) surveys. SHARE provides with longitudinal information on people older than 50 years. We therefore estimate the age- and sex-specific mortality rates by socioeconomic status for all the available countries and estimate the benefits of reducing mortality in the most disadvantaged classes.

[4] Mackenbach et al. (2007) also separately estimate the effects on the costs of social security and health-care systems and health care. Inequality-related losses to health account for 15% of the costs of social security systems and for 20% of the costs of health-care systems in the European Union as a whole.

2 Data and methods

2.1 Data

We used data from SHARE. This was a high-quality panel survey providing information on the health and socioeconomic status of non-institutionalized adults 50 years and older[5] representing the various regions of Europe (Börsch-Supan et al., 2005). More specifically, the 2004 SHARE baseline study obtained representative samples for 11 countries, which were the focus of our study:[6] Denmark and Sweden (representing Scandinavian countries), Austria, Belgium, France, Germany, Netherlands and Switzerland (representing central Europe) and Greece, Italy and Spain (representing the Mediterranean area). The second wave of data was collected in 2006–2007 and the third one in 2008–2009.

We used information on the socioeconomic status of individuals in the first wave and considered whether the same individuals were alive in the following waves. For deceased individuals, the date of death was available, so that we could consider socioeconomic status as a determinant of individuals' survival.

SHARE enables different indicators of socioeconomic status. Following the practice of other researchers using the same data (Avendano et al., 2009), we started by considering total household net worth as an indicator of socioeconomic status. Following Avendano et al. (2009), this is "the sum of all financial (net stock value, mutual funds, bonds and savings) and housing wealth (value of primary residence net of mortgage, other real estate value, own business share and owned cars) minus liabilities". Missing items were imputed using the method of multiple imputation (Mannheim Research Institute for the Economics of Aging, 2011). We accounted for the differences in the number of household members by dividing wealth by the square root of household size (Buhmann et al., 1998; Huisman et al., 2003; Avendano et al., 2009). In the analysis, we collapsed wealth into country-specific quintiles.

The second indicator of socioeconomic status was education. In the survey, it was measured using the ISCED (International Standard Classification of Education) coding; we then grouped the different levels into three categories: low – corresponding to the ISCED codes from 0 to 2 (lower secondary school or lower), medium – corresponding to the ISCED code 3 (upper-secondary school) and high – including ISCED codes from 4 to 6 (post-secondary).

2.2 Methods

Our analysis of health inequalities and the potential scenarios of their reductions had four steps.

First, we started by describing existing socioeconomic inequalities in mortality. In particular, we estimated the influence of socioeconomic status on mortality by means of Cox survival regression models. Controlled for age and sex, these models estimate the effects of socioeconomic status on the risk of death, considering the first wave as a starting time.

In a second step, based on the results of the regression models, we constructed life tables for each combination of country, sex and socioeconomic status. We obtained the predicted values of mortality rates by the estimated models and used them to construct the life tables. From the life tables, we took five-year age-specific mortality rates by socioeconomic status, and referring to the population by sex, socioeconomic status and countries (obtained from weighted survey samples), we estimated the number of real deaths in the population.

Then, considering separately men and women, we created a set of hypothetical inequality reduction scenarios by reducing the socioeconomic status gradient for each country and providing an estimate of the life-years saved.

[5] The focus only on the population 50 years or older is not a limitation since most of mortality is concentrated among people older than 50 years. In fact, a limitation may be the fact that only non-institutionalized individuals are considered and are clearly the most healthy: as a consequence, the mortality may be underestimated.

[6] Further data were collected in Israel in 2005–2006 and from the second wave (in 2006–2007) also Poland and the Czech Republic joined SHARE. These three countries were not used in this study.

Finally, for each country and for each scenario, the monetary expected benefits resulting from inequality reduction were estimated based on available estimates and/or assumptions of the value of a statistical life in each country.

In each step, the two measures of socioeconomic status (total household net worth and education) were used alternatively, so that we obtained two sets of results of health inequality reduction scenarios for each sex and for each country.

3 Empirical analysis

3.1 Inequalities based on wealth as a socioeconomic status proxy

Table 1 describes the existing inequalities for men and women in the countries considering life expectancy at 50 years old as a synthetic measure of mortality. We calculated life expectancy based on country-specific Cox regression models, in which the covariates used were sex, age and wealth (as a continuous variable). The life expectancy was constantly higher than that reported by official statistics. For example, life expectancy at 50 years in France reported by the National Institute of Statistics and Economic Studies (INSEE) was 29.09 years for men and 34.96 for women, but the life expectancy at 50 years reported in Table 1 is higher than this. This discrepancy certainly results from the fact that the SHARE sample does not include individuals in institutions (including hospitals). Moreover, individuals living at home but with severe health conditions probably did not participate in the survey. Therefore, we would expect that individuals in the SHARE sample had better health – and, consequently a higher life expectancy – than the entire population on average.

