The Puzzle of Excess Infant and Child Mortality in Turkey

by

Rengin Aktar

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The dissertation is approved by the following members of the Final Oral Committee:

Alberto Palloni, Professor, Sociology
John Mullahy, Professor, Population Health
Jenna Nobles, Associate Professor, Sociology
Jane Collins, Professor, Sociology
Monica Grant, Assistant Professor, Sociology

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CONTENTS

ABSTRACT

This dissertation explores excess infant and child mortality rates observed in Turkey, persistently throughout the second half of the twentieth century. Across three chapters, I examine this 'demographic puzzle' both in the context of a country's modern economic and cultural development, and public health investments, and at the micro-level, with families' behavioral transitions to formal health care services that are known to significantly reduce morbidity and mortality risks in newborns and young children. Chapter I defines the research problem in depth, by quantifying the size of Turkey's mortality lag with comparisons to other middle-income and Southern European countries. In addition, the chapter mainly relies on census data to present within-country variations in infant mortality rates, which overall suggest a massive regional and subgroup heterogeneity. With the second chapter, the dissertation moves on to a discussion of the existing theories of mortality decline. These theories can be grouped as: a) 'Structural' explanations which in turn have three subclasses (i) improvements in standards of living and nutrition, (ii) increasing public health investments, (iii) medical advances, and b) 'Cultural' explanations that invoke ideational shifts with which individuals conceive the medical causes of diseases as well as modern methods of prevention and treatment. After demonstrating the crude opposition that exists between structural and cultural theories of mortality decline, the second chapter shows how to get out of this trap by re-tooling a well-known framework that is originally designed to deal with fertility transitions. After defining 'under-utilization' of formal health services as a population problem at the intersection of the overarching importance of change in attitudes, and the availability of effective medical technologies in a society, Coale's 'Ready-Willing-Able' framework (1973) is reformulated to analyze behavioral transitions to the utilization of maternal and child health care services. The third chapter applies this conceptualization to the Demographic and Health Survey data from Turkey in a time-period (1988-2008) that has witnessed the largest and fastest gains in infant and child mortality reductions. The results of the third chapter demonstrate the analytic capabilities of the

R-W-A model to understand exceptional mortality lags, despite large-scale import of Western medical technologies and improvements in national economy, in some developing nations.

INTRODUCTION

Mortality levels in Turkey started declining in the post-World War II period as in other developing countries, after exposure to beneficial medical innovations, yet prior to satisfactory gains in socio-economic development. Contrary to rapid declines in infant and child mortality observed in some Western-countries, excess death rates in infancy and early childhood persisted at least until the end of 1990's in Turkey, despite improvements in broad socio-economic indicators throughout the second half of the twentieth century. For example in 1990, Turkey's infant mortality rate (IMR) that was equal to 70 per 1,000 births was well above the rates observed in other countries at similar levels of economic development, such as Albania, Georgia, Brazil, Columbia, Moldova, Poland, Bosnia-Herzegovina and Bulgaria with IMR' s of 41, 41, 46, 28, 30, 15, 21 and 14 (per 1,000 births) respectively (UNICEF Child Mortality Report 2010).

Turkey's mortality lag in infant and child mortality has been described as "exceptional", and becoming one of the defining features of its demographic transition (Gursoy 1992 & 1994, Aksit & Aksit 1989, Behar et al. 1999). As persistent as the high level of death rates are their urban-rural and regional variations. There is a striking diversity between the Eastern regions and rest of the country, which gets more extreme in rural areas than urban centers. No satisfactory explanations can be given for the evolution of infant mortality in Turkey without considering these regional differences that tend to overlap with socioeconomic and ethnic (Kurdish) disparities.

Exceptionally high death rates in infancy and childhood can be investigated with reference to the classic debate on the main drivers of mortality decline, which posits improved living standards and nutritional status due to economic growth against the technological potential of public health investments. Alternatively, high death rates can be framed as a problem of 'neglect', drawing attention to cultural norms that particularly affect women's and children's health in developing countries. This dissertation formulates its research question in an integrative manner, by building on considerations that warn us against drawing too deep and dogmatic distinction between the economic and cultural explanations of change in populations.

The broad research question is: How the typical socio-economic variables articulated with cultural attitudes and practices, as well as with public health institutions, to generate the observed trends. To be able to answer this question, dissertation sets three goals. First, this study tries to identify socio-economic and cultural dynamics that

exist in familial decision-making processes regarding the adoption of new health behaviors that improve infant and early-childhood morbidity & mortality. Second, this study aims to develop measures to capture these decision processes and their outcomes. Ultimately, this dissertation attempts to assess the relative contribution of economic changes, and of changes in cultural beliefs and attitudes, to Turkey's survival gains only after the 2000's.

First chapter of the dissertation identifies Turkey as a laggard in mortality transition, and attempts to quantify its lag by a number of demographic techniques. Within-country inequalities are described, and international comparisons are presented. These results are followed with two separate questions. Which factors have been most influential in creating Turkey's mortality lag? How much of the observed differences in death rates between Turkey and developed countries are due to disparities in economic conditions, and how much are due to 'cultural' disparities?

After answering these questions, the dissertation moves on to a discussion of the existing theories of mortality decline with the second chapter. These theories can be grouped as: a) 'Structural' explanations which in turn have three subclasses (i) improvements in standards of living and nutrition, (ii) increasing public health investments, (iii) medical advances, and b) 'Cultural' explanations that invoke ideational shifts with which individuals conceive the medical causes of diseases as well as modern methods of prevention and treatment. After demonstrating the crude opposition that exists between structural and cultural theories of mortality decline, the second chapter finally shows how to get out of this trap by re-tooling a well-known framework that is originally designed to deal with fertility.

This is the well-known framework of Ansley Coale (1973), who specified that three conditions had to be fulfilled before a given population would embrace the voluntary limitation of fertility with contraceptive methods: 1) The idea of fertility regulation had to become part of the calculus of conscious choice, 2) limiting the size of a family had to be perceived as advantageous, and 3) couples had to have the knowledge and means to practice contraception. In the international literature, his specifications became known as the "Ready, Willing, Able" formula.

The model presented at the end of the second chapter takes Coale's framework and adjusts it for the study of mortality. Theoretically capable of addressing the 'under-utilization' of maternal and child health care services as a

population problem at the intersection of the overarching importance of change in attitudes, and the availability of effective medical technologies, the new conceptual model is specifically designed to measure parents' behavioral transition to formal health care services. In its new form, the Ready-Willing-Able framework requires that mothers engage in cost-benefit calculus regarding the utilization of formal health care (Ready), that they have the power to go against established patriarchal structures (Willing), and finally, that they have access to health institutions and personnel providing these health services (Able). Parents' adaptation to new forms of health knowledge and behavior, and the subsequent generalization of these new forms among population, are thus very critical factors required for large-scale mortality reductions.

This framework has a number of features that bring a novel approach to the study of infant and child mortality. Once the 'under-utilization' of formal health care services providing antenatal, natal and post-natal care, vaccinations, and antibiotic drug treatments, is identified as the main problem that lagged Turkey's mortality transition, we seek the potential explanation among theories of behavioral change. Conventionally, there is a sharp division between the structural and diffusionist explanations of behavioral change: Structural explanations of behavioral changes seek their cause in the alteration of preferences and opportunities that result from either changes in positions that individuals occupy (individual social mobility) or from reshuffling of resources associated with a given social position (redistribution of wealth). Diffusion explanations and models, on the other hand, attempt to identify a cascading mechanism that leads to cumulative adoption by some individuals, even though their social position and the resources associated with them changes only trivially or remains unchanged. Diffusion models are built on the central idea that individuals transfer partial or total control of their own behavior to others.

As a flexible model where conditions of an either economic or cultural nature are allowed to lead or lag, the Ready-Willing-Able framework ends the conventional opposition between the structural and diffusionist explanations of behavioral change. In this sense, it stops narrow disciplinary interpretations, and invites broad social sciences perspectives to the study of mortality. When either the readiness or the willingness factor is the slowest moving distribution in transition, that would mean that the demographic maps between more developed countries of Europe and Turkey's are shaped by a (a lack of) "cultural evolution". When the ability is the slowest factor, this

would point to "economic and structural" disparities between Europe and Turkey, therefore to poverty at the micro-level of households, and material, legal and organizational difficulties at the macro-level of health policies.

The formulation of the conceptual framework in the second chapter is followed by its operationalization in the final chapter, which primarily aims to demonstrate the Ready-Willing-Able framework's application to Turkey's Demographic and Health Survey data. Since readiness, willingness and ability are 'latent' dimensions that are not capable of being measured directly, their assessment requires complex modeling. The third chapter starts with a brief discussion of structural equation models (SEM) with latent variables, introducing it as a technique that is equipped to handle multi-equation models, multiple measures of concepts and measurement errors (Bollen and Noble, 2011). This chapter proceeds with a model specification section laying out the most important components of SEM. The rationale behind each technical choice is extensively explained, analysis results are presented, and post-estimation strategies that group individuals into different combinations of readiness, willingness and ability are clarified.

The final chapter answers some of the most important questions. Do we observe any shifting or overtaking distributions of readiness, willingness and ability in the population during the last two decades that have witnessed the largest and fastest declines in infant and child mortality in Turkey's history? Can any of the three conditions be identified as 'bottleneck' that particularly delayed the mortality transition? Did any of the conditions leapfrog? Were the utilization rates of antenatal care and delivery services, and immunization rates significantly different across these groups, and was any change observed over time? Overall, what proportion of change in mortality levels during the analysis period can be explained with more and more number of individuals meeting all three requirements of the model? Answers to these questions are tied back to the closing arguments of the first chapter on the Turkish puzzle of excess infant and child mortality.

CHAPTER I. INFANT AND CHILD MORTALITY IN TURKEY

Introduction

The relation between economic development and mortality has changed during the second half of the twentieth century for all countries, due to the import and diffusion of medical and health technologies. In developing countries, international transfer payments that distorted the proportion of national income spent on health-related services or the efficiency of those services also played a role. Gains in survival attributable to these 'structural' and exogenous effects, led to investigations about whether the relationship between mortality and level of economic development has become progressively weaker over time (Arriaga and Davis 1969, Stolnitz, 1965). The findings of demographic studies that decomposed mortality reductions into economic and other (structural) factors showed that mortality trends cannot be dissociated from countries' national income levels at any point in time, even though the cross-sectional relationship might change due to other factors and possibly new influences (Preston 1975, 1980, 1985; Palloni 1990).

Among various measures of mortality, infant death rates are considered to be the most responsive to economic progress, as indicated by higher order correlation coefficients recorded between countries' infant mortality rates and GDP per capita levels. Comprising the value of all good and services produced in a certain period, GDP is considered to be the best single indicator of living standards in a country, and its growth as an aggregate level of income implies larger real consumption of items by families that affect health, such as food, housing, and education. As hypothesized by Preston, income per capita also captures dimensions related to the provision of public health structure.

While the association of GDP levels with mortality is significant due to multiplicity of economic factors represented by GDP as an indicator, its relation with infant mortality is even stronger due to the fact that mortality from infectious and parasitic diseases to which infants and children are most vulnerable is especially responsive to rising income, food intake, and nutritional status levels as well as to improvements in public health. Turkey's trends in infant mortality during the second half of the twentieth century have been described as a 'demographic puzzle', due to persistently higher than expected, or "excess" death rates given the national indicators of economic development. Aksit & Aksit who studied determinants of infant and child mortality in the

1980s commented that "It is known that the historical relationship between income and mortality can be highly variable during economic development, yet it is puzzling that Sri Lanka with one third of the Turkish GNP has half the Turkish infant mortality" (1989, p. 571). Akile-Gursoy argued from a different perspective stating that "In Turkey, as in most Middle Eastern countries, neither the GNP per capita nor other criteria of development seem to explain the high incidence of infant deaths" (1992, p. 131). The following section describes the geographical variations in infant mortality, and how they might have contributed to this anomaly.

Part 1. Turkey's Excess Infant and Child Mortality Rates

a. Defining the 'Excess'

Given the availability of information for many countries today about past trends in economic development and mortality, it is possible to re-examine the relationship for Turkey and to what extent it diverged from the experiences of other economically similar countries. The effect of national incomes on mortality levels in any country or group of countries can be estimated by a regression line. In the case of life expectancy, relation with national income per capita is decidedly non-linear, with life expectancy showing strongly diminishing returns to increases in income. Therefore it is reasonable to expect that infant mortality also responds non-linearly to national income levels. Even though infant mortality rate is theoretically bound by 0 and 1000, indicating a *probability* of death, the upper bound of infant mortality rates entering this analysis does not exceed 200, which is why it is treated as continuous outcome and measured with OLS modeling techniques. High R-square values obtained in regressions seem to support this choice.

