# Money or Medicine?
# The contribution of rising income and improving health care to the East-West German mortality convergence

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## Abstract

Improving health care and increasing income have strong benefits for human survival to and at older ages but their relative importance is less clear. German reunification demonstrates that the adoption of the modern western health and pension system lead to a decline in old age mortality among East Germans and to a convergence of life expectancy between both parts of the country. By using the reunification of Germany as a natural experiment, this study seeks to address the question if one of the two, wealth or health care, is more important. Our analysis uses individual level register data from the German statutory retirement fund which covers over 90% of East German pensioners. We apply hazard regression models to estimate the relative importance of availabilty of health care and increasing pension levels for the East German mortality catch up.

# 1  Background

The German reunification provides an ideal opportunity to assess the impact of changing mortality conditions on human survival on a population level. One population with an identical cultural and historic background was separated for over 4 decades receiving a very different social, economic and political treatment. After the collapse of the socialist regime, the reunification of Germany exposed East Germans to the same treatment as West Germans. Thus, in experimental terms, we have Germans in the West as the control group and East Germans as the treatment group. Life expectancy in the East reacted very rapidly to the changes brought by reunification and eventually caught up to the West German level. This convergence was mainly driven by mortality improvements among the elderly (Klenk et al., 2007; Gjonça et al., 2000). East Germans in the age groups above 65 contributed up to 80 % of the convergence of average life expectancy at birth (Vogt, 2013). In only 6 years, East Germans over 60 living in university towns caught up to the mortality levels of their western compatriots. The question remains which treatment caused this quick mortality decline among the elderly.

The reunification of Germany altered living conditions for East Germans in different ways. The social, economic and currency union between the East and the West entered into force on the July 1, 1990 and implemented the West German economic and social political system in the East. The introduction of the West German health care system gave access to modern medical treatments and facilities. Avoidable diseases from medical interventions declined in the East and triggered the convergence of mortality levels to the West (Nolte et al., 2002).

At the same time, the currency union and the adoption of the West German pension system brought a massive increase in relative and nominal income for older East Germans. The East German Mark was exchanged into *Deutschmark* at a highly beneficial, politically motivated, rate of 1:1.[1] Simultaneously, East German pensioners became members of the West German statutory pension system and their monthly retirement benefits were adapted accordingly. Income levels converged very quickly and average male pensions reached the West German level within five years, while the average pension income for females in the East exceeded the West just one year after reunification. Life expectancy followed the reduced income disparities and mortality converged for pensioners whose income level reached the western average.

This study aims at estimating the relative importance of both factors. Previous

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[1]Studies suggested that a realistic exchange rate between the two currency were ranging between 5:1 and 10:1, which means an overnight manifold increase in purchasing power (Baylis, 1993; Neumann, 1992).

studies showed that the introduction of the western health care system did not occur simultaneously across whole East Germany. Mortality levels declined first where health care became available first with declining circulatory mortality being the main driver (Vogt and Vaupel, 2012). Towns with state university hospitals received investments into health care first while a network of private practitioners had to be established and reached older East Germans later in towns with no hospital. In contrast, with the introduction of the western pension system, higher incomes reached all eastern pensioners at the same time. Thus, we hypothesize that mortality of older East Germans in university towns with high pension incomes converged first to the West German level. Likewise, mortality of pensioners outside university towns with low income converged last. Furthermore, if medicine was more important for the mortality convergence then pensioners in university towns should catch up earlier to the West than high income pensioners in rural areas. To test our hypotheses we use two different methods. First, we show the convergence of life expectancy for the four different groups to West German average life expectancy. Secondly, we use a hazard regression model to estimate the effect of income and health care on individual mortality dynamics.

## 2    Data and Methods

Post-reunification East German data on individual mortality determinants are scarce and do not exist for the years before the fall of the Berlin Wall. Unfortunately, there is no data source which combines information on mortality levels, pension income and health care usage. Thus, we have to rely on indirect measures to test for the impact of health care. We use registry data from the statutory German pension fund, which covers 98% of East German pensioners. These data contain information on individual pension levels, place of residence, health care insurance, number of children and demographic information on sex, date of birth and of death. The available data are annual 10% samples from the stock of East German pensioners, and they can be analysed via remote access at the research center of the German pension fund. Consequently, around 100,000 cases were drawn each year between 1993 and 2007, leading to a total sample size of more than one million individuals.