The estimated life expectancy at age 50 years by wealth quintiles reveals a varying level of inequality in each country. In Greece, for example, the life expectancy of men aged 50 years belonging to the bottom wealth quintile (the poorest group) is about 6 years below that of men belonging to the top wealth quintile (the richest). In the Netherlands and Italy, the difference between the life expectancy of the poorest group and the richest group is even larger (8 and 9 years, respectively) whereas in other countries (such as Belgium), the difference across the wealth quintiles is smaller. Germany is a special case: here we find virtually no difference between people belonging to different wealth groups: the poorest people have higher life expectancy than the richest people, but these differences are not statistically significant.

3.2 Scenarios for reducing health inequalities based on wealth as a proxy for socioeconomic status

We used age-specific mortality rates, grouped into 5-year age groups (50–54, 55–59, … 85+) by wealth quintiles obtained from Cox regression models, and we multiplied these mortality rates by the population at risk by wealth quintiles. In this way, we obtained an estimated number of deaths by age groups and wealth quintiles for each country.

Subsequently, we simulated the number of life-years that would be gained if people of lower socioeconomic status experienced the lower mortality rates of people of higher socioeconomic status.

In particular, we considered four scenarios:

- the mortality rates of the bottom wealth quintile decrease to those of the second lowest;
- the mortality rates of the bottom two wealth quintiles decrease to those of the middle quintile;
- the social gradient about the level of the middle quintile, but only 50% of the way to becoming a horizontal line: in practice, achieved by halving the coefficients of the Cox regression models, and the general level of survival has been increased so that the life expectancy of the richest group remains unaltered and the life expectancy of all the other groups increases; and
- the mortality rates of all quintile groups decrease to those of the top quintile.

These four scenarios are increasingly ambitious: the first one provides the mildest reduction of health inequalities; the fourth

Table 1
Estimated life expectancy (in years) at 50 years by wealth quintiles, sex and countries

	Men				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Austria	34.262	34.328	34.562	35.018	36.095
Belgium	35.449	35.644	35.801	36.104	37.564
Denmark	32.900	32.972	33.045	33.196	34.318
France	32.988	33.198	33.370	33.718	35.913
Germany	33.916	33.912	33.882	33.814	33.562
Greece	36.977	37.614	38.209	39.047	42.646
Italy	27.568	28.182	28.940	30.014	36.478
Netherlands	32.024	32.360	33.312	34.446	40.175
Spain	30.182	30.235	30.301	30.328	30.885
Sweden	33.152	33.585	34.047	34.584	37.827
Switzerland	30.670	30.790	31.045	31.451	34.563
	Women				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Austria	37.318	37.404	37.639	38.027	39.067
Belgium	41.880	42.100	42.178	42.318	43.428
Denmark	35.867	36.000	36.116	36.314	37.271
France	38.122	38.293	38.524	38.784	40.643
Germany	38.729	38.681	38.629	38.519	38.299
Greece	39.121	39.791	40.315	41.066	44.219
Italy	32.825	33.500	34.173	35.250	41.018
Netherlands	36.711	37.025	37.917	38.950	43.884
Spain	34.302	34.332	34.365	34.386	34.924
Sweden	37.919	38.267	38.667	39.257	42.101
Switzerland	41.417	41.521	41.626	41.912	43.892

one completely removes any form of inequality. The idea of the third scenario is to halve the wealth gradient, but none of the wealth groups is expected to undergo a rise in mortality rates. Here we assumed that the survival of the poorest groups will increase more than that of the richest ones.

All scenarios certainly reduce the number of expected deaths (except for Germany, which has a slightly negative gradient). By comparing the number of deaths simulated in the scenarios to the number of deaths in the initial situation (Table 2), we derived the number of deaths saved in each scenario (Table 3).

Generally speaking, among these four scenarios, the fourth one provides – not surprisingly – the highest reduction of deaths and the first the lowest one. In the fourth scenario, all the quintile groups have the same morality level (the same life expectancy). Table 3 in the Annex shows the gain in terms of life expectancy at 50 years provided by these four scenarios.

Table 2
Estimated number of deaths by wealth quintiles, sex and country

	Men				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Austria	16 261	16 437	12 301	14 739	12 918
Belgium	21 398	17 385	17 120	14 429	13 616
Denmark	12 856	12 257	12 813	10 701	8 723
France	130 159	127 469	134 432	117 378	102 715
Germany	182 185	139 273	150 793	147 924	158 200
Greece	20 768	19 146	17 313	14 660	5 793
Italy	285 810	199 164	155 749	199 584	116 501
Netherlands	52 850	31 837	18 656	19 555	12 959
Spain	128 295	124 049	137 044	114 136	99 434
Sweden	25 859	26 174	22 035	20 715	11 372
Switzerland	12 220	23 988	21 295	17 303	16 402
	Women				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Austria	36 145	17 215	16 942	16 902	12 392
Belgium	27 232	18 827	11 562	16 972	12 776
Denmark	24 020	17 952	13 363	9 747	9 975
France	258 362	140 854	122 433	98 716	99 135
Germany	513 320	195 390	102 066	104 860	91 040
Greece	31 790	20 766	15 046	13 084	4 621
Italy	401 997	200 558	166 886	177 893	99 478
Netherlands	76 392	45 502	14 822	25 062	7 479
Spain	156 241	116 257	127 894	128 352	146 950
Sweden	51 833	26 916	18 428	17 660	7 171
Switzerland	23 453	19 987	6 575	13 554	5 719