If the relation between infant mortality and national income per capita is log linear, this relation can be expressed as:

$$ {}_1^0q = \alpha + \beta \cdot \ln (gdp) $$

where ${}_1^0\mathrm{q}$ = infant mortality in a given year

gdp = Level of national income per capita in a given year

α and β are constants

Whereas this relation can be estimated for a group of countries, the most straightforward means of determining whether certain countries differ significantly from others in their infant mortality rates is to recompute the regression lines between national income per capita and infant mortality, and on each occasion employing a dummy variable representing a different country, as this is equivalent to adding the country from which an observation derives as an independent, explanatory variable to the equation. Since the dummy variable takes the value of 1 if an observation is in a country, and 0 otherwise, the coefficient of the dummy would thus indicate by how much, on the average, death rates in a particular country lie above or below the regression line. This equation would have the following form:

$$ {}_1^0q = \alpha + \beta \cdot \ln (gdp) + d_i \cdot D $$

where D=1 if observation is in country i and 0, otherwise

Regression coefficients for country dummy variables presented in Table I are obtained from the application of the above formula to 3,766 cross-sections from a total of 100 countries, which are classified either as lower-middle and upper-middle income countries and for which data is available. Each cross-section of countries indicates the level of national income and infant mortality in a given year. While the source of data used in estimations is World Bank, information is available only for after 1960, allowing an analysis window of 50 years. Table I presents regression coefficients for country dummy variables that display significant effects on infant mortality levels, either positive or negative, yet independent of the effect of economic development jointly estimated for all countries between 1960 and 2010. Here it is clear that the coefficient for Turkey is both significant and positive, on average indicating an excess of 47 deaths in 1000 births, that cannot be explained by national income levels.

Another way to evaluate the level of infant and child mortality in a country is to compare the rates to observed adult mortality levels. In this sense too Turkey's mortality patterns in early childhood have been identified as 'excess' (Adlakha 1970:31,56,181). Table II clearly illustrates that Turkey had better adult mortality

relative to child mortality, by using the 'life-expectancy at age 50' (e(50)) and 'probability of death under age five' (5(q)0) as indices of adult and child mortality respectively. The observed and predicted range of values in Table II are compiled through a number of steps: The earliest available life table providing geographically representative estimates for Turkey (Alpay, 1969) is used to establish the e(50) values, which are then each matched to a life-table level in Coale and Demeny's (1966) West, North and South regional model life tables. The values of 5(q)0 from model life-tables are then compared with the observed rates of 5(q)0 in Turkey. The results show that with the exception of Izmir, death rates under age five in 1960 were too high relative to adult mortality.

The causes of the particularly high infant and child mortality rates in Turkey relative to mortality at older ages remain unexplained. It is not clear whether they are due to certain child-specific diseases or health conditions that uniquely affect Turkey, or malnutrition, or whether the health-care practices that exist for adults do not exist to the same extent and effectiveness for infants and children (Shorter and Macura 1982, p. 21). Shorter argued for that Turkey's better adult mortality relative to child mortality when evaluated by a European historical standard may be connected with a second fact, namely its non-European sequence of mortality improvement (1969, p. 27). According to Shorter, rapid introduction of chemo-therapeutic drugs and new types of public health programs in Turkey had a different pattern of effectiveness by age (especially in rural areas) than the more gradual and entirely different sequence of specific health measures that occurred in Europe, resulting in a temporary twist in the age pattern of mortality decline.

b. Regional Disparities and the Ethnicity Factor

Past demographic studies indicated substantial differences in infant mortality rates between urban and rural areas (Shorter 1969, Goldberg & Adlakha 1969), that intersect with regional and provincial variations (Fisek 1969, Shorter & Macura 1982). Main inequalities follow economic and social differentials between coastal and interior provinces, where the most striking dichotomy is the one observed between the wealthier West and the poorer East, with no significant convergence over the years. The disparities between the east and south-east, and the rest of the

country, have been evident in almost all development indicators throughout the second half of the nineteenth century, including production, income per person, human capital, public investment, unemployment and poverty levels. Despite official statements about state's efforts to abolish the regional gaps both in five-year plans and in negotiations with the European Union, regional gaps in the allocation of public resources and services, most importantly education and health, could not yet be eliminated (Adaman & Keyder, 2006).

While infant mortality is sensitive to a broad range of environmental factors including micro-level natural surroundings, breast-feeding practices, nutrition, housing and clothing, the absence of converge in development patterns between the East and the rest of Turkey has been so remarkable that the influence of more general socio-economic factors is nearly incontestable. If significant geographical variations in infant mortality were observed, they were partially but certainly due to broad socio-economic conditions that existed in disadvantaged regions and provinces, affecting both the initial levels and pace of mortality decline by operating through various factors such as sanitation and water supply, transportation, or unavailability of health care.

To a lesser extent, determinants of mortality were regionally specific and dependent on climatic and local epidemiological conditions. Eastern Anatolia region has the highest average altitude, largest geographical area, and lowest population density in the country, and is known for a harsh continental climate with very cold and long winters, and short and hot summers. Infant and child mortality might be the result of a different cause structure in the East, characterized by respiratory diseases and by particular diseases of early childhood that include several bronchopneumonic forms. In consequence, eastern locations more frequently experienced mortality from fatal acute respiratory infections and fever incidents, in addition to mortality from other infectious and parasitic diseases, particularly gastrointestinal disorders, that were shared by other locations across the country (where development of an abundance of parasites and pathogenic germs was encouraged as a function of temperature and precipitation). This ecologically random component of mortality with respect to the natural environment, climate, seasonality and meteorological factors played a significant role in regional differentials and their contribution to overall excess levels. At the same time, it draws attention to those factors which affect the patterns of mortality in addition to those which affect its levels.

Since relative death rates by urban-rural and regional divisions are not readily available through national or international resources, they can only be estimated by indirect methods of mortality. A well-known and widely used approach the Brass method that generates estimations from reports of mothers about the survivorship of their children. In this indirect method of estimation, the set of correspondences between ages of mothers and ages of their children are not exact, but depend on the nature of reproductive histories in a particular group of women who are reporting their births. The adjustment factors developed by Brass, and later by Sullivan (1972) and Trussell (1975), attempt to adjust for these particularities, by assuming certain mortality and fertility schedules. When estimates of mortality have to be based on census records that provide only the distribution of population by age and sex, the usual procedure is to assume implicitly or explicitly that a typical relationship exists between adult mortality and its counter-part at the youngest ages as expressed in one of the four regional model life tables.

Set of coefficients that pertain to the "South" Coale-Demeny model are used to analyze Turkey's survival rates in Brass estimations. This choice can be justified by arguing that Turkey is a Mediterranean country in a geographical sense and therefore may fall closest to the experience of this group of countries whose historical mortality experience has underlined the 'South' regional models. A second and better justification is based on the assumption that the age pattern of Turkish mortality is better described by the south model than, for instance, the West, since the former set imputes a substantially higher value to childhood mortality than the latter. As a matter of fact, the choice of the South model is found to be largely inconsequential in previous estimations of adult mortality where selection of an alternative set of life-tables would have resulted in essentially the same estimates of life-expectancy as was obtained by means of the 'South' model, however this proposition no longer holds for with respect to levels of childhood mortality associated with levels of adult mortality (Demeny & Shorter 1968, p. 17). It is important to note however that given the levels of adult mortality, Turkey's death rates in infancy and early childhood have exceeded the normal bounds observed in the history of western Europe, therefore 'South' models are "somewhat closer to the Turkish child-adult mortality relationship, but still far removed" (Shorter & Macura, 1982).

Census data from 1985, 1990 and 2000 is able to generate estimates of infant mortality rates between 1970 and 1997. In order to be able to incorporate post-World War II trends, the estimation results from Shorter and

Macura (1982) for the period between 1945 and 1970 are also used. This adds up to an analysis period of 52 years between 1945 and 1997 for examining regional and provincial patterns. Following the geographical categories of Shorter and Macura, we use six groups of territorial units: a) Istanbul and Izmir, b) Urban West, c) Urban Central and East, d) Rural West, e) Rural Central, f) Rural East. Except for the first category that consists of two major metropolitan centers, representative provinces have been selected for other categories, which contribute either by their urban and rural populations. Table III lists selected cities and size of the data samples used for Brass estimations.

Results of the Brass estimations are given in Table IV. In addition, Figure I uses these results to display patterns in infant mortality by regional and urban-rural groupings, and Figure II displays the results from *selected* time periods, which are considered 'critical' for reasons explained further below. What we first notice in these findings is that the initial level of Turkey's overall infant mortality rate, 260 per 1000 births, is in fact a reflection of very different regional and urban/rural levels across the country, with Istanbul, Izmir and other urban areas in the west displaying IMR's that are less than 200, while rural central and rural eastern regions are displaying the highest levels, ranging between 300 - 350. Another striking feature is the fast and uninterrupted mortality decline in central regions, which almost eliminates their initial disadvantage in comparison to western regions in the 1980s. A final point to emphasize is the slow pace of decline in eastern regions, with mortality decline literally coming to a halt in the late 1980s, both in urban and rural areas.

The period of analysis can be broken down to three critical periods that have affected the patterns of mortality decline across Turkey. The initial advantage of western regions, regardless of urban-rural place of residence, is preserved until the 1960s, and characterizes the first stage of infant mortality transition. During the 1970s, however, a shift in infant mortality rates takes place, as urban areas become the forerunners of mortality transition, regardless of the region. Rural west that had an initial advantage falls behind the cities of central and eastern regions, and in general, mortality decline in rural areas considerably slows down. This period that is characterized by the 'urban advantage' continues until the early 1980s. The third phase of mortality transition takes place in the late 1980s, and is characterized by a very clear 'disadvantage of eastern regions'. Mortality decline in urban eastern Turkey

noticeably slows down, and displays the highest levels of IMR together with the rural east. Rates in the rural west and rural central areas align with the rates in western regions during the same period.

The magnitude of locational effects can be estimated by the use of regression coefficients that relate predicted mortality rates to geographical variations across different time periods. Since sample size is limited and does not enable regression analyses by narrower time-intervals, period effects are controlled for by dividing the whole period of analysis into six sub-periods, and treating time as a categorical variable. Interaction effects are used to capture regional patterns of mortality decline that might vary with time. Results of the multiple regression model, which is based on the application of the following formula to 180 observations between 1945 and 1997, are presented in Table V.

$$ {}_1^0q = \alpha + \beta_1 \cdot Region + \beta_2 \cdot TimePeriod + \beta_3 \cdot Region * TimePeriod $$

At least initially, results situate Istanbul, Izmir and other urban areas in the West in sharp contrast with rural central and rural eastern regions. In each time-period after 1950, however, pace of mortality decline in the rural central region takes off, pulling up the average effect estimated for the region for the whole period. On the other hand, rural eastern regions which previously have lower infant mortality rates than central regions, become Turkey's highest infant mortality areas during the 1960s, and stay that way until the end of transition. Even though there is progress in rural east, at least starting from the 1970s, cumulative gains in survival do not catch-up with the gains of other regions at any point in time. That being said, mortality decline does not always continue at a higher than average pace in Istanbul, Izmir and other cities in the West. There is clearly a slowdown in these locations in the 1970s and 1990s, coinciding with periods of fast decline in the rural high-mortality regions.

One can argue that the striking gap between the western and eastern parts of Turkey is likely to reflect the differences in the ethnic composition of regions. Eastern regions are considered the traditional areas of the Kurdish population (Koc et al., 2008), despite the massive movements during the last decades that geographically redistributed the Kurds to the western and southern parts of the country (Mutlu,1996). Various types of disadvantage overlap among Kurdish citizens: They reside in socio-economically less-developed eastern parts of the country, live in poor living conditions, and have limited access to educational opportunities (Koç et al., 2008;

Sirkeci, 2000). Principally the by-products of socio-economic under-development, lack of investments in water treatment, sanitation, transportation and public health infrastructure in areas where Kurdish populations live as majority suggest higher exposure to the risk factors of infant and child mortality.

In addition to concentration of socio-economic disadvantages among the Kurdish population, a long period of conflict that displaced around one million Kurdish people from their homes in eastern and south-eastern Turkey should have indirect influences on mortality. Ethnic conflict started in 1984, included an emergency rule with a heavy military presence in 14 provinces, the imposition of martial law and severe restrictions on civil and political rights in 1987. Internal displacement was caused by the evacuation of villages by the government during this period. After the announcement of a unilateral cessation of armed activities by Kurdish armed groups in 1999, the level of violence in these regions sharply decreased, and the state of emergency was gradually lifted. As a result of the evacuation, those who were displaced lost property and land previously used to benefit from materially (the share and products of land and livestock entrusted to family members remained in villages) and psychologically as a place to turn to at a time of crisis (Bugŏra & Keyder, 2003; Erder, 1998). Second, mass displacement accelerated the disintegration of the tribal system as a traditional mechanism of social security for the Kurds. Third, a sense of communal solidarity hardly existed in the new areas of settlement, major cities such as Istanbul, Ankara, Izmir and other large cities.

Migration implied the breakdown and or weakening of extended family ties and the dissolution of mutual help arrangements so essential in providing for the care of infants and young children previously. Stresses from precarious household conditions, over-crowding or low hygiene, or the disruption of traditional breast-feeding practices, might be among the new contributing factors to infant mortality among Kurdish migrants who were likely to live in multiple-family living arrangements in the new cities. These unfavorable conditions are not inconsequential when combined with other disadvantages related to poverty, such as under-nutrition of children, lack of social insurance or inability to pay for medical treatment in times of sickness. In addition, maternal health can also accommodate all these factors, influencing the fetal development of child, likelihood of congenital deformation or premature birth, as well as post-natal nutrition.