As a first step, we use these data to estimate cohort specific mortality rates for four different groups of pensioners. We compare the convergence of each cohort to the average West German mortality level in the corresponding western cohort. The first group contains pensioners with monthly pension benefits in the highest income quartile and living in university towns. The second group are pensioners with highest

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quartile income living outside university towns. The third group consists of pensioners with a pension income lower than the highest income quartile and living in university towns. Finally, the fourth group lives outside university towns and receives below highest quartile pension payments. The average West German mortality rate is estimated over all income groups independent of place of living. This descriptive approach allows us to evaluate which group characteristics were beneficial for the mortality convergence.

In the second step, we use a hazard regression model to estimate the relative effects of income and health care availability on the convergence trajectory of the force of mortality in East Germany. The impact of income is measured according to income quartiles in inflation discounted 2005 Euro values. The availability of health care is measured as an indirect proxy, namely whether individuals are living in a town with university hospital or not.

## 3 Preliminary Results

Our first results show the mortality catch up of East Germans in cohort perspective. Figures 1 and 2 show the time dependent convergence based on income level and availability of health care for two different cohorts.

Both figures show that men and women outside university towns with low income could not catch up to the average western mortality level. Likewise, the mortality of pensioners with high income living in towns with university hospitals is below the West German average mortality level and caught up already before 1993. It seems that pensioners who lived in university towns and had low income caught up later than East Germans with high income living in areas with no direct access to modern health care. However, these results differ among cohorts and sexes. Eastern men who were born between 1920 and 1929 and living with below average pension income in university towns did not catch up to the West German mortality level.