We then have to take into account the fact that the individuals whose lives would be saved in 2004 would be expected to live many more years beyond 2004, on average. To do so, we consider the life expectancy by 5-year age groups for each socioeconomic status class. The total number of life-years saved by improved mortality is equal to the number of lives saved in 2004 multiplied by the remaining life expectancy for each age group and socioeconomic status class. In this way, we assume that the health benefits are instantaneous. The latter assumption may sound somewhat unrealistic, but since life expectancy is estimated in a cross-sectional perspective and not in a longitudinal one,[7] we see no superior alternative. As a result, our life expectancy figures underestimate the true figures, and hence our estimates of the economic benefits of reducing health inequalities are conservative – which we believe is a desirable feature of the estimates after all.

[7] We would need to observe the total extinction of our sample to have a longitudinal estimate of life expectancy.

Table 3
Estimated number of individuals whose lives would be saved under alternative scenarios by sex and country

	Men			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	77	597	3 758	7 277
Belgium	337	797	5 675	10 843
Denmark	83	233	2 708	5 047
France	2 299	6 620	56 252	107 506
Germany	–85	–1 041	–9 828	–21 745
Greece	1 113	3 271	15 175	26 371
Italy	13 760	43 094	247 936	423 693
Netherlands	1 451	8 308	38 938	63 808
Spain	529	1 593	13 447	24 839
Sweden	927	2 915	16 169	28 998
Switzerland	105	773	10 317	19 066
	Women			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	294	1 141	4 988	9 772
Belgium	503	791	4 660	8 275
Denmark	236	566	2 783	5 554
France	2 333	9 710	53 524	104 395
Germany	–1 218	–4 535	–16 221	–32 136
Greece	1 737	3 992	16 108	27 590
Italy	18 183	47 217	245 483	412 787
Netherlands	1 887	9 997	40 902	67 345
Spain	290	992	12 220	23 816
Sweden	1 369	3 551	16 202	28 971
Switzerland	129	394	5 389	10 041

A negative number indicates that the number of deaths under that scenario is higher than that observed in real data.

The results of Table 4 reflect the increase in deaths observed in Table 3. We find that, even when considering the mildest scenario (the first one), many life-years are saved in France and Italy, while for Greece and the Netherlands we find a slightly smaller increase (about 10 000 life-years) and less for other countries. Scenario 4 produces the highest number of life-years saved, especially for Italy (more than 5 million life-years saved for men).

3.3 Inequalities based on education as a proxy for socioeconomic status

A similar approach can be followed using education as a proxy for socioeconomic status.

Cox survival regression models are used with education, sex and age as covariates (Table 5 in the Annex reports the hazard ratio estimates for education) to estimate the age-specific mortality rates and life expectancy (Table 5 reports the life expectancy at the age of 50 years).

Table 4
Number of life-years saved under alternative scenarios by sex and country

	Men			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	735	7 099	52 073	103 023
Belgium	3 644	8 311	70 054	139 893
Denmark	596	1 579	32 004	58 713
France	25 128	63 311	584 980	1 228 517
Germany	–265	–6 615	–65 677	–163 219
Greece	12 758	31 477	194 294	218 316
Italy	112 330	383 016	2 717 180	5 586 375
Netherlands	10 714	71 068	454 724	866 059
Spain	3 254	17 185	144 231	238 188
Sweden	6 418	26 781	153 939	303 219
Switzerland	946	8 839	123 757	244 514
	Women			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	2 659	9 770	66 158	136 376
Belgium	6 830	9 468	67 753	119 865
Denmark	2 568	4 695	28 857	61 480
France	24 235	85 957	569 685	1 206 894
Germany	–15 927	–48 954	–165 892	–302 487
Greece	20 518	42 532	218 844	309 400
Italy	177 700	386 410	2 888 353	5 630 737
Netherlands	15 629	71 511	453 351	869 336
Spain	2 438	9 332	120 394	245 335
Sweden	9 896	23 253	161 149	319 377
Switzerland	1 908	3 442	76 382	149 445

These tables, similar to the corresponding ones obtained considering wealth as a socioeconomic status proxy, reveal varying inequality in each country. However, caution is required in interpreting the results reported. These are particularly unexpected for Italy, Spain and Switzerland, where education seems to increase mortality rather than reduce it, in contrast to most of the existing literature. The proportion of highly educated individuals (the reference group) is very low in Italy and Spain, so the unusual effect of education might partly depend on this. This explanation does not apply, however, to Switzerland. Nevertheless, the sample size for Switzerland is particularly low, and this makes our estimates less precise.

3.4 Scenarios for reducing health inequalities based on education as a proxy for socioeconomic status

The number of deaths was obtained by multiplying age-specific mortality rates for education groups by the population at risk (Table 6).