Not only internal migration, but increasing fertility rates among the Kurds escalated the risk factors of infant and child mortality. Fertility levels increased in eight predominantly Kurdish provinces in the east (Ağrı, Batman, Diyarbakır, Hakkari, Şanlıurfa, Siirt, Şırnak and Van) between the late 1980s and the 1990s (Yücesahin & Özgür 2008) reversing the trends in the 1970s and early 1980s. In the city of Van, for example, TFR declined from 5.2 to 4.9 between 1980 and 1985, but went up to 6.0 by 2000 (State Institute of Statistics, 2002: 12). High fertility has negative biological effects on mortality (i.e the effects of close spacing of births and related factors), and might suggest behavioral responses such as underinvestment in some children that would manifest in their care, feeding, and parents' response to their illnesses (Scrimshaw, 1978) that would increase the risks of death.

Yet one of the most important unexplained findings in the study of infant mortality is the persistence of ethnic differences in mortality. To address this need, the following analysis treats Turkish and Kurdish populations as two separate populations in order to study their past trends. Even though Kurds constitute the largest minority ethnic group constituting just over 20% of the total population, ethnicity has never been included in Turkey's census questionnaires, forcing the use of two types of data in the following estimations. First, census data for ten provinces where the percentage of Kurds to the total population is at least 60% in year 1990 (Mutlu, 1996) are selected as representative the Kurdish population[1]. Second, despite providing much smaller sample sizes in comparison to census data, Demographic and Health Surveys (DHS) conducted every five years between 1993 and 2008 enable a more accurate measurement of ethnicity, since the surveys included either a direct question on ethnicity, or on the mother-tongue of the respondents. Table VI describes the sample sizes of census and DHS data used as sources of information about the survivorship of children and mothers' age.

Figure III presents a set of graphs that illustrate the ethnicity factor between the Turkish and Kurdish populations. The first graph simply gives the overall levels in infant mortality, calculated by the Brass method for the total population. The second graph gives Brass estimation results calculated with census data and applying to the period between 1970 and 1995, revealing infant mortality rates in urban areas where the Kurdish population lived as

[1] Cities with more than 60% of the population with Kurdish ethnicity are Agri, Bitlis, Bingol, Diyarbakir, Hakkari, Mardin, Siirt, Batman, Sirnak and Kars.

a majority. The last graph which is based on a more accurate measurement of ethnicity with DHS and therefore can be used to verify the external validity of the results presented in the previous graph during time periods that allow this, reveals several important features between 1988 and 2008. The first one is that infant mortality is lower among the Kurdish population in the 1980s, and both second and third figures validate this point. The second feature is a 'cross-over' in infant mortality rates in the early 1990s, after which the levels of infant mortality predicted for the Kurdish population are never again lower than those predicted for the Turkish population during the course of next decade. While both figure two and three illustrate this cross-over in infant mortality rates by ethnicity in the first half of the 1990s, the latter clearly shows that gains in infant mortality came to a halt among the Kurds during the 1990s, which might be expected given the strength of adverse conditions that they experienced during this period due to reasons explained above. As the last figure reveals, mortality levels do not decrease much between 1990 and 2000 for the Kurds, while the gap between the two populations continues to widen.

Part 2. Determinants of Infant Mortality Reductions in Turkey

a. Arguments of Economic Development

The effect of national income levels on infant mortality rates was discussed above, and it was explained that while this relationship has been changing mainly due to exogenous shifts in less-developed countries, it has not become irrelevant at any point in time. This relationship can be estimated separately for Turkey and all middle-income countries by using infant mortality rates, and the natural logarithms of income levels because of expected nonlinearities. Two equations obtained are:

Middle Income Countries (n=3,766, R-Squared = .32)

$$ {}_1^0q = 232.1 - 24.7 \cdot \ln (gdp) $$

Turkey (n=51, R-Squared = .96)

$$ {}_1^0q = 1101.7 - 127.8 \cdot \ln (gdp) $$

These equations reveal two points: First is that the difference in the magnitude of intercepts is huge, suggesting that the initial levels of infant mortality in Turkey were considerably higher than the average rates observed in middle-income countries . Whereas α in Turkey's equation is equal to 1101.7, for the pool of all middle-income countries the α value is 232.1. Second, the coefficient of national income level is higher in Turkey's equation, almost as five times as β in the other equation, suggesting that infant mortality responds much strongly to increases in economic development in Turkey. Whereas Figure IV illustrates these two points, Table VII gives estimates of mortality reductions in both groups with $100 and $500 increase in GDP per capita at various base levels of national income.

In demographic studies, mortality decomposition followed the work of Preston (1975) on the relationship between mortality and national income levels, and its change over time. Preston discussed that while there is a strong relationship between national income and mortality indicators at any time, the main difficulty lies in the fact that this cross-sectional relationship has itself been changing due to other factors and possibly new influences. Estimating the impact of economic development on mortality reduction in a particular country from any cross-sectional relationship would be acceptable only if this cross-sectional relationship remained invariant over time. On the contrary, Preston showed that between the 1900s and 1960s, the estimated regression line shifted upwards, meaning that at any given level of national income, countries would have lower mortality (or higher life-expectancy) in more recent years.

Preston's technique accounts both for the strong cross-sectional relationships between mortality and income, and the dynamics of these relationships. Furthermore, this technique which rests on the estimation of the cross-sectional relationship at two different times, can be applied to one country, or a group of countries; to Turkey and the pool of middle-income countries in this study. Relationships are estimated for two periods; 1960-1984 and 1985-2010, as seen in Table VIII. The coefficient of national income is properly signed in all equations, and the explanatory power of the regression equations is virtually identical across the two periods. Income is highly significant both in Turkey and the group of middle income countries, even though its effect gets noticeably weaker in

the later period for Turkey. Finally, the constant term decreases by 55.3 points and 482.7 points for middle-income countries and Turkey respectively, although by itself this change cannot be readily interpreted , since the zero points on the independent variable are well below the range of observed experience.

The corresponding decompositions are illustrated in Table IX and Table X. Both results confirm an downward shift in the relationship between infant mortality rates and income levels, however its share in the total change between 1960 and 2010 is strikingly different between Turkey and middle-income countries (Figure V). Whereas 90.2% of the change in infant survival is attributable to increase in national income in Turkey, 30.4% of change is attributable to increase in average national income in middle-income countries. On the other hand, the effect of structural changes seem to be very small in Turkey; only 9.8%. In the group of middle income countries, the share of structural changes is 65%.

Based on these findings, several points can be made: When the relationship between infant mortality and national income levels is estimated for all lower- and middle-income countries as a group, it is found that Turkey consistently displayed excess levels of infant mortality between 1960 and 2010. However, in comparison to the average experience of lower- and upper- middle income countries, the decline in infant mortality responded more strongly to economic development in Turkey. On the other hand, change attributable to structural changes such as medical technology and public health measures was trivial, accounting for no more than 10% of total decline between 1960 and 2010. This is also fundamentally different from the experience of other middle-inome countries, where structural shifts, not economic development, were the main drivers of mortality decline.

b. Public Health Arguments

After World War II, rapid declines in mortality in less developed regions were due to the application of new public health and medical techniques that substantially reduced the number of deaths from infectious-communicable diseases. Sulpha-drugs, antibiotics and effective anti-malarial measures were deployed extensively in less developed countries. Other measures included the eradication of disease vectors, chlorination of drinking water and good sewage systems, vaccines and dietary supplements. All these factors exerted strong influences on mortality

independently of local economic conditions, indicating that in most less-developed regions of the world, mortality change became increasingly independent of economic development, and more dependent on the importation of preventive medicine and public health from the industrial countries.

Turkey was not a country that made important advances in the mortality transition prior to medical advances, mainly due to the lack of significant improvements in the living standards of the population. In the early years of the Turkish Republic founded in 1923, health resources were extremely limited and epidemics repeatedly scourged the nation. The first organized attempts to fight with infectious diseases started with establishment of tuberculosis dispensaries in the 1920s and the first national immunization campaign (against smallpox) during the 1930s (Table XI). However, progress in the fight against infectious diseases was not continuous, and underwent several interruptions at least until mid-1980s (Ozsari, 1998). In the case of malaria, for instance, prevalence rate at the population level that was 11,000 (per 100,000) in 1940 increased to 32,000 (per 100,000) in 1945, indicating nearly two times increase over the course of five years. Another infectious disease which fluctuated was tuberculosis, with a prevalence rate of 1,500 (per 100,000) in 1940, 6,500 (per 100,000) in 1950, 1,200 (per 1000,000) in 1960, and 3,400 (per 100,000) in 1970.

In the case of infectious diseases that affected infants and very young children (1-5 years of age) in particular, the earliest statistical record available is the Health Statistics Yearbook 1955-59, presenting information on the causes of death under age 5 based on vital statistics. Examination of diseases that cause mortality in any given period is significant for two reasons: First, changes in the distribution of mortality by age and cause characterize the progression of the demographic and epidemiological transitions, the latter used to describe the process of change in leading causes of death from infectious/communicable diseases to chronic/non-communicable diseases (Omran 1971). With this change in the leading of causes of death, a shift is expected in the age distribution of deaths, from mostly concentrated at younger ages to a concentration at older ages, and eventually to a distribution where child and infant mortality become relatively trivial. Second, if we characterize reduction in mortality in terms of the underlying causes of death (and by age group) on the one hand, and by medical technologies available at that time, on

the other, we are then able to identify the main determinants of reduction, i.e. whether socio-economic or structural factors were the principal driver of mortality decline (Preston1980, Soares 2007).

The first significant effort to identify diseases responsible for mortality reductions in the developing world was undertaken by Preston, who argued that apart from influenza / pneumonia / bronchitis, preventive measures such as large-scale immunization of populations and improvements in public health infrastructure were probably the most effective factors in determining mortality reductions between 1900 and 1970. Influenza, pneumonia and bronchitis, on the other hand, for which there was no effective deployment of preventive measures and treatment became widely available later in the period, were diseases that more directly depended on socio-economic factors, mainly due to linkages with the nutritional status of both the mother and child. While most children can fight infections with natural defenses, children whose immune system is compromised due to malnutrition/undernourishment, another infection, or the interaction between the two are at higher risk of developing pneumonia. Lastly, diarrhea is known to be a common successor of eliminated infectious diseases in the developing countries, and to create disquieting lags in mortality decline by the virtue of its persistence in the face of considerable increase in medical and public health services available to populations (Preston & Nelson, 1974) The fundamental problem with diarrheal diseases is that they can be neither prevented nor cured by injections or other 'direct' remedies readily dispensed through public health programs. As diarrheal disease is prompted by poverty and ignorance, it remains closely connected to nations' levels of social and economic development.

The change in leading causes of death should be investigated for Turkey because (1) infant and child mortality (given adult levels of mortality) not at any time declined to levels that would be considered 'trivial' at least until the 1990s, and (2) the share of the two leading causes of death, pneumonia and diarrhea, remained extremely high in comparison to other diseases such as heart-disease, cancers, or congenital disorders (in the case of infant deaths) during that time. Table XII presents the magnitude of change in the leading causes of death between 1955-59, and 1975-76, a period when infant mortality rate (per 1,000 births) decreased from 190 to 100, and child mortality rate decreased from 95 to 45. Here the significance of pneumonia and diarrhea as the leading causes of death is clearly noticed in both periods, even though some reduction is observed: In the case of infant deaths, for example, the share

of influenza/pneumonia/bronchitis as the leading cause of death declines from approximately 33 percent to 26 percent, and the share of diarrhea declines approximately from 22 percent to 13 percent. In the case of child deaths, there is no significant change in the share of influenza/pneumonia/bronchitis, even though the share of diarrhea as the second leading cause of death halved over the same amount of time. The share of respiratory tuberculosis which is a more common cause of death among children, declined considerably by 4 percent between two periods, whereas the risk of death from heart disease or malignant neoplasms was now considerably higher for children by 6 percent, and to a lesser extent for infants by 3 percent. Finally, it is seen that diphtheria and whooping cough were almost completely eliminated as causes of death both among infants and children, preceded by the elimination of smallpox earlier in the century, and succeeded with further reductions in measles with the introduction of its vaccine in 1970.

Between the late 1970s and early 1990s, infant and child mortality rates fell sharply, child mortality declined more rapidly than infant mortality, and neonatal mortality became higher than post-neonatal mortality (Ergocmen et al, 1995). These trends and distributional changes in under-five mortality between 1978 and 2008 (given in Table XIII) highlight the role of socio-economic rather than residual/exogenous factors as the main driver of mortality declines, operating through better nutrition and elimination of the environmental risks of infectious disease mortality. In 2007, meningococcal infections, heart disease, congenital anomalies and other causes of perinatal mortality had become the leading causes of death in infants, whereas meningococcal infections, heart disease, and malignant neoplasms including neoplasms of lymphatic and haematopoietic tissue were the leading causes of death in children under age five (Turkey Death Statistics, 2009). Pneumonia and diarrheal diseases were not totally eliminated, but their total share in mortality did not exceed 3 percent neither for infants nor children.