These preliminary results suggest that both income and health care availability were important contributors to the East German mortality catch up. While it seems that pensioners with higher income converged first to the West German level, the relative importance of income compared to health care has to be analysed in greater detail. The second step of our analysis aims at addressing this open question.
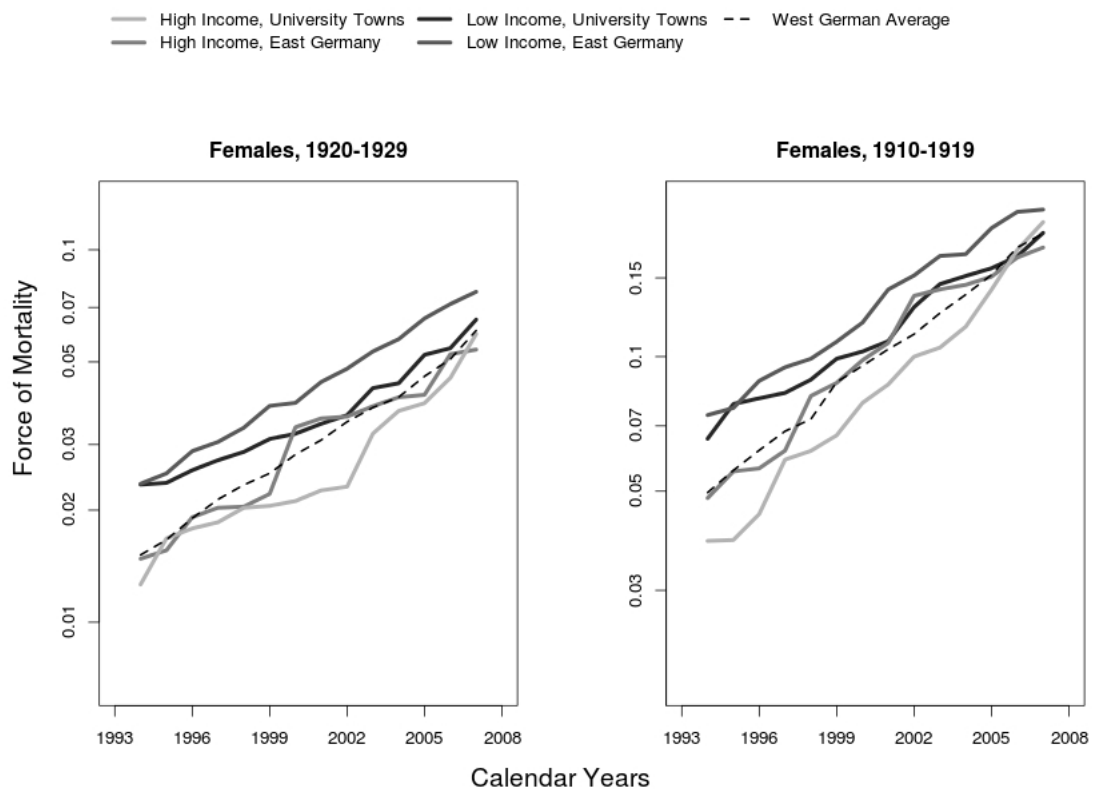
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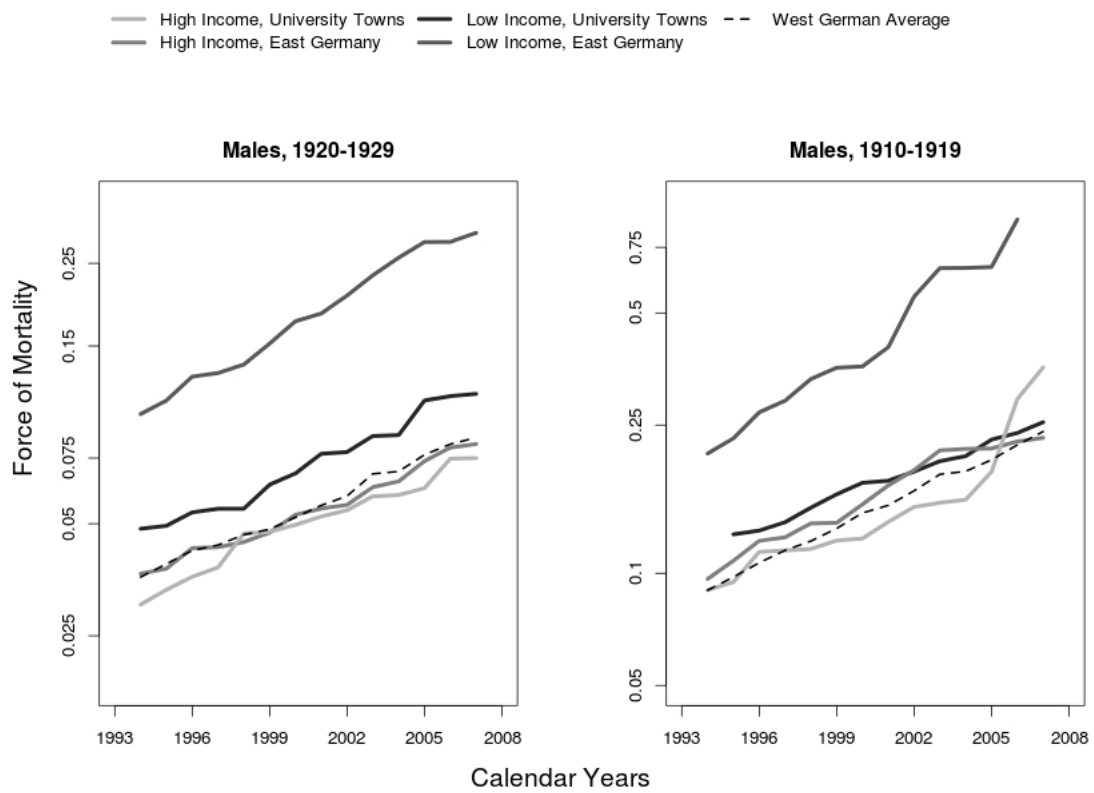Figure 1: Female cohort mortality convergence according to income and health care availability (log scale)

Figure 2: Male cohort mortality convergence according to income and health care availability (log scale)

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