Following the basic approach used above, we can simulate the number of life-years that would be gained if people of lower educational groups experienced the lower mortality rates of those of higher educational levels. Three scenarios are considered.

1. The mortality rates of individuals with low education decrease to those of individuals with a medium educational level.
2. All individuals have the mortality rates of the highly educated ones.
3. Similarly to scenario 2, we pivot the social gradient about the level of the medium educational level but only 50% of the way to becoming a horizontal line. In practice, this is achieved by halving the coefficients of the Cox regression models.

Table 7 reports the estimates of the number of deaths saved in each scenario, obtained comparing the number of deaths simulated in the different scenarios with the number of deaths in the initial situation (of Table 6).

Table 5
Estimated life expectancy (in years) at 50 years by educational level, sex and country

	Men		
	Low	Medium	High
Austria	31.516	34.092	40.968
Belgium	35.186	36.026	37.935
Denmark	33.045	32.345	35.085
France	30.666	37.074	43.390
Germany	33.056	33.462	34.843
Greece	37.865	39.86	40.018
Italy	29.082	34.553	28.062
Netherlands	32.967	34.699	33.649
Spain	30.338	35.326	30.247
Sweden	33.996	31.717	37.562
Switzerland	33.487	31.965	30.387
	Women		
	Low	Medium	High
Austria	35.928	38.262	43.889
Belgium	41.822	42.437	43.752
Denmark	35.889	35.255	37.839
France	37.371	42.711	46.938
Germany	38.287	38.553	39.930
Greece	39.809	41.659	41.902
Italy	33.960	39.073	32.949
Netherlands	37.344	38.952	38.018
Spain	34.379	39.319	34.277
Sweden	38.464	36.307	41.693
Switzerland	42.317	41.133	39.954

Table 6
Estimated number of deaths by educational level, sex and country

	Men		
	Low	Medium	High
Austria	17 595	31 680	17 645
Belgium	49 140	19 551	16 530
Denmark	19 125	24 580	14 450
France	500 469	100 396	39 366
Germany	87 172	470 230	222 176
Greece	62 987	10 118	5 267
Italy	645 874	215 826	83 356
Netherlands	82 972	29 430	28 248
Spain	532 421	19 071	41 025
Sweden	73 433	14 954	18 082
Switzerland	45 321	15 694	26 739
	Women		
	Low	Medium	High
Austria	61 395	30 979	7 725
Belgium	58 250	17 229	12 577
Denmark	42 932	22 540	8 836
France	307 999	342 798	15 844
Germany	580 875	335 300	97 517
Greece	67 814	13 664	3 002
Italy	1 018 123	38 511	23 138
Netherlands	133 283	23 041	16 867
Spain	631 818	9 670	31 589
Sweden	99 361	12 174	11 184
Switzerland	47 939	13 987	7 364

Table 4 in the Annex shows the gain in terms of life expectancy at 50 years provided by these three scenarios.

Once again, scenario 2 is the most ambitious, since it provides the highest number of lives saved (except for Italy, Spain, and Switzerland because of the above-mentioned surprising effect of education on mortality in these countries and except for the Netherlands). By contrast, scenario 3 is the one providing the lowest increment of lives, implying an increase in deaths in many countries. Table 8 reports the numbers of life-years saved with improved mortality under the different scenarios.

Table 7
Estimated number of individuals whose lives would be saved under alternative scenarios by sex and country

	Men			Women		
	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Austria	3 843	27 143	–2 682	9 320	39 883	2 139
Belgium	3 727	14 359	207	3 020	11 079	592
Denmark	–1 054	8 366	–1 225	–1 922	9 661	–569
France	214 328	391 556	7 900	159 631	304 985	12 020
Germany	3 316	78 715	–10 098	13 268	114 995	4 449
Greece	10 856	11 734	–2	10 079	11 742	193
Italy	273 752	–166 464	8 848	324 970	–114 828	10 165
Netherlands	13 397	2 353	1 076	17 327	5 362	1 974
Spain	191 650	–16 647	817	200 427	–11 729	4 960
Sweden	–17 966	27 743	–2 130	–18 720	26 655	–1 326
Switzerland	–5 641	–14 923	490	–4 611	–10 647	–1 024

A negative number indicates that the number of deaths under that scenario is higher than that observed in real data.

Table 8
Numbers of life-years saved under alternative scenarios by sex and country

	Men			Women		
	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Austria	50 668	495 547	–44 917	118 216	643 371	16 712
Belgium	45 599	190 835	566	40 983	156 885	4 840
Denmark	–8 477	106 432	–15 543	–17 008	111 651	–9 797
France	2 535 021	6 173 183	–74 967	2 410 432	5 118 601	27 157
Germany	31 929	788 208	–108 374	97 423	1 194 207	–1 479
Greece	126 902	138 048	–5 963	138 049	165 496	–1 031
Italy	3 478 302	–1 385 444	80 358	4 031 140	–1 251 323	125 073
Netherlands	137 900	21 481	12 007	177 261	51 940	17 875
Spain	2 335 931	–211 213	6 512	2 558 004	–161 087	69 552
Sweden	–122 770	289 350	–19 447	–130 019	282 586	–23 733
Switzerland	–53 460	–136 986	9 085	–57 758	–126 481	–10 960

Monetary valuation of the life-years gained in the scenarios

The final step assigns a monetary value to the additional life-years gained. Assigning monetary value to life and health is highly controversial in health but much less in economics. Hence, we start by motivating and explaining the basic approach adopted.