Despite recent reductions, why pneumonia and diarrhea remained as the leading causes of infant and child deaths at least until the 1980s poses several questions. The first contradiction is due to the above finding that Turkey's infant mortality rates have been closely associated with rising income levels, while it is known that pneumonia and diarrhea are diseases that respond to economic development more strongly than other infectious

diseases such as diphtheria, measles, whooping cough and poliomylitis for which imported medical technology; mainly vaccines, have been the main factors preventing mortality. This suggests that whereas routine immunizations provided large-scale immunity against certain infectious diseases relatively early-on during Turkey's mortality transition, improvements in socio-economic conditions were not sufficient to simultaneously revert deaths from pneumonia and diarrhea, whose elimination was consequently postponed to the last quarter of the twentieth century. Given that during the same period reductions in mortality due to influenza/pneumonia/bronchitis and diarrhea were shown to be main factors contributing to gains in life expectancy in other economically similar countries (Preston 1980, Palloni & Wyrick 1981), it seems that it took longer for Turkey to make similar gains, since these diseases continued to be the leading causes of death in infants and children until much later.

How can this be explained? Palloni (1990) argues that we can expect an interrelation between medical technology and knowledge, and socio-economic transformations, because the accessibility of the technology depends directly on improved standards of living, or because the effects of its application have a threshold that can only be removed by raising standards of living. Therefore one theory is that the same threshold was much higher for Turkey and socio-economic improvements were not sufficient to build that large-scale link between the imported medical technologies and general population. Variations in levels of socio-economic development across Turkey are compatible with this theory.

A second explanation that can be offered is based on a distinction among the medical technologies between preventive and curative methods and their different degrees of accessibility: Even though vaccinations which were accessible to the population on a wider-scale (through health campaigns) were able eliminate a number of infectious diseases in Turkey, the knowledge and utilization of other types of medical technology to be used as treatment for diseases such as pneumonia and diarrhea remained limited, i.e. these two diseases remained as the leading causes of death due to lack of treatment with antibiotics (in the case of pneumonia) and by oral-rehydration therapy (in the case of diarrhea). The second theory which suggests that treatment methods were not as extensively deployed as preventive methods is in line with the findings of decomposition method above, which showed that the role of

structural changes, or reductions in infant mortality due to exogenous factors were quite limited in Turkey, not exceeding 10% of the total gains made between 1960 and 2010.

Finally in this section investments of public health that have specifically targeted the health of newborns and young children will be discussed with some of the related problems. The first serious attempts of the government to improve health outcomes in newborns and young children was on the basis of an international agreement between the Ministry of Health and Social Assistance, World Health Organization (WHO) and United Children's Fund (UNICEF) in 1952, after which maternal and child health centers, offices and stations were set up more systematically across Turkey (Fisek, 1974). In 1961, the government nationalized health care services, a development known as "the socialization of health care" in Turkey, and aimed for full implementation of the modern health-care model in every province within the time frame between 1963 and 1982 (Fisek, 1998).

Villages and towns but particularly under-developed districts were prioritized in the expansion of maternal and child health services across Turkey, and Auxiliary Nurse-Midwives (ANMs) were given the primary responsibility in these health matters (Fisek, 1974). ANMs regularly visited homes in their area to assist with pregnancy, conduct periodic examinations after child birth, educate mothers and grandmothers about child care and nutrition, provide immunizations against diphtheria, whooping cough, tetanus, poliomyelitis and tuberculosis, and in the case of a high risk of complication at birth or detection of symptoms of infectious / communicable diseases, instruct patients to the nearest health facilities.

Great expansion of maternal and child health services across the country did not achieve the anticipated effects on child mortality (Fisek 1989, Tezcan 1976, Oral et al., 1983). One group of explanations were focused on the general inefficiencies of health-care, arguing that it is not personnel shortages and lack of health facilities, but inadequate finances and poor management of the existing health facilities which are the primary limiting factors in the satisfactory provision of health care. The reasons underlying the inadequate financing of health services were twofold. First, Turkey was a middle-income country that was characterized by a highly unequal income distribution and part of the population that was at the lower-end of income distribution usually did not have health insurance.

Second, governments traditionally did not give high priority to health services, as historically apparent in expenditures for health care by government agencies, and Ministry of Health's least possible shares in the national budget. On the other hand, poor management as exemplified by poor planning, improper allocation of available resources, lack of cooperation between primary, secondary, and tertiary health care units, incorrect decisions on institutional priorities considerably impaired the provision of health care.

A second group of arguments pointed out to the demand side of the existing health-care services. It was argued that a vast majority of the population do not believe it is necessary, or important enough, to spend their limited time and money on such minor complaints as fever, coughing or diarrhea, and thus this reluctance to seek medical care did not reflect lack of confidence in medical professionals, but simply neglect and nonchalance. This wide-scale attitude constituted a major factor underlying Turkey's high infant mortality rate, since in the absence of medical care, folk practitioners, self-care with home remedies were preferred for many common ailments. Other studies using qualitative research methods insisted that the provision of health services alone is not sufficient to control mortality as cultural values and socio-economic conditions have to be changed jointly (Tezcan 1985; Fisek 1989). Special investigations based on interviews with parents who were identified from death reports showed that most of the infants and children could have easily been treated with available health facilities in districts, had they been taken to these health facilities.

Since high mortality rates could be attributed neither to the unavailability or inaccessibility of health services, inquiries of 'social etiology' were required to understand the persistence of excess mortality. Studies found that lack of concern and belief in modern health care was the main reason for medically preventable deaths, whereas transportation and economic problems were negligible factors, even in poorer neighborhoods. In those instances where interaction with a health personnel had already taken place, the records of auxiliary nurse-midwives (who visited mothers and children at least once a month in their households) showed that their medical recommendations were most often not complied with at the time of subsequent visits, often resulting in the occurrence of child deaths. Whereas the compliance of mothers with recommendations of health personnel could be interpreted as an index of

deriving benefits from health care facilities, its significance was due to the fact that compliance modified the effects of other social correlates on mortality, such as maternal education, or housing and environmental factors.

In short, even though there was a decline in mortality levels immediately in the post-World War II period due to modern medicine, eradication of malaria, the campaign against tuberculosis, and later antibiotics, public health efforts were not able to improve the within country inequality in health and mortality to a satisfactory level. Strong mortality differentials between major metropolitan areas (such as Istanbul, Ankara and Izmir) and the rest of the country persisted until early 1980s due to differences in the provision of public health infrastructure and modern health facilities. A broader contrast between the western and coastal areas of Turkey, on the one hand, and the central plateau and eastern provinces, on the other, could not be eliminated. In addition to discontinuities in the nation-wide provision of public health infrastructure and modern health facilities, the limited diffusion and absorption, and poor reception of imported health technologies among the population led to these results.

c. Expected Levels of Infant and Child Mortality with Southern Europe as Standard

The relation between national income levels and infant mortality can be extended to include various other indicators of socio-economic development believed to be correlated with mortality. The period that enabled cross-country comparisons with Turkey's infant and child mortality levels was between 1960 and 2010, for which other indicators such as school enrollment or urbanization rates can also be obtained. Regression models that relate infant or child mortality rates to these type of indicators can be estimated separately for Turkey and any other desired country or group of countries in order to assess similarity or differences in the nature of respective relationships, as well as to produce rates for Turkey that would indicate the effects of compositional influences from standard population(s).

Well-documented historical experience of developed countries sheds light on the potentially important forces behind the changes registered in developing countries. To use as standard, Southern European countries; Greece, Italy, Portugal and Spain, are most appropriate for Turkey that can be classified as a Mediterranean country itself.

High levels of under-5 mortality given levels of adult mortality is another shared characteristic with Southern European countries in the first half of the twentieth century, which formed the rationale for choosing Southern model life-tables in the indirect mortality estimations above. Three separate models are used to estimate the relationship between mortality and socio-economic indicators, and in the case of Southern Europe, the average values of dependent variables are used in estimations. There are two outcome variables; infant mortality rate and child mortality rate per 1,000 births. These relationships can be expressed as:

Model 1

$$ {}_1^0q = \alpha + \beta_1 X^{GDP} + \varepsilon $$

$$ {}_1^4q = \alpha + \beta_1 X^{GDP} + \varepsilon $$

Model 2

$$ {}_1^0q = \alpha + \beta_1 X^{GDP} + \beta_2 X^{primary} + \beta_3 X^{secondary} + \beta_4 X^{urban} + \varepsilon $$

$$ {}_1^4q = \alpha + \beta_1 X^{GDP} + \beta_2 X^{primary} + \beta_3 X^{secondary} + \beta_4 X^{urban} + \varepsilon $$

Model 3

$$ {}_1^0q = \alpha + \beta_1 X^{GDP} + \beta_2 X^{sex\ ratio\ primary} + \varepsilon $$

$$ {}_1^4q = \alpha + \beta_1 X^{GDP} + \beta_2 X^{sex\ ratio\ primary} + \varepsilon $$

The first model measures the effect of national income levels only, whereas the second and third models incorporate additional socio-economic measures expected to be associated with mortality rates under age 5. In addition to the natural logarithm of income levels, primary or secondary school enrollment rates that refer to the ratio of children of official school age who are enrolled in school to the population of the corresponding official school age, and the urban population rate that refers to the percent of population living in urban areas, are the other independent variables of the second model. The final model still includes income levels, but measures a slightly different aspect of socio-economic development by focusing on female to male primary-school enrollment ratio exclusively. The results of the linear regression models are given in Table XIV, suggesting two points worth mentioning: First and as expected, the effects of national income levels, primary and secondary school enrollment

rates, urbanization levels, and female to male primary-school enrollment ratios on mortality rates are stronger in Turkey than in Southern Europe. Second, the variable in the second model indicating the share of urban population has the highest t-value, and absorbs the effects of other significant indicators; national income and primary school enrollment rates, on infant and child mortality levels.

The next step in the analysis will assess to what extent contrasting mortality rates between Southern European countries and Turkey are due to differences in values of the selected indicators. Standardization is based on the substitution of average yearly values on these indicators from Greece, Italy, Portugal and Spain into Turkey's equations. This procedure will produce new rates for Turkey that reveal the effect of eliminating internal and less-favorable socio-economic conditions, such as lower levels of income, or education. Since the local confounding effects on infant and child mortality rates are removed, the predicted rates reflect the effects of compositional influences from Southern Europe. The following equations summarize this procedure:

$$ {}_{0}^{1}q = \alpha + \beta_{TR}^{GDP} X_{SE}^{GDP} + \varepsilon $$

$$ {}_{1}^{4}q = \alpha + \beta_{TR}^{GDP} X_{SE}^{GDP} + \varepsilon $$

$$ {}_{0}^{1}q = \alpha + \beta_{TR}^{GDP} X_{SE}^{GDP} + \beta_{TR}^{primary} X_{SE}^{primary} + \beta_{TR}^{secondary} X_{SE}^{secondary} + \beta_4 X^{urban} + \varepsilon $$

$$ {}_{1}^{4}q = \alpha + \beta_{TR}^{GDP} X_{SE}^{GDP} + \beta_{TR}^{primary} X_{SE}^{primary} + \beta_{TR}^{secondary} X_{SE}^{secondary} + \beta_4 X^{urban} + \varepsilon $$

$$ {}_{0}^{1}q = \alpha + \beta_{TR}^{GDP} X_{SE}^{GDP} + \beta_{TR}^{sex\ ratio} X_{SE}^{sex\ ratio} + \varepsilon $$

$$ {}_{1}^{4}q = \alpha + \beta_{TR}^{GDP} X_{SE}^{GDP} + \beta_{TR}^{sex\ ratio} X_{SE}^{sex\ ratio} + \varepsilon $$

Figure VI displays the observed and expected infant mortality and child mortality rates for Turkey (according to three models), and the average rates from four reference populations. Standardization with the first, second and third model produces infant mortality rates between 1960 and 2010 that are respectively in the range of 73 and 9 percent, of 47 and 97 percent, and of 6 and 32 percent of the observed rates. In the case of child mortality,

produced rates are in the range of 1 and 24 percent, of 12 and 57 percent, and of 0 to 1 percent of the observed rates. These results are crucial the following reasons: The first model shows that even if Turkey had same levels of national income as Southern Europe, infant mortality rates would not decline to levels that are significantly different from the observed levels, especially during the 1960s and 1970s. The procedure produces the opposite effect for child mortality, which would be eliminated by at least three quarters between 1960 and 2010. Secondly, controlling for other significant effects such as level of education and urban population rate, do not eliminate the differences observed between Southern Europe and Turkey, especially after the 1990s. Whereas this might be due to the combination of the strength of urbanization as an explanatory variable in Turkey's equation and the reverse urbanization trends in Europe especially after the 1990s, it might suggest in the big picture that differences in these classic socio-economic indicators cannot fully explain the contrasts in mortality rates between the two group of populations.

