THE FUNDAMENTAL CAUSES OF DEATH THEORY, MEDICAL TECHONOLOGIES AND INEQUALITIES IN MORTALITY

Introduction

In the recent years the so called fundamental cause theory of health (Link-Phelan, 1995) has gained increasing attention in explaining social inequalities in health and mortality. According to this theory, the resources owned by the privileged groups of society such as knowledge, money, power and beneficial social relations can be used as flexible resources for improving and maintaining heath. According to the theory the appearance of new knowledge and new medical technologies would lead to increasing inequalities in mortality from those causes which are influenced by this new technologies or knowledge. The theory was tested mainly in the more developed countries and mainly supportive (Phealan et al, 2004) but in some cases controversial evidences were found for the theory. This testing procedure also increased the attention toward the nature of the new technologies (Rogers, 2002; 2003; Goldman-Lakdawalla, 2005; Chang-Lauderdale, 2009) including the way they are implemented.

In this paper we investigate education specific correlates of some of these new technologies in Hungary. We selected those major medical discoveries from which proven benefits can be expected for mortality from one or more causes of death (Hoffman et al, 2013) and we added to this list two prevention measures (mammography and cervical cancer screening). From this list we selected those innovations about which at least partial data are available for Hungary, which were the spread of hypertension-lowering medications and beta-blockers and the major cornerstones in expansion of screening.

According to the data on drug consumption both the use hypertension-lowering drugs and beta-blockers has reached a level of close to full penetration in about 2006. Based on these facts we expected an increasing improvement for cause-specific mortality for the lower educated regarding to those diseases which are connected to hypertension-lowering drugs (hypertension and strokes) and to those which are connected to use of beta-blockers (ischaemic heart diseases). In the same time we expected the highly educated groups experiencing a similar dynamic decrease from mortality of the same causes in an earlier period. These hypothesises are supported by the results of the health surveys which showed a rather balanced picture for the different educational groups for 2008 regarding blood pressure control.

As for the screening procedures, first „pilot" but organized breast cancer screening was introduced in 1995 in Hungary which was followed by the introduction of a general screening program in 2002. Participation rates for the two programs, however, were very close to each other, approaching 60% of the target population. (Boncz et al, 2007). Cervical cancer screening has a longer history in Hungary, but it has never reached a satisfactory coverage. The first organized nation-wide program was established in 2003 followed a pilot program in 1997. The coverage has been at around 30% at both cases (Anttila et al, 2004). Health surveys shows large inequalities in participation rates across educational groups for cervical screening and attenuated but existing inequalities for mammography screening. Based on these facts we expected more beneficial effects on mortality for highly educated groups following the introduction of these screening programs compared to the less educated.

Data and methods

For the cause-specific analyses we use those estimated data which we corrected in order to eliminate the effects of the changes in a coding system appeared in 1978, 1996 and in 2005 (for detailed description see: Kovács, 2014) Time series produced in this way were broken down to linear phases by join-point regression analysis using a software provided by the National Cancer Institute of the United States. The software fits data in the simplest possible sequence of linear trends which are connected by the join-points. First a linear trend for the overall period is fitted, then trends with a growing number of joint-points are also fitted and their significances are tested against the Null-hypothesis (e.g. having 0 join-points). The tests of significance are based on a Monte Carlo permutation test. The breakdown of the time series was successful in most of the cases, though the method applied involves some uncertainties, in these cases we did not evaluated the timing of changes in trend but we turned to some simplified comparisons. Finally we examined if the expected changes appeared in the time series of the appropriate cause-of death mortality.

Results

Assessing the possible effects of the levelling-off the hypertension lowering drugs we expected an increase of start of the decrease of mortality due to hypertension and strokes among the less educated in the second part of the 2000s and similar periods characterizes by strong decrease for the more educated to some earlier periods. The expectations were supported only partially.