Much of the reservation about putting a monetary value on life and health stems from a misunderstanding of what such a value actually means. In fact, we cannot – and do not seek to – place a monetary value on our own or others' lives. Instead, we are valuing often comparatively small changes in the risk of mortality, a very different matter. A more appropriate term than value of life would thus be the value of reducing mortality risk. Although no one would trade his or her life for money under normal circumstances, most people would weigh safety versus cost in choosing safety equipment, safety versus time in crossing a street and on-the-job risks versus differences in wages. In making these choices, people implicitly put a price on their risk of mortality.

Although the value of reducing mortality risk is not directly observable, it can be inferred from the decisions people make when choosing between mortality risk and financial compensation. The most common procedure uses labour-market data about the wage premium workers demand for carrying out a job with higher mortality risk since, given a choice, individuals demand higher wages to work in jobs associated with greater risks, such as coal mining or offshore oil work. For example, if an individual is willing to forego €200 to reduce the risk of mortality by 1 per 1000, this trade-off gives a value of life of €200 000 only in the sense that the risk reduction is achieved in a population of 1000: if mortality risk is reduced by 1 per 1000 population in a population of 1000, this is the same as saying that we expect – statistically – one life to be saved in this population. Put this way, we can also speak of the value of a statistical life.

Nevertheless, can an actual price be placed on life or health? Pretending that this is easy would be foolish. Nevertheless, many studies have measured how people value the risks of mortality or even morbidity. Many of these studies infer willingness to pay for small changes in mortality risk from observed choices in labour markets and in markets for safety-related products (such as seat-belts and smoke detectors). Other studies use contingent valuation methods, in which people are asked directly what they would be willing to pay for a change in risk, using surveys. The considerable experience that has accumulated with both market-based and survey approaches has led to significant improvements in the methods used, but the estimates obtained from studies still vary considerably, and the point estimates obtained from any single willingness-to-pay study have large confidence intervals.

Although this challenge calls for cautious use of such estimates (and for the use of appropriate sensitivity analysis), it is certainly not a reason for abandoning the pursuit of more accurately measuring this meaningful concept. Further improvement in both measurement methods and data sources will enable the degree of uncertainty around estimates to be narrowed. Indeed, the act of undertaking such measurements has inherent value, since it forces decision-makers explicitly state what are often implicit and unexamined choices concealed within policy decisions.

The literature has a host of estimates of the value of a statistical life. A meta-analysis of the value of a statistical life in OECD countries (OECD, 2012) represents a particularly useful resource for our present exercise. The carefully conducted study proposes a range for the average adult value of a statistical life for OECD countries of US$ 1.5 million to US$ 4.5 million (2005 prices), with a base value of US$ 3 million. For our purposes, we converted the dollar figures into euros and use 2010 as our reference year, starting from the value of a statistical life that the OECD study proposes for every country that is also included in the SHARE data. We then adjusted for inflation and differences in purchasing power using the online tool developed by Shemilt et al. (2010) (http://eppi.ioe.ac.uk/costconversion/default.aspx). We do so for every SHARE country, and then average the country values across the SHARE sample.

Table 9

Economic benefits (in billions of euros) from the life-years saved by three scenarios for reducing health inequality (with wealth as a socioeconomic measure) by sex and country (a range of ±50% is reported in parentheses)