It is only the third model incorporating the female to male ratio in primary school enrollment into the relationship between mortality and national income levels that eliminates Turkey's excess death rates relative to Southern Europe. Further, this is true in case of both infant and child mortality. Given that Turkey would eliminate its differences in death rates under age five by maintaining its own relationship and having both the same levels of national income and sex ratio in primary education as in Southern Europe, the question becomes how much Turkey would gain in terms of mortality from each of these two angles. Table XV shows estimations of relative change to be expected by calculating what percent of reduction would be achieved if Turkey maintained its own relationship, but (1) had the same levels of income and sex ratio as in Southern Europe, (2) had the same levels of income only, and (3) had the same levels of sex ratio of primary education. The last column in the table suggests that at least until the 2000's, sex ratios in primary education would play a more significant role in (expected) mortality reductions than national income levels, and would be responsible for about 40% to 88% of total change in survival gains.

One net implication of these findings is that 'social change' arguments would be highly relevant and thus should be integrated to the explanations of Turkey's mortality lag. For this reason, the next section shifts to looking

at some of the cultural factors that might have been keeping infant and child mortality at high levels, regardless of economic improvements or the geographical expansion of health services.

d. Cultural Arguments

Another strand of research on mortality declines in diverse and less developed societies emphasizes the role of cultural and behavioral factors in health improvements. As discussed, mortality declines in less-developed countries were achieved through the use of medical technologies at faster rates and lower incomes than the history of industrialized populations during an earlier era of weak technological effectiveness. A distinguishing characteristic of health technologies in less developed countries has been the public good dimension, as embodied in notions of basic ideas and knowledge about health. In many contexts, transmission of new medical preventive and curative knowledge has been achieved by various public mechanisms, ranging from simple diffusion of pure nontrivial and nonexcludable knowledge to public or international interventions focused on particular diseases, and to family and public health programs that target at health practices within the household (such as personal hygiene, handling and preparation of food, treatment of milk and water, child care and so on).

The absorption of medical knowledge by members of a population, on the other hand, depends on a somehow large-scale change in cultural beliefs and attitudes. In demography, cultural determinants of mortality achievements in infants and young children was first explored by Caldwell (1986) extensively. His starting point was the classic argument between national income and infant mortality levels, which was studied for a number of economically less-advanced countries with diverse mortality performances. Caldwell (1986) found that whereas some countries reached health levels far above what would be predicted by their economies, there were others which fell far below. Kerala, Sri Lanka and Costa Rica, for example, were the superior health achievers that performed better than what would be predicted based on their economies.

One common characteristic of superior health achievers was that they had overcome the constraint of material resources by import of medical technology and social institutions. These experiences were also exceptional in their social and political environments, and in the effectiveness of governmental inputs in all three areas of education,

health services and nutrition. Among cultural factors, female autonomy, value attached to education, open political system and large civil society without a rigid class structure, were found crucial in facilitating the adoption of new health inputs and the absorption of medical technologies.

Education is significant for health improvements in the first place because the effectiveness of health care is very much dependent upon the degree to which the population comes to accept the scientific basis of disease causation. Since health care can be effective only if the population is willing to employ it, follow the medical instructions carefully, and comply with recommended treatments, the beneficial effect of imported medical technologies comes only when the educational message imparts a specific understanding of the scientific causes and treatments of diseases. One observation from the exceptional good experiences in Caldwell's study (1986) was that the success of public health programs was due to the existence of educated, capable and demanding public. Women's education was particularly important for improving children's health, as realized by considerable inputs in the area of female education in these countries.

The strength of maternal education as a determinant of infant and child mortality is primarily due to 'behavioral' pathways including greater protection against infection through hygiene, reduced sustainability to infection with nutrition and immunization, enhanced recovery from infection by more effective domestic and external health care, and reduced risk of accidents through supervision (Mosley & Chen, 1984). In terms of cultural beliefs and attitudes, educated mothers attach a higher value to the welfare and health of their children, have greater decision making power on health related matters, are less fatalistic about diseases and death, more knowledgeable about disease and cure, more innovative in the use of remedies, and more likely to adopt new codes of behavior that have indirect but positive consequences for the health of children (Cleland and Van Ginneken, 1988). This multi-dimensional effect was investigated with studies in other less-developed countries, which generally agreed that maternal education has a strong, independent and positive effect on child health, even after statistically controlling for other associated variables such as place of residence or household income (Hobcraft et al. 1984; Mensch et al 1985; Cleland and van Ginneken 1988; Cleland et al.,1992).

Caldwell's theory would classify Turkey's mortality decline as an 'exceptionally bad experience' since progress in infant and child mortality reductions historically fell far below expected levels according to economic indicators. On the other hand, given that one striking contrast between the superior and poor health achievers was the religions of the two groups since nine out of the eleven in the latter group were Muslim populations, the fact that Turkey is a pre-dominantly Muslim population would not contradict his interpretations. Caldwell (1986) argued that the central aspect of the relationship between Islam and mortality levels is undoubtly the separate and distinctive position of women operating through their access to education, levels of family planning and limited access to employment outside the household. Even though Caldwell himself notes that these mortality differences are not necessarily inherent in the religions nor immutable, it is important to realize that assuming a 'fateful triangle model' that sees a pernicious association between Islam, women and demographic outcomes would lead us to discount some of the crucial factors of variability and ignore the ambiguities inherent in the normative structures in societies (Obermeyer, 1992)

Since a demanding and educated public, which can be truly achieved by increasing female education levels, is the key to health improvements in children, a more correct approach in the study the cultural determinants of mortality for Turkey is to focus on maternal education as a driver of social change, and problematizing excess death rates by the educational attainments of mothers. Indeed, female schooling levels have been alarmingly low in Turkey; only 45%, 50%, 65%, 68%, 75% and 80% of adult female population (ages 15 and above) were literate in 1975, 1980, 1985, 1990, 1995 and 2000 respectively (World Development Indicators, 2015). Gender gap in education has historically been described as 'drastic' throughout the twentieth century, although the schooling levels of women across different educational categories have been improving after the late 1980's (Dayioglu et al., 2009): In less than two decades between 1988 and 2006, the proportion of illiterate women dropped from 33.9% to 19.6%, the proportions of men and women with just primary school education became equal, and the proportion of women with more than primary school education more than doubled. In addition, the urban-rural divide in educational attainment among women were as drastic as the overall gender gap in education, and even in as late as 2006, the proportion of illiterate women in rural areas was 27.7% while it was an order of 14.8% among urban

women.

Given this background, infant mortality can be indirectly estimated by the Brass method for different educational categories. Table XVI gives the sample sizes of educational categories in census data, used as sources of information about the survivorship of children and mothers' age. Estimation results are visually presented in Figure VII. The results indeed show that the most striking sub-group differences in Turkey are revealed by analyses of infant and child mortality by maternal education, as revealed by the initial levels in 1970s, pace of decline and final values achieved by mid-1990s. The initial infant mortality levels in the early 1970s are just over 120 per 1000 births and 110 per 1000 births for those with less than primary education and with complete primary education respectively. Infant mortality rates for those with a complete secondary education and with university degree are much lower: Just over 60 per 1000 births for the former, and 40 per 1000 births for the latter. The intensity of change is greatest for the lowest education category, followed by those with complete primary education. There is no significant change for those with a university degree in the period of estimation, who appear to be at the same level of infant mortality between 1970 and mid-1990s. The pace of decline in the infant mortality rates of mothers with complete secondary education is slower than declines in lower educational categories, with nearly one third of their intensity. The gap in mortality rates by maternal education shrinks but does not disappear by the mid-1990s. These results suggest that there have been two distinct mortality regimes in Turkey, one shared by those with less than primary school and complete primary school educations, and another shared by complete secondary graduates and university degree holders.

Finally this section presents an infant mortality index that is created by taking advantage of the information provided by DHS, and examining the predicted probabilities of infant mortality between 1988 and 2008 by three categories of maternal education and other important variations by region, ethnicity, or urban/rural type of residence. The index is created in two steps: First step consists of computing probabilities based on the logistic regression of infant mortality on selected characteristics. The second step takes the ratio of the predicted probabilities for those categories of interest to the country-level infant mortality rate in 1998, which corresponds to

the middle of the time interval between 1988 and 2008. This way, index indicates the relative advantage or disadvantage of individuals in various sub-categories in comparison to the average experience in the country, while enabling a thorough examination of maternal education a central axis of variation/inequality.

The results in Table XVII confirm the highest infant mortality for mothers with no education, while mothers who have a complete primary education have a clear advantage over mothers with no education, and mothers who have higher than primary school education have advantage over mothers with primary education. At every level of education, the Turkish mothers have an advantage over the Kurdish, urban areas have an advantage over rural areas, and eastern region has the greatest disadvantage, but differences get trivial at the highest levels of educational attainment. Examining the interactions between regions and type of residence, the highest disadvantage is found for the rural eastern, rural southern and rural central areas, especially at the lower end of educational distribution, and the western and northern urban areas have the greatest advantage. The interactions between ethnicity and type of residence show that the rural Kurdish population with no formal education has the highest infant mortality, which is in line with the results for eastern Turkey, and is immediately followed by the infant mortality among the rural Turkish population with no education.

Conclusion

Much of the large and sustained reductions in mortality that have taken place in pre-transitional populations have been due to decreased mortality from infectious and parasitic diseases, that is, from diseases that are caused by the growth of pathogenic microorganisms within the body and are usually transmittable to others, to which infants and children are most vulnerable. Among theories advanced to explain why and how mortality levels from infectious diseases have declined, the classic debate posits improved living standards due to economic growth against the application of modern health technologies as powerful determinants of mortality improvement: One group of theories attributed the declines in mortality to rising income, food intake and nutritional status levels leading to increased host resistance to infectious diseases, whereas the other argued that structural changes in the relationship between socioeconomic variables and infant mortality rates were essential in mortality reductions that enabled

developing countries to achieve mortality declines through the use of better technologies at faster rates and at lower incomes than the history of industrialized populations during an earlier era of weak technological effectiveness.

Spectacular reductions in death rates that were achieved in many less developed countries without any great change in economic conditions were substantiated by Preston (1975), who showed that probably no more than 20% of mortality declines between the 1930s and 1960s was due to economic development during that period. The decomposition analysis in this study that broke down mortality reductions into economic and other residual/exogenous factors started only after 1960, however, this was a time when Turkey was still characterized by alarmingly high death rates in infancy and early childhood, and massive heterogeneity across urban/rural types of residence and geographical regions. The results showed that 90-95 % of all mortality reductions between 1960 and 2010 were solely due to income changes (which is a finding that is totally out of whack with other research), and the role of structural shifts in mortality declines due to the expansion of public health services and their medical methods has been very small.

On the other hand, the minimal effect of 'structural shift' primarily calls into question the effectiveness of public interventions, or the "adjustment-structural policies" (Hill & Pebley, 1989). As noted by others, when the primary focus is on the delivery of specific technologies, such as immunizations or corrective measures (for example rehydration therapy), these might have a modest impact on overall mortality reductions, as they might simply increase mortality resulting from competing causes of death, and therefore would merely postpone the death of a child rather than actually preventing it (Soares 2007). In Turkey, the persistence of malnutrition, pneumonia and diarrheal diseases as the leading causes of death in children, despite a complete elimination of infectious disease mortality from relatively easily preventable diseases by immunization campaigns, such as smallpox, diphtheria, whooping cough and later tuberculosis, suggests that in addition to economic factors, problems related to the diffusion and absorption of health technologies slowed down the process of mortality decline, since curative health measures, such as anti-biotic treatment or re-hydration therapy, could not prevent deaths from these particular infectious diseases.

Given that adequate' health interventions that would address the social causes of health inequalities in children were absent in Turkey, its historically drastic gender gap in education is very likely to be responsible for excess infant and child mortality rates and their uneven distributions at the sub-group level. Infant mortality estimations in this analysis by educational categories found striking differences in mortality rates, both between uneducated and primary school educated mothers, and between those with lower than or with primary education, and with secondary education and higher. The standardization procedure showed that only when both the female to male primary school enrollment ratios and income levels between 1960 and 2010 were set to the same levels as in Southern Europe, the differences in mortality rates would be completely eliminated. Furthermore, sex ratio in primary education would be responsible for majority of gap to close. At the same time, indirectly estimated infant mortality rates for mothers with secondary and university education during the thirty year period between 1970 and 2000 closely resembled the levels observed in Southern European countries. These points emphasize the importance of social and cultural change, as a key determinant of success in any public health program or economic development effort that aims to improve health outcomes in infants' and young children.

Overall, results of the analysis in Chapter One suggest that there are two culturally distinct mortality regimes exist in Turkey; on the one hand, educated mothers exhibiting death rates similar to advanced countries, and on the other, extremely high rates and a much more slower pace of reduction among women at the lower end of educational attainment. In addition, there are the lingering issues of how much of the disparities in mortality by education has been due to the contribution by Kurdish people, and how much of the regional disparities is due to concentration of low-educated Kurdish population in some locations, adding more punch to the idea that it is a 'cultural gap' that would explain Turkey's lags in childhood mortality decline: If more female were educated and perhaps disproportionately more Kurdish women, then the cultural gap would be closed and disparities in death rates would be eradicated.