We did not find expected changes in mortality from hypertension. Total hypertension mortality is strongly declining in Hungary from about 1989. The growing phase of mortality was followed by a strongly decreasing phase for both the less and the more educated, and the space of the decrease is similar for both social groups over the all period between 1989 and 2008.

For strokes however, the hypothesis was supported, but only in a very uncertain way until now. Total stroke mortality has been decreasing since 1980. For less educated this decrease was taken place with more or less the same space except with a short period of acceleration of the decrease from 2003. For more educated we can find periods with more accelerated decrease earlier (especially between 1980 and 1985). In this way patterns of stroke mortality pattern are similar to that we expected, though the separation of the last period in mortality of the less educated encompasses some uncertainty. On the other hand, we found similar results for mortality from the sub-type of ischaemic stroke and not for mortality from the other major sub-types (haemorrhagic stroke) and this fact reinforces the assumption according which the extension of anti-hypertension drug consumption can be associated with changes in stroke mortality.

Similarly weak evidences were found in connection with the extension of beta-blocker use. Ischaemic heart disease is decreasing for the more educated from already 1985 while for the less educated a decreasing period appeared to start only in 2004. Similarly dynamic decreases which was experienced by the less educated from 2004 appeared two times earlier for the more educated (in the early eighties and in the late nineties), in accordance with our assumptions. Education-specific mortality from ischaemic heart diseases therefore can be associated with the assumed pattern of beta-blocker consumption, and the socially differentiated spread of use of these medicines could result in the expected plateau of ischaemic heart disease mortality of the less educated between 1998 and 2004 and its drop following 2004 (See figures 1 and 2).

Cervical cancer mortality is slowly declining since 1982 in Hungary. The lowering of the decline has diminished following 1995 – which results cannot be interpreted with the connection of the introduction of the screening program in 1997. Though the timing and the dynamic seems to be slightly different for the two educational groups, none of these dynamics show any changes following 1997 or 2003.

Breast cancer mortality was higher among the more educated for most part of the observed period: for 1971 to about 2000. Both mortality of more and less educated can be characterized by the sequence of one growing and one diminishing period. The start of the diminishing period among the more educated was 1992 – so that was clearly not triggered by the introduction of the organized screening in 1995. The beginning of the fall of mortality, however, is 1997 for the less educated which can be connected with suddenly starting measurable participation in screening. It must be mentioned that trend analyses for the mortality of the more educated is less convincing, their mortality is rather characterized by the sequence of a mid (1971-1979), a high (1980-1996) and a low (1997-2008) level mortality period. Looking at the data in this way one cannot exclude the possibility, that the introduction of screening resulted a sudden and persisting lowering in mortality of highly educated women, and a much limited, slow decrease in mortality of the less educated women, benefitting finally the more educated.

Strengths and limitations of the study

The main limitation of this study is the lack of exact data on implementation of certain medical procedures and technologies, which is characteristic not only for Hungary, but for all countries of Central Eastern and Eastern Europe. Inequalities in mortality, on the other hand, are known to be more pronounced in this region compared to Northern, Western or Southern Europe. For reducing inequalities, the proper introduction and availability of new medical achievement can be of key importance. In our knowledge, still, the present study is among the firsts which try to access the possible effects of some of these technologies on inequalities in health.

Due to the data limitations, our hypotheses were also of a restricted nature. We could not assess the full process of the spread of certain technologies, we could only make assumption about the consequences of the period of their full or close to full penetration periods. While in most cases we founded the expected results, the changes, which are expected to appear in the second part of the 2000s, were represented by only data for a couple of years. We hope that the extension of the study period until 2014 which is on the way will eradicate some of the uncertainties in the results of the present study soon.

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Figure

Mortality from ischaemic heart diseases, Hungary, 1971-2008, estimated and modelled values by education

(Estimated values: fitted value corresponding the coding rules in effects from 2005, modelled values: sequences of linear trend provided by joint point regression)