	Men			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	0.154 (0.077, 0.231)	1.529 (0.760, 2.293)	11.448 (5.720, 17.172)	23.240 (11.621, 34.861)
Belgium	0.792 (0.396, 1.187)	1.705 (0.850, 2.557)	15.154 (7.580, 22.732)	30.373 (15.186, 45.559)
Denmark	0.117 (0.059, 0.176)	0.320 (0.160, 0.480)	6.854 (3.430, 10.281)	12.659 (6.329, 18.989)
France	5.583 (2.791, 8.374)	13.135 (6.570, 19.702)	122.818 (61.409, 184.228)	269.111 (134.555, 403.666)
Germany	–0.057 (–0.085, –0.028)	–1.268 (–1.902, –0.634)	–12.874 (–19.311, –6.437)	–32.600 (–16.300, –48.901)
Greece	2.786 (1.393, 4.178)	7.849 (3.924, 11.773)	42.286 (21.143, 63.430	44.409 (22.204, 66.613)
Italy	22.897 (11.449, 34.346)	77.479 (38.740, 116.219)	574.784 (287.392, 862.177)	1237.635 (618.818, 1856.423)
Netherlands	2.116 (1.058, 3.175)	14.550 (7.273, 21.819)	100.127 (50.064, 150.191)	197.608 (98.804, 296.416)
Spain	0.630 (0.315, 0.945)	3.696 (1.848, 5.544)	30.823 (15.412, 46.235)	50.709 (25.354, 76.063)
Sweden	1.257 (0.628, 1.885)	5.834 (2.917, 8.751)	31.901 (15.951, 47.852)	64.135 (32.068, 96.203)
Switzerland	0.188 (0.094, 0.281)	1.887 (0.943, 2.830)	27.018 (13.509, 40.527)	53.049 (26.525, 79.575)
	Women			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	0.527 (0.450, 0.604)	2.318 (1.550, 3.082)	13.067 (7.340, 18.791)	30.847 (19.227,42.467)
Belgium	1.515 (1.120, 1.910)	2.309 (1.460, 3.161)	13.150 (5.570, 20.727)	27.625 (12.438, 42.811)
Denmark	0.526 (0.470, 0.584)	1.134 (0.970, 1.294)	5.397 (1.970, 8.823)	13.153 (6.824, 19.483)
France	5.443 (2.650, 8.234)	22.065 (15.498, 28.633)	105.818 (44.409, 167.227)	258.364 (123.809, 392.919)
Germany	–3.813 (–3.841, –3.784)	–11.498 (–12.132, –10.864)	–27.186 (–33.623, –20.749)	–60.864 (–44.564, –77.165)
Greece	4.500 (3.107, 5.893)	10.281 (6.357, 14.206)	41.730 (20.586, 62.873)	65.641 (43.437, 87.845)
Italy	37.129 (25.680, 48.577)	93.949 (55.209, 132.688)	558.901 (271.509, 846.293)	1262.923 (644.106, 1881.741)
Netherlands	3.177 (2.119, 4.235)	17.288 (10.015, 24.560)	79.804 (29.740, 129.868)	193.513 (94.709, 292.316)
Spain	0.490 (0.175, 0.805)	2.161 (0.313, 4.009)	22.138 (6.726, 37.550)	49.851 (24.497, 75.206)
Sweden	1.962 (1.333, 2.590)	6.293 (3.376, 9.210)	28.431 (12.481, 44.382)	68.117 (36.049, 100.185)
Switzerland	0.484 (0.390, 0.577)	1.072 (0.129, 2.016)	15.447 (1.938, 28.956)	33.994 (7.469, 60.519)

Table 10

Economic benefits (in billions of euros) from the life-years saved by three scenarios for reducing health inequality (with education as a socioeconomic measure) (a range of ±50% is reported in parentheses)

	Men		
	Scenario 1	Scenario 2	Scenario 3
Austria	10 905 (5 453, 16 358)	119 209 (59 604, 178 813)	–10 564 (–15 846, –5 282)
Belgium	9 987 (4 993, 14 980)	42 847 (21 423, 64 270)	88 (44, 131)
Denmark	–1 675 (–2 513, –838)	22 981 (11 491, 34 472)	–3 326 (–4 990, –1 663)
France	542 272 (271 136, 813 408)	1 437 188 (718 594, 2 155 782)	–23 832 (–35 749, –11 916)
Germany	6 817 (3 409, 10 226)	165 067 (82 533, 247 600)	–24 034 (–36 052, –12 017)
Greece	27 574 (13 787, 41 361)	29 844 (14 922, 44 766)	–1 562 (–2 343, –0 781)
Italy	741 379 (370 689, 1112 068)	–292 059 (–438 088, –146 029)	15 962 (7 981, 23 944)
Netherlands	29 572 (14 786, 44 358)	4 359 (2 179, 6 538)	2 625 (1 312, 3 937)
Spain	504 409 (252 205, 756 614)	–181 790 (–272 685, –90 895)	1 328 (664, 1 992)
Sweden	–25 250 (–37 875, –12 625)	61 167 (30 584, 91 751)	–3 992 (–1 996, –5 988)
Switzerland	–10 979 (–16 468, –5 489	–28 378 (–42 567, –14 189)	1 891 (946, 2 837)
	Women		
	Scenario 1	Scenario 2	Scenario 3
Austria	25 580 (20 128, 31 033)	148 758 (89 154, 208 362)	1 106 (–4 176, 6 388)
Belgium	8 291 (3 298, 13 285)	35 157 (13 734, 56 581)	782 (738, 825)
Denmark	–3 443 (–4 281, –2 605)	24 064 (12 573, 35 554)	–2 300 (–3 963, –0 637)
France	531 339 (260 203, 802 475)	1202 958 (484 364, 1921 552)	–8 870 (–20 787, 3 406)
Germany	19 488 (16 079, 22 897)	243 493 (160 960, 326 026)	–2 786 (9 231, –14 804)
Greece	30 191 (16 404, 43 978)	36 382 (21 460, 51 303)	–470 (–1 250, 0 311)
Italy	876 232 (505 543, 1246 921)	–270 372 (–416 402, –124 343)	27 249 (19 268, 35 230)
Netherlands	37 477 (22 691, 52 263)	10 667 (8 487, 12 846)	3 533 (2 220, 4 845)
Spain	553 552 (301 347, 805 756)	–36 715 (–127 610, 54 180)	15 635 (14 971, 16 299)
Sweden	–24 612 (–37 237, –11 987)	61 162 (30 578, 91 746)	–5 778 (–7 774, –3 783)
Switzerland	–12 501 (–17 990, –7 012)	–26 807 (–40 996, –12 618)	–2 227 (–3 173, –1 281)