After concluding that the Turkish lag in infant and child mortality may be explained by a cultural gap, this chapter connects to Chapter Two, which will theoretically examine the role of economic development, public health investments and cultural factors in mortality declines, and suggest a new framework that takes into account a variety

of social, economic and cultural factors while studying people's transitions to modern health behaviors. It is Chapter Three that is going to empirically demonstrate the role of 'culture' as an important determinant of declining death rates in Turkey, relative to that of economic changes.

CHAPTER II. THEORETICAL CONJECTURES

Introduction

In modern world the earliest historical mortality decline was experienced in Western Europe, most clearly identified at the end of the eighteenth century and the first half of the nineteenth century, though some reduction of mortality may well have occurred earlier. The speed of mortality decline showed variations as the mortality transition that took 75-100 years in Northern Europe to complete was achieved within 20 to 25 years in Eastern Europe, and within even shorter periods in less developed countries that joined the scene much later. There have been disputes about the causes of mortality decline during the early period, mainly revolving around the argument that the early decline was primarily due to improvements in nutrition and resistance to infectious diseases, independent of other factors such as the establishment of public health, medical interventions, and better hygiene.

Demographic transition theory that explained the reductions both in mortality and fertility by giving pre-eminence to socio-economic factors associated with modernization, has been criticized and reinstated by a number of scholars in attempts to integrate economic, cultural and institutional theories of decline, the critiques of the transition theory are more heavily concentrated on fertility transitions. The importance of cultural factors was particularly emphasized in fertility transitions, suggested to be more closely connected with the diffusion of ideas than with changes in economic forces. It was argued that the timing of transitions was strongly influenced by linguistic and cultural boundaries and less strongly by modernization factors (Coale 1973, Lesthaeghe & Surkyn 1988, Lesthaeghe, 1993), even though women's education and status were singled out as the most important factors under economic modernization (Cleland & Wilson, 1987).

In comparison to fertility transition, motives for the reductions in mortality are assumed to be much easier to explain, and causes to be much more easily identified. Reductions in mortality and morbidity across the world, especially after the mid-twentieth century, strengthened the belief that humans can control and modify their environment and destinies, and in demographic transition theory, it is assumed that the members of modern societies take a less fatalistic and passive view of life than the members of pre-industrial populations. The change in views of life; the social change, occurs as a natural consequence of modernization, that brings with it the belief that it is possible to influence one's own fate, as well as his/her offspring's. The emphasis in the case of mortality transitions,

has rather been on the fast tempo of declines in the more recent years (due to import of powerful medical technologies to less-developed countries after the Second World War), and the success stories in Kerala, Sri Lanka and Costa Rica, identified as the 'superior' health achievers (Caldwell, 1986).

However there are also the laggards in mortality transition, those countries which experience significant delays, often despite what the socio-economic indicators would lead us to expect. These experiences of mortality decline have been not been approached in a similar fashion as in the case of fertility that called for an integrated theory of economic, social, cultural and institutional factors of change. What assigned a particular country as a poor health achiever has not been adequately addressed, and not less shallow and general explanations than some very broad arguments focused on such the relationship between Islam and mortality, has been suggested. Biases and lags in mortality perceptions have been neglected, and the passage from modernization to Westernization to individual perceptions of mortality change has been assumed to involve lags of little consequence.

This chapter investigates why some developing countries might experience lags in their mortality transition despite large-scale imported medical technologies and improvements in national income over time. Three objectives of the current chapter are to 1) discuss the existing theories of mortality decline, 2) demonstrate the crude opposition between structural and cultural theories of mortality decline, and 3) show how to get out of this trap by re-tooling a well-known framework that is originally designed to deal with fertility.

The past can further our understanding of the present and future, by defining the limits of the possible, and the contours of the probable (Landers, 1992). The first part sets out the main explanations of mortality decline, especially to the extent that they apply to the deaths of infants and children. These explanations can be broadly divided into two groups; 'structural' explanations that focus on economic and social arrangements to explain secular mortality declines, and 'cultural' explanations that invoke ideational shifts with which individuals conceive the scientifically proven medical causes and treatment of diseases. Structural explanations in turn have three subclasses: Those explanations which argue for the primary role of (i) improvements in the standards of living and nutrition, (ii) social interventions in public health, or (iii) greater efficiency over time by the advances in medical science. Cultural explanations are grounded on at least two relevant schools of thought. The first examines the psychological shift

from fatalism to a sense of control of destiny, and from a religious and tradition-bound view of the world to a secular and rational attitude. The second school of thought, the diffusion of innovations' theory, is concerned with the way in which new technologies and forms of behavior spread within a population.

The second part introduces an important framework on infectious mortality decline proposed by Johansson and Mosk (1987) with the discussion of two major factors that are involved in the differential distribution of disease levels in any one population at any one time and over time; protection from exposure to lethal pathogens and resistance to/recovery from exposure, as well as their adaptation to infant and child mortality from obstetric and infectious causes of death.

The mains goal in the third part are to introduce a new model for the study of mortality decline and to offer a formalization of integrated theory. The under-utilization of maternal and child health services is problematized as directly influencing the exposure, resistance and recovery dimensions of infectious disease mortality. After establishing these links, a new conceptual model is developed to study the relation between behavioral change and mortality, on the basis of a well-known demographic framework designed to study fertility reductions: Coale's 'Ready-Willing-Able' framework (1973). The section demonstrates that this framework can be re-formulated to study the transitions into new and modern health behaviors in transitioning societies, while taking into account a variety of social, economic and cultural factors previously discussed in the chapter. This formulation eliminates the false dichotomy between structural and cultural theories, and offers a more integrated and comprehensive understanding of mortality decline in countries that experience lags of significant consequence, with its ability to accommodate a wider set of influences, and thus to relate to exceptional experiences.

PART 1. Theories of Mortality Decline

a. Structural Explanations

i. Economic growth and improved nutrition

One group of explanations favors nutritional improvements as the single or leading explanation for mortality declines at least in all periods and phases up to 1950s, during which survival gains are considered to be more heavily

dependent on socio-economic improvements in comparison to subsequent years. Theoretically, the relation between economic development and nutritional improvements is based on two aspects. First, economic improvements increase the per capita supply of food that alleviate the prevalence of chronic or severe malnutrition in populations. Second, economic development improves the food quality and dietary composition, and therefore reduces nutritional deficiencies such as iron deficiency and protein-energy malnutrition that are closely related to negative growth and health outcomes.

The work by McKeown was the first strong nutritional thesis in the field of demography, which relied on substantial empirical work by analysis that was performed on the national death registration data for England and Wales, for the period from 1837 onwards. The main argument of McKeown in the Modern Rise of the Population (1976) was that improved nutrition was the primary cause of mortality decline in England and Wales, and its role was clearly distinct from the roles of alternatives including advances in medical technology, reductions in the virulence of pathogens, human acquisition of immunity through natural selection or genetic drift, personal hygiene and public sanitation.

McKeown (1976) did not make his case for nutrition directly but through a residual argument in which he rejected other principal explanations. The simple classification that he made between air-borne diseases on the one hand, and water- and food-borne diseases, on the other, allowed him to argue against the probable impact of public health measures and personal sanitation. For example, he argued that cleaning up the public water supply and improving the sewage systems would have little effect on the air-borne diseases, which as a group was associated with more than half of the total decline in mortality from infectious diseases until the end of the nineteenth century. Similarly, major declines in death rates from respiratory tuberculosis, bronchitis, pneumonia, whooping cough, measles, scarlet fever and typhoid preceded the development of effective chemotherapies. On the basis of these points, McKeown made the conclusion that the reduction of airborne infections could only have come about through heightened host resistance to be achieved by higher per capita income, food intake and nutritional status.

While virtually most of the researchers who studied secular mortality declines in Europe and northern America agreed that the improvements in nutrition have made a contribution, the main disagreement revolved around whether these improvements were the leading and primary force behind mortality reductions from infectious diseases. Main objections to McKeon's nutrition argument included criticisms pointing out to the major gaps in his evidence and his assumption of 'a benevolent invisible hand' of gradually rising living standards (particularly in the form of increases in per capita nutritional consumption), overall downplaying the importance of social interventions in public health (Szreter (1988), Preston and van de Walle, 1978) while exaggerating the role of nutrition (Livi-Bacci, 1983).

Despite criticisms, it was not only the findings of medical and biological sciences that appeared to be consistent with McKeown's nutrition argument, but the work of Fogel (1986, 2004a) gave a powerful boost among demographers to the improved nutrition explanation on mortality transitions. Fogel used food consumption figures of France and England starting from the end of the eighteenth century until the third quarter of the twentieth century, together with anthropometric data to study the secular trends in European nutrition, health and risks of mortality. Treating the height at given ages, weight at given ages and weight for height (body mass index) as effective predictors of the risk of morbidity and mortality, Fogel found that improvements in the average nutritional status as indicated by stature and body mass indexes appeared to explain about 90 percent of the decline in mortality rates. Nutritional status is the critical link connecting improvements in technology to improvements in human physiology, by a process Fogel named 'technophysio evolution', referring to "a form of human evolution that is biological but not genetic, rapid, culturally transmitted and not necessarily stable" (2004b, p. 646). In this explanation, the rapid accumulation of physiological capital is tied to 'the conquest of chronic malnutrition' made possible by the technophysio evolution, as well as to the long-term reductions in environmental hazards.

Drawing on the theory of a nexus between nutritional and environmental insults in utero or at early post-natal period (that would translate into the risk of chronic conditions half a century or more later) (Barker 1998), Fogel discussed the importance of maternal nutrition and prenatal care (2004b). With an understanding of uterus as a crucial environment for the developing embryo and fetus, Fogel (2004b) explained that pregnant women who are

malnourished and exposed to high levels of pathogens would have intrauterine environments that retard the development of the child, creating higher risk of mortality through low birthweight or permanent damage to the central system of the fetus. These arguments underlined the importance of providing nutritionally stressed pregnant women with such food supplements as folate, iron and iodine, and taking effective measures after birth to promote breast-feeding that can substantially reduce morbidity and death rates among infants. The importance of prenatal care was stressed by the emphasis on the need to control and manage the environmental quality of the uterus, and to address environmental issues in both the enhancement of baby's physiological capital and in affecting the rate of depreciation in that capital.

While the differences in nutrition of mothers during pregnancy are often invoked as a major cause of differences in infant mortality through operating on birth weight, malnutrition in the post-neonatal period and childhood is known to lead to impaired growth and development that may not be reversed. Chronic malnutrition scars and alters the immune system, and due to only a limited number of possible alterations of the immune system, the observed effects of individual nutrient deficiencies tend to be similar across societies (Scrimshaw and Sangiovanni, 1997). For instance, protein-energy malnutrition and iron deficiency which are the most prevalent in populations, are consistently observed to interfere with 'resistance to infection'.

When there is a protein deficiency, essentially all forms of immunity are affected, since most immune mechanisms are dependent on cell replication or the production of active protein compounds. The effects include impaired antibody formation, decreased serum immunoglobulin, decreased secretory immunoglobulin, decreased thymic function and splenic lymphocytes, delayed cutaneous hypersensitivity, decreased complement formation, decreased interferon, and effects on nonspecific mechanisms such as anatomic barriers and secretory substances such as lysozymes and mucus. Iron deficiency is consistently associated with increased morbidity from infectious diseases, which has been explained by decreased immune function, impaired immune mechanisms (such as phagocytic killing power), less response to lymphocyte stimulation, fewer natural killer cells associated with reduced interferon production, and depressed and delayed cutaneous hypersensitivity.

The close interrelation between nutrition, infection and immunity implies for pre-transitional, high-mortality populations that the changes in one component would inevitably cause significant alterations in the other two. Whereas malnutrition is associated with a lowering of immuno-competence in children under age five to be expressed as greater susceptibility to infectious disease, infection will clearly result in a more malnourished subject and complete the vicious circle. Therefore the relation between nutrional status and infection is reciprocal and synergystic (Scrimshaw, 1968), implying that each may worsen the other (malnutrition is a major factor in the occurrence of infection, but infection is a also common precipitating factor of malnutrition) and that the biological effects of malnutrition and infection combined are greater than the sum of the two.