With several simplifying assumptions,[8] the value of a statistical life (VoSL) can be converted into the value of a statistical life-year (VoSLY) by using the standard compound interest formula VoSLY = VoSL * d/[1–(1+*d*)$^{-L}$], with *L* as the remaining life expectancy and *d* as the discount rate. Assuming the value of a statistical life is for an average person, say, 40 years old, remaining life expectancy of 40 years (*L*) and the recommended discount rate of 3.5% (*d*), the value of a statistical life-year for the OECD would be about £163 895 (as of 2005).[9] To express future amounts in present value terms (Dow & Schoeni, 2008), a discount rate of 3.5% is used.

Table 9 reports the monetary gains (in euros) obtained in each scenario of reducing health inequality when socioeconomic status is measured through wealth. Table 10 shows similar figures for the education-based scenarios. Tables 3 and 4 in the Annex report the economic gain from reducing inequality as a percentage of GDP.

The scenario predicting the highest gain in terms of life-years (scenario 4) provides the highest monetary gain, and the scenario providing the least life-years gained provides the lowest monetary gain. In addition, within each scenario, the countries with the highest inequality also gain the most benefits from reducing it. Italy, for instance, will gain between €11.449 and €34.346 billion if the first scenario (that predicting the mildest reduction in health inequality) materializes just for men. This is about the same as what Switzerland will gain if the third scenario can be achieved.

As expected, when education is used as a measure of socioeconomic status, the most ambitious scenario (the second one) is also the one providing the largest economic gains (about €1400 billion for France), whereas the third scenario provides the least gain – and in some cases there is even a monetary loss.

6 Discussion

With few exceptions, our estimates in the various scenarios imply an enormous economic benefit associated with improving mortality in the lower socioeconomic groups. It is beyond the scope of this paper to determine the correct scenario out of the many we presented, but even the mildest one (the first one) would provide monetized benefits to countries ranging from €0.643 billion in Denmark to €60.026 billion in Italy. The education-based estimates provide more heterogeneous results: for the same scenario (the second one), there is a gain of about €1400 billion in France (85% of GDP) and a loss of about €300 billion in Italy (21% of GDP).

It is important to recognize the caveats related to the assumptions underlying the hypothesized scenarios for reducing inequality. Two assumptions might appear particularly strong: first, we assume that health benefits are instantaneous; second, the economic benefits we estimated for one saved life-year are net of health opportunity costs (or, even more implausibly, the health opportunity costs are assumed to be zero). Further, our scenarios all ignore any effects on economic growth and social security expenditure. However, if the latter assumption has the effect of overstating the economic benefits of reducing health inequalities, the former assumption – which we are forced to make since life expectancy estimates are traditional and backward-looking demographic estimates of life expectancy based on past mortality rates – will tend to underestimate the life expectancy of the population currently alive. In addition, the SHARE sample comprises on average a healthier population than the actual national population: institutionalized people have not

[8] In addition to the critical assumption that each year of life over the life cycle has the same value, this approach assumes that the value of a statistical life can be expressed as the present discounted value of these annual amounts. In practice, several factors are likely to lead to differences in how one values survival at different ages, such as changes in wealth levels, family responsibilities, health status and other aspects of one's life cycle (Hammitt, 2007).

[9] We also allow for a range of estimates of the value of a statistical life-year in our sensitivity analysis, assuming ±50% of the mean value, the same range suggested by the OECD report (OECD, 2012).

been surveyed, and more generally we may expect that healthier individuals are more likely to collaborate with the survey. This caveat is confirmed if we compare the life expectancy at 50 years estimated in SHARE data with national estimates, which are lower. Therefore, we might assume that the socioeconomic status gradient on mortality is underestimated, and so are the estimated benefits of reducing health inequalities. Given all these caveats, we certainly cannot claim that the numbers we provide correctly estimate the true benefits observed if the scenarios depicted came true. However, there are good reasons to believe that, even though the assumptions we are making might look strong, the overall effect of these assumptions is not overestimating the economic benefits of reducing health inequalities but rather underestimating them.

Overall, we conclude that the expected economic benefits of reducing mortality inequalities according to even the (arguably) not very ambitious scenarios appear to be large. This may be an additional reason for policy-makers to try to identify and pursue strategies trying to reduce health inequalities.

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Annex

Table 1
Years gained in terms of life expectancy at age 50 years based on four scenarios for reducing health inequality (with wealth as a socioeconomic measure)

	Men			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	0.0132	0.1068	0.6252	1.242
Belgium	0.039	0.1018	0.7178	1.4516
Denmark	0.0144	0.0436	0.5424	1.0318
France	0.042	0.1108	1.025	2.0756
Germany	–0.0008	–0.0128	–0.1194	–0.2606
Greece	0.1274	0.3654	1.9656	3.7474
Italy	0.1228	0.426	3.128	6.2416
Netherlands	0.0672	0.448	2.977	5.7116
Spain	0.0106	0.037	0.2692	0.4988
Sweden	0.0866	0.2714	1.6128	3.188
Switzerland	0.024	0.126	1.434	2.8592
	Women			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	0.0172	0.1112	0.5808	1.176
Belgium	0.044	0.0752	0.5516	1.0472
Denmark	0.0266	0.073	0.4516	0.9574
France	0.0342	0.1266	0.8906	1.7698
Germany	–0.0096	–0.0304	–0.1382	–0.2724
Greece	0.134	0.3436	1.7966	3.3166
Italy	0.135	0.4042	2.969	5.6648
Netherlands	0.0628	0.4196	2.6814	4.9866
Spain	0.006	0.0192	0.24	0.4622
Sweden	0.0696	0.2296	1.4684	2.8588
Switzerland	0.0208	0.0628	0.9622	1.8184

Table 2
Years gained in terms of life expectancy at age 50 years based on three scenarios for reducing health inequality (with education as a socioeconomic measure)

	Men		
	Scenario 1	Scenario 2	Scenario 3
Austria	5.443	0.859	–0.708
Belgium	1.553	0.280	–0.219
Denmark	1.593	–0.233	–0.303
France	6.347	2.136	–1.374
Germany	1.056	0.135	–0.085
Greece	0.770	0.665	–0.273
Italy	–2.504	1.824	0.227
Netherlands	–0.123	0.577	0.014
Spain	–1.823	1.763	0.035
Sweden	3.137	–0.760	–0.533
Switzerland	–1.559	–0.507	0.138
	Women		
	Scenario 1	Scenario 2	Scenario 3
Austria	4.529	0.778	–0.527
Belgium	1.082	0.205	–0.158
Denmark	1.511	–0.211	–0.295
France	4.598	1.780	–0.909
Germany	1.007	0.089	–0.132
Greece	0.779	0.617	–0.250
Italy	–2.378	1.704	0.248
Netherlands	–0.087	0.536	0.001
Spain	–1.715	1.647	0.079
Sweden	2.872	–0.719	–0.479
Switzerland	–1.181	–0.395	0.140

Table 3
Economic benefits (as a percentage of 2004 GDP) from the life-years saved by four scenarios for reducing health inequality, with wealth as a socioeconomic measure

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Austria	0.290	1.639	10.445	23.044
Belgium	0.792	1.378	9.717	19.911
Denmark	0.326	0.738	6.217	13.098
France	0.666	2.126	13.810	31.861
Germany	–0.176	–0.581	–1.824	–4.257
Greece	3.933	9.786	45.349	59.401
Italy	4.295	12.265	81.109	178.902
Netherlands	1.078	6.482	36.632	79.628
Spain	0.133	0.696	6.295	11.953
Sweden	1.119	4.215	20.971	45.970
Switzerland	0.230	1.012	14.524	29.770

Table 4
Economic benefits (as a percentage of 2004 GDP) from the life-years saved by three scenarios for reducing health inequality (with education as a socioeconomic measure)

	Scenario 1	Scenario 2	Scenario 3
Austria	15.545	114.170	–4.030
Belgium	6.275	26.779	0.299
Denmark	–2.597	23.872	–2.855
France	64.848	159.470	–1.975
Germany	1.198	18.607	–1.221
Greece	31.180	35.747	–1.097
Italy	115.731	–40.239	3.092
Netherlands	13.650	3.059	1.254
Spain	125.754	–25.972	2.016
Sweden	–17.332	42.521	–3.396
Switzerland	–8.031	–18.874	–0.115

Table 5

Estimated hazard ratios for educational levels of Cox regression models adjusting for age and sex for the countries (95% confidence intervals in parentheses)

	Low	Medium	High
Austria	2.873 (1.236, 6.680)	2.208 (0.959, 5.082)	1.00 (ref)
Belgium	1.378 (0.834, 2.277)	1.252 (0.697, 2.250)	1.00 (ref)
Denmark	1.256 (0.699, 2.259)	1.354 (0.787, 2.329)	1.00 (ref)
France	5.138 (2.037, 12.964)	2.450 (0.889, 6.753)	1.00 (ref)
Germany	1.260 (0.705, 2.252)	1.208 (0.736, 1.982)	1.00 (ref)
Greece	1.361 (0.671, 2.763)	1.024 (0.438, 2.393)	1.00 (ref)
Italy	0.897 (0.426, 1.889)	0.494 (0.174, 1.406)	1.00 (ref)
Netherlands	1.092 (0.668, 1.786)	0.874 (0.468, 1.635)	1.00 (ref)
Spain	0.992 (0.488, 2.015)	0.556 (0.154, 2.004)	1.00 (ref)
Sweden	1.611 (0.959, 2.708)	2.194 (1.147, 4.200)	1.00 (ref)
Switzerland	0.707 (0.279, 1.790)	0.838 (0.283, 2.485)	1.00 (ref)

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Discussion paper on economics and health inequalities

Review of social determinants of health and the health divide in the WHO European Region

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