While the interaction of nutritional status with infection particularly affecting the mortality patterns in infants and young children has been extremely important in pre-transitional, high-mortality populations, this aspect was neglected by McKeown, who based his evidence on the per capita food supply in England, and therefore dietary patterns only (Fogel, 2004a). This distinction is important since 'diet' refers to daily food consumption that can be judged in terms of calorie adequacy and quality, whereas 'nutritional status' denotes the balance between the intake of nutrients and claims against it, therefore acting more closely with occurrences of infection. Fogel's focus on body size as a universal way that the chronically malnourished populations of Europe responded to food constraints, also points out to a cumulative effect of nutritional status from early years on, which might be affected by the high rate of exposure to infectious diseases, preventing many of the ingested calories from being metabolized. Despite these considerations, McKeown's argument on the primary role of nutrition as the leading cause of secular mortality declines is widely agreed upon both within the history of developed countries, and the twentieth-century mortality transitions in developing countries.

ii. Social interventions in public health

The significance of income and nutritional improvements as the leading cause of Western secular mortality declines has been challenged with a counter argument, according to which, the rises in societies' overall investments in public health technology and services have been a more significant source of gains in average life expectancy than

their rising per capita incomes. How to explain the critical role played by public health measures, independently of the influence of rising levels of national income and nutritional status? The correction of environmental conditions that expose populations to disease is possible only through public health initiatives as most of these risk factors are beyond individual control. Services that promote health, such as the provision of pure water supply, proper disposal of sewage and spraying of insecticides, are beyond individual means, especially in settings of dense habitation. Similarly, access to modern health facilities and a proper health infrastructure are beyond individuals' control. Therefore, both types of direct- and indirect-medical methods of public health to control the spread of infectious diseases require, by principle, the development of new institutions centering on public health system, with functions including sanitation, health education, regulation, and the financing and direct provision of health services (such as immunization campaigns or oral rehydration therapies). Accordingly, the establishment of a public health system requires an acceptance of societal responsibility for the control of major infectious diseases and an organizational structure that would support it.

Whereas intervention in the interest of public health is definitely a requirement, it is not simply a residual function of economic development, but a product of a 'politically and ideologically negotiated movement' (Szreter, 1988). Even though it is reasonable to suspect that income growth associated with economic development can make the survival gains more feasible by facilitating the financing of public interventions, the problem is not so much the affordability of such investments. The key is the presence of an essential set of governmental decisions regarding large-scale strategic public health interventions, which is not mechanically triggered by rising per capita income, but has the potential to lead to substantial improvements in life expectancy even at very low income levels. In addition, public health is crucial not only for the implementation of the new techniques of disease control, but also for the provision to the public the knowledge of the mechanisms of disease causation and transmission. Acceptance of this knowledge requires a shift in norms, and a generally positive reception of public health as necessary by members of a population.

These correct health behaviors and practices that are of central significance for transmission of disease, are not, however, a simple function of income or prices, but "are rooted in the established norms of the society and its

customs and beliefs" (Easterlin 2004, p. 118). As the appropriate health manners do not arise spontaneously in populations, but result chiefly from increasing awareness among the public of the consequences of one's actions for the spread of disease, the public health is the only organization that can assess the compatibility between the most advanced state of medical knowledge and beliefs among members of a population, while acting on the critical need for collective action to improve population health. It is the public agencies and medical practitioners, which undertake concrete efforts to disseminate the correct behaviors. It is for the same reason that in addition to a formal establishment of an apparatus for state interventions, public health needs to encompass informal arrangements in the form of 'a change in social norms' relating to 'the responsibility for disease'. It is for the same reason that one-to-one interactions between medical practitioners and populations, through educational campaigns or home visits of health workers, have the ability to dramatically decrease infectious disease mortality rates, especially in socio-economically less advanced settings.

In the history of developed countries, excessive mortality that characterized urban areas after the Industrial Revolution (and at least until the mid-nineteenth century) is the main point of departure among the proponents of the public health argument, since proliferated morbidity and mortality rates characterizing these areas could be eliminated only after the introduction of public health measures (Szreter 1988, Easterlin 2004). The main paradox to which studies pointed out is the better mortality experience of economically less-developed rural areas showing a trajectory of slow but steady improvements during the same period.

Such significant divergence of rural trends from the trends of more economically-advanced urban areas, contradicts in theory what would otherwise be expected from improving living standards and nutrition, due to increased resistance to disease. For instance, despite McKeown's case against the influence of medicine, medical profession and public health in general, Britain also experienced the excess urban mortality paradox when the British economy experienced its historically unprecedented, sustained economic growth rates. Mortality levels between 1700 and 1870 suggested a powerfully negative direct impact of industrialization on population health, concentrated particularly among the families of the relatively disempowered, displaced migrants who constituted the workforce in the fast-growing industrial towns and cities (Szreter, 2004)

The proponents of the public health argument believe that the initial lack of 'appropriate social overhead capital' to preserve health among highly-populated urban areas led to an increased exposure to disease, cancelling out any effect of increased resistance. By the same token, the subsequent eradication of excess mortality demonstrated the importance of public health investments, or at best a small positive impact of economic growth on life expectancy in the absence of a public health system implementing the new techniques of infectious disease control.

There are a number of other studies that demonstrated the critical role of public health investments in mortality reductions in the West during the course of the nineteenth century. The analysis by Preston and van de Wale (1978) identified an apparent link between the nineteenth century water supply and sewage improvements in the three large cities in France and cohort-specific mortality gains. Preston and Haines (1991) argued for the United States that increased recognition that most diseases spread from person to person provided a sounder basis for public preventive measures in the last two decades of the nineteenth century, when municipal governments prioritized and mounted major efforts to clean their water supplies. Cutler and Miller (2005) investigated the causal influence of clean water technologies; filtration and chlorination on mortality in the major cities of the U.S. and found that clean water was responsible for nearly half the total mortality reduction, three quarters of the infant mortality reduction, and nearly two thirds of the child mortality reduction. Since water-borne diseases that are the most responsive to public health investments are known to reduce the appetite and absorption of essential nutrients, increase metabolic demands and often lead to dietary restrictions, these studies of mortality in Europe and the US commonly argued that elimination of water-borne diseases due to incipient yet effective public health initiatives had important 'nutritional' consequences that probably contributed to the reduction of deaths from air-borne infectious diseases during the same period. This indirect effect was most strong in the case of infant and child deaths, since youngest ages are the most vulnerable to the strong and negative interaction between infection and nutritional status, that is very likely to lead to death.

In the history of economically advanced countries, the most important components behind the success of public health measures were the 'new techniques' of disease control, as well as the 'diffusion' of a 'new body of knowledge' concerning these techniques. The 'sanitation revolution' starting around the middle of the nineteenth

century is considered the first historical breakthrough in public health efforts, by offering new methods to prevent the transmission of diseases, most importantly through clean water supplies, better sewage systems, and education of the public in personal hygiene (Easterlin, 2004). These strategic-level improvements in the urban environment were immediately reflected to a reduction in the mortality of older children and young adults throughout the last third of the nineteenth century, whereas that of infants had to wait until "the more probing and detailed regulations, and the expansion of skeletal social services" not taking place until the turn of the twentieth century (Szreter 1988, p.32). These secondary nevertheless as important interventions specifically targeted conditions existing in the infant environment, especially in poor households, previously approached with a libertarian respect to domestic privacy, and as a result, remaining untouched with any sort of regulation or control. The correct hygiene and feeding practices (especially breast-feeding) that were promoted by health visitors may be directly linked to drops in infant mortality at the turn of the century, even though in countries like England and the United States, these behavioral changes were externally supported at the same time by the infrastructural expansion of local health and maternity services, and legally, by the enactment of the 'Notification of Birth Act's (Szreter 1988, Preston & Haines 1991).

In the case of less-developed countries, public health measures were imported from the West, especially after the end of the second World War, which enabled studies to investigate the comparative roles in life expectancy improvement of higher per capita income and improvements in public health. In this regard, Samuel Preston's work published in several papers (1975, 1980 and 1985) is considered one of the first significant contributions presenting an application of economic analysis to the study of mortality change. By assessing the impact of national income (or the rates of change in national income) on the rate of change of life expectancy at birth, Preston clearly documented that between 1900s and 1960s, the estimated regression line changed and notably shifted upwards over time, suggesting that at any given level of income, a country was estimated to have lower mortality (and higher life expectancy) in the more recent years. The results of the decomposition technique comparatively estimated the increase in life expectancy that would have occurred if only economic development had had an effect on mortality, and the increase in life expectancy that could be attributed to the impact of other factors, holding economic levels constant. The latter effects on mortality held responsible for the structural shift in the relation between national

income and mortality levels are interpreted as the effect of technological change, brought by advances in medical science and improvements in public health. With his cross-national statistical research, Preston has become one of the most important dissenting voices that disputed the general validity of McKeown's claims in favor of countries' income-related and nutritional factors.

Preston's findings were also compatible with a number of studies conducted in the 1960s in Latin America, Asia and Africa, which showed mortality change to be increasingly independent of local economic development levels, and more dependent on the 'importation' of preventive medicine and public health methods. For instance, Arriaga and Davis (1969) argued for Latin America that whereas mortality decline was extremely slow in the more backward regions until around 1930, the pace of decline was faster than ever for all countries (both more backward and advanced) in the region after that date, demonstrating the ability of public health measures exerting strong influence on mortality rates independently of the local economic achievements.

Stolnitz (1965) similarly argued for Latin America, Asia and Africa that the strategic ingredients of mortality changes after 1940s were barely economic: The basic factors have rather been the availability of public health and disease-control methods that were imported far more easily than ever before, and have been almost unhindered by the social and structural obstacles besetting low levels of economic development. Meegama (1967) concentrated on Sri Lanka, and addressed how to explain the rapid decline in the death rate after 1946. Meegama showed that this was not only a period of malaria eradication, but a period that witnessed the beginning of attempts to change some of the depressive features of this geography, through a substantial expansion of maternity and child welfare services and free milk feeding centers, provision of hygienic care (especially targeting the poorer segments of the population), and improvements in the quality of the drinking water and sanitation. Meegama strongly argued that the improvements in standards of living were concealed before the introduction of these public health measures, due to the operation of conflicting factors in poor environments.

Contrary to the experience of Western populations, the presumption today for less-developed countries is, if there is a distinct pattern of differentiation between urban and rural places, that they will favor the urban populations, which have superior access to the most modern health facilities and a proper public health infrastructure. Although

many cities in today's developing world have benefited from the investments in public health needed to safeguard the water-supply and assure sanitary disposal of waste, these protections often are partially extended across and even within cities, leaving a substantial exposure to risk factors, not unlike those that existed in Western populations during the nineteenth century. Many high-density low-income urban communities face elevated levels of risk, currently resulting in a global resurgence of diseases such as tuberculosis, acute respiratory infections, and malaria (Reference). Therefore even in the most economically advanced geographical areas in less-developed countries, targeted public health interventions (both 'environmental' and 'domestic' corrections) continue to be critical in preventing the further spread of infectious diseases.

While public health investments require systematic and large-scope commitments over extended periods of time, medical 'treatment' methods such as immunizations, chemotherapy and antimicrobial agents are particularly important to achieve accelerated declines in mortality. The next section discusses the role of scientific discoveries and medical advances which have affected the mortality decline in the Western world first, even though responsible for a larger share of reductions from infectious and parasitic diseases in low-to-middle income countries. the Third World.

iii. Advances in medical science

Summarizing the empirical evidence at hand on Western mortality declines, Cutler, Deaton and Lleras-Muney (2006) argue that the history of mortality reduction can be seen as encompassing three phases. The first phase between the middle of the eighteenth and middle of the nineteenth century is when improved nutrition and economic growth may well have played a larger role in health improvement, even though the incipient public health measures mattered as well. The second phase from the closing decades of the nineteenth century on, was the stage when public health mattered more. Health came from the institutional ability and political willingness to implement the new techniques and to spread the new ideas about correct personal behaviors, neither of which was an automatic consequence of rising incomes. The third phase came in the 1930s when major-life saving scientific innovations in the

treatment of infectious diseases took place. This phase formed the base of a third competing group of explanations on the determinants of historical decline in mortality.

This group of theories studied the history of science to show that it was primarily the internal evolution of scientific medical knowledge, not the resources provided by economic growth, that was responsible for the great discoveries leading to the control of infectious diseases. In the second half of the nineteenth century when the spearhead of technological change, the sanitation movement, was gaining increased momentum and gradually leading to effective public health investments in urban areas, the validity of the germ theory was established by the work of Pasteur, Koch and others, who identified the role of carriers or vectors in the dissemination of disease (Easterlin 2004, p. 93). Working in numerous ways, this discovery laid the foundation for major breakthroughs in the control of contagious diseases, starting with the reinforcement and expansion of the newly developed public health movement. The germ theory strengthened the sanitation movement as well as the efforts to quarantine and isolate disease victims, and established the fundamental importance of pure water and safer food supplies. The germ theory was also closely linked to the growth of public education in personal hygiene practices, and the care and feeding of infants. The most significant affect, however, was the emergence of a new medical research strategy on the identification of the causal agent and carrier, on the basis of which, new preventive and therapeutic measures were developed.

The identification of causal agents and mode of transmission of certain diseases laid the foundation for systematic development of immunology, and vaccines became feasible against a growing number of diseases at the end of the nineteenth century. The conquest of diphtheria in 1892 was the first in a series of developments that brought several major infectious diseases under control via immunization, including cholera, tuberculosis, tetanus, yellow fever, typhoid fever, polio and measles. While these developments were techniques that reduced mortality through the prevention of disease, the ability to cure those who contracted infectious diseases remained elusive for almost a half century after the identification of causal agents. It was only after development of antibiotics -more specifically, the development of penicillin in 1941 and the long list of antibiotics to which it subsequently gave rise-, that the previously identified causes of diseases could be treated without any harmful side-effects.

These advances in scientific knowledge and methods have affected the Western world first, even though declining mortality regimes that emerged after 1950s in low-to-middle income countries have been partially or totally, but more heavily, sustained by massive medical improvements that decreased the sequelae and lethality of infectious and parasitic diseases. In today's high-mortality countries, the problem is not primarily the lack of suitable treatments, since cheap and easy-to-administer treatments already available to treat many infectious diseases are under- utilized.

Even though this observation can be explained by factors related to the overall medical and economic environment in countries (for example, low quality in health delivery due to institutional disabilities), it also brings into question the argument that the reductions in infant and child deaths are not only a consequence of advances in medical science and knowledge, but also of a wider diffusion of such knowledge among the population. From this perspective, mass vaccination campaigns, for instance, do not only offer protection against infectious diseases such as smallpox, malaria and respiratory tuberculosis, but also result in a recognition of the value of scientific methods and knowledge among sections of the population that had previously remained ignorant. The next section will discuss the cultural explanations of mortality decline, that explore the shift in attitudes towards (and propensity to) the use of medical methods in pretransitional populations.

b. Cultural Explanations

A third and final strand of research on mortality declines, for the most part built with studies from socio-economically less-developed countries, prioritized the role of culture and personal behaviors in mortality transitions. One important contribution of this approach is the realization that mortality decline is a 'social' transition in addition to an economic one, that requires us to take an account of changing attitudes to life and death, as well as the cultural and normative contexts and systems of values, beliefs, ideologies and normative pressures. The cultural explanation is not fully excluded from the classic demographic transition theory (Notestein, 1945), where mortality is expected to react to modernity with the emergence of a new, calculating rationality under modernism that transforms the grounds of the processes of decision-making about health, and consequently moving these decisions from the realm of

custom and tradition to a legitimate object of rational choice. Specializing in this ideational or psychological shift from fatalism to a sense of control of destiny, cultural explanations of mortality are focused on individual perceptions and behaviors that result as indirect effects of existing (or changing) social systems such as family settings, formal schooling and health-care.

In the field of demography, it was Caldwell (1982) who first elaborated the socio-cultural explanations of mortality decline, by recognizing the variations in infant and child mortality (both across and within populations) by maternal education. He identified a key element produced by maternal education: The ability to rattle the cage of cultural and traditional constraints. Thus for Caldwell maternal education was the most significant variable, not primarily because of enhancing women's involvement as mothers to use and efficiently allocate the material resources available, but because of the greater autonomy that education brings, with important health benefits for children, mainly through educated mothers' rejection of traditional age and sex differentiations in power, decision-making and benefits (1982).

Caldwell (1986) studied a number of economically less-advanced countries with diverse mortality performances and found that whereas some countries reached health levels far above what would be predicted by their economies, there were others that fell far below. Kerala, Sri Lanka and Costa Rica, for example, were the superior health achievers that performed better than what would be predicted by their economies. One common characteristic of superior health achievers was that they had overcome the constraint of material resources by import of medical technology and social institutions. They were exceptional in their social and political environments, and in the effectiveness of governmental inputs in all three areas of education, health services and nutrition. Among cultural factors, female autonomy, value attached to education, open political system and large civil society without a rigid class structure, were found crucial in facilitating the adoption of new health inputs and the absorption of medical technologies. One striking contrast found between the superior and poor health achievers was the religions of the two groups since nine out of the eleven in the latter were Muslim populations. Caldwell argued that the central aspect of the relationship between Islam and mortality levels is undoubtly the separate and distinctive position of women operating through their access to education, levels of family planning and limited access to employment

outside the household, even though he also noted that these mortality differences are not necessarily inherent in the religions nor immutable.

Caldwell (1986) prioritized the role of maternal education by identifying two observations from countries with exceptionally good experiences of mortality. In these countries, the success of public health programs was due to the existence of an educated, capable and demanding public, and they were characterized with considerable inputs in the area of female education, which in turn was significantly associated with improvements in child health and survival. Caldwell believed that the extraordinarily broad differentials found in developing countries during the 1970s in child survival by maternal education can be shown to be the product of two processes (Caldwell, 1994): (1) the importation of a global health system, developed first in the West and based on biomedical discoveries, which explained ill-health quite differently from indigenous explanations, and which underlay the provision of both the new preventive and curative health services; (2) the importation of a modern educational system, developed in the West with assumptions about the truth of science, personal responsibility for ensuring health, and the need to employ and co-operate with other modern institutions such as health systems. For Caldwell, the greatest gains made in Third World health, and the greatest potential gains yet to be realized, were from the product of these two forces and thus policy-makers would be well advised to make considerable and balanced investments in both health services, democratic curative ones as well as preventive ones, and education, especially girls' education.

Other studies in less-developed countries agreed with the finding that maternal education has a strong, independent and positive effect on child health, even after statistically controlling for other crucial variables such as household income, or urban/rural type of residence (Hobcraft et al. 1984; Mensch et al 1985; Cleland and van Ginneken 1988; Cleland 1990). Mosley and Chen (1984) argued that the strength of maternal education as a determinant of infant and child mortality is due to certain 'behavioral' pathways including greater protection against infection through hygiene, reduced sustainability to infection with nutrition and immunization, enhanced recovery from infection by more effective domestic and external health care, and reduced risk of accidents through supervision. Cleland and Van Ginneken (1988) took a more general approach in that, in terms of cultural beliefs and attitudes, educated mothers are explained to attach a higher value to the welfare and health of their children, have

greater decision making power on health related matters, are less fatalistic about diseases and death, more knowledgeable about disease and cure, more innovative in the use of remedies, and more likely to adopt new codes of behavior that have indirect but positive consequences for the health of children.

Even though cultural explanations were set on an understanding of mortality reductions in the Third World (e.g. Caldwell, 1986), can the role of cultural factors in historical mortality declines of industrialized countries be dismissed? Two books that set the research agenda on infant mortality in the 1990's, Preston and Haines' Fatal Years: Child Mortality in Late Nineteenth Century America (1991) and Schofield, Reher and Bideau's the Decline of Mortality in Europe (1991) shared the same conclusion that in long run, cultural factors were essential for the breakthrough in the fight against high mortality by creating an awareness about the importance breastfeeding, use of boiled milk or water, and general hygiene. Morel (1991) argued that the role of physicians who tried to inspire, stimulate and be active in different forms of hygienic and cultural activities was key for mortality reductions after the turn of the twentieth century, however occupying such a position of expertise in the social aspects of disease was effective mainly because parents' attitudes remained slow to change in the first place (either for reasons of economy or because of a long tradition of fatalism). Despite the efforts of health professionals and active infant- and child-welfare movements (in England, Germany and France), the gap between theory and practice had persisted from a public health point of view, as a result of European populations showing a psychological resistance to changing feeding and hygiene practices before 1900s.

Recently, a new branch of studies emerged which integrated 'diffusion theory' into the analysis of mortality change (Montgomery 1998, 2000, Goldman et al. 2001, 2002), by bringing an emphasis on the process by which new health behaviors and attitudes are communicated through certain channels over time among social network members. Diffusion theory applications of mortality change have been used to study mortality transitions in less-developed, often rural and traditional communities. The main problems posed by classic diffusion theory are the questions of who adopts an innovation and how fast, while the variations between individuals in their capacity both to learn of and to decide for an adoption are explained by many contributing factors, including social and economic stratification, geographic conditions such as means of transportation, availability of communication networks, and

individual differences in the behavioral characteristics that govern both awareness and eventual adoption (Cavalli-Sforza and Feldman, 1981: p.39) Within demography, fertility is the field with the best known application of diffusion theory, where ideational change pre-transition populations can be assessed as one key determinant of 'contraceptive use' (Coale 1973, Lesthaeghe & Surkyn 1988)

Montgomery incorporated diffusion theory into the study of mortality by discussing death-risk conceptions that determine the motivations for modern health care. Arguing that the passage from socioeconomic change to individual perceptions of change is not immediate and may involve lags of significant consequence, Montgomery (2000) argued in particular for mortality declines in developing countries that individual perceptions should be expected to be diffuse, possibly biased upward in relation to the empirical risks, and probably rather slow to adjust to declines in those risks. Individuals' understanding of probabilities and risks in relation to the system of modern health care and its methods are not perfect, especially so when the probabilities are changing, but the usual perceptual difficulties are greatly amplified in the case of mortality since mortality decline is a process that is not fully exogenous, but involving a new set of social and political actors and institutions constituting the modern health care system, whose methods may not be initially accepted.

As in other cultural studies of mortality in the field of demography, the transition from traditional to modern is central in Montgomery's (1998, 2000) theoretical discussion. After drawing attention to the existence of traditional health practices in pre-transitional, high mortality populations, Montgomery explains that developments needed to produce sustained mortality decline are, first, that these traditional health care practices are redirected to the modern health care system; and second, that the modern health system obtains the resources it needs to supply effective health care. The redirection of traditional practices to modern health care system depends on perceptions at the level of families, where social definitions shape beliefs about the relative efficacy of modern health care in comparison to traditional alternatives. Here the main avenues for social learning and diffusion are the interactions with social network, involving discussion with peer groups and conversations with the better-educated, as well as messages from the media and modern health institutions.

In an empirical study, Goldman et al. (2001) draw attention to traditional health beliefs pertaining to the causes of childhood diarrhea, which is a major cause of death for children in rural Guatemala, and explore the diffusion of correct scientific ideas about its causes. Even though diarrhea is a disease transmitted by fecal-oral contamination and therefore strongly associated with the level of cleanliness in the household, the authors find that there are several common belief systems in these communities regarding what causes it, including the imbalance of hot and cold food and drinks, worms in the digestive system, improper eating (eating too slowly, too rapidly, or not at the right time) as well as classic folk beliefs such as empacho, evil eye/evil sprit and susto. This analysis shows that the primary mechanism for diffusion of correct ideas about hygiene is through social contacts, who are important conduits both for 'information' and 'norms'. The significance placed upon social learning through interpersonal contacts is thus a conclusion shared by Montgomery (2000), as a significant determinant of mortality outcomes in children.

Even though the diffusion branch of cultural theories is not as developed as some of the mainstream arguments initiated by Caldwell (1986) (and typically measured by 'social change' indicators of maternal education and autonomy) , cultural explanations as a group bring an additional insight into the study of mortality declines, which cannot be accessed by the study of macro- or micro-economic and institutional factors alone. Since the utilization of modern health care requires a switch from traditional health beliefs and practices to an acceptance of the medical causes of disease and methods in order to achieve substantial survival gains in infant and children, the next section will discuss the strong opposition between the structural and disunion theories of 'behavioral change', and ask whether this distinction is constructive in terms of broadening our understanding of mortality transitions across societies with diverse experiences.

c. The False Dichotomy between Structural and Cultural Explanations

While explaining trends, demographers look for fundamental forces of change that can be experienced in common within populations. The earliest theories of demographic transition by Notestein (1945) and Davis (1963) are examples of the socio-economic theorizing where social change is seen as primarily driven by economic forces.

One of the most pervasive themes in transition theory is that the modernization of societies changes the economics of child-bearing in such a way that fewer number of children become advantageous to parents. However, such this conventional perception of fertility decline as a rational accommodation to changes in objective economic circumstances has also been strongly challenged by a number of other studies that have shown that the onset of demographic change is not associated with economic indicators, but rather strongly influenced by cultural boundaries. While analyzing declining fertility trends, these works stressed the cultural and normative context in which reproduction occurs, and argued that the systems of values, beliefs and normative pressures needed to evolve first, before (reduced) fertility outcomes. Thus in contrast to the large body of theoretical work concerning the impact of modernization on the 'demand' for children, studies with a cultural emphasis were concerned with "the propensity to translate desires into appropriate behavior" (Cleland & Wilson 1987, p. 28), that depended on an ideational shift away from fatalism, the spread of new ideas to take control of one's own destiny and reproductive outcomes, and the accessibility of these new methods.

The socio-economic and cultural theorizing in the understanding of demographic changes correspond to the two major perspectives on behavioral changes; the structural and diffusion explanations. The structural explanations of behavioral changes seek their cause in the alteration of preferences and opportunities that result from either changes in positions that individuals occupy (individual social mobility) or from reshuffling of resources associated with a given social position (structural social mobility or redistribution of wealth), therefore inferring the expected behavioral change from the reading of individual socioeconomic positions (Palloni, 2001). Diffusion explanations and models, on the other hand, attempt to identify a "cascading mechanism" that leads to cumulative adoption by some individuals, even though their social position and the resources associated with them changes only trivially, or remains unchanged (Palloni 2001, pg. 68). This approach infers the expected behavior from the likely adherence of actors to ethnic, religious or cultural prescriptions and beliefs shared by others in the same community.

When new ideas and ways of behavior emerge, pervasive uncertainty in the population is natural, reflecting a lack of predictability, structure and information at that initial stage. While in both structuralism and diffusion explanations individuals make use of information drawn from many sources to help resolve the uncertainties and to

clarify the benefits and costs associated with their private decisions, one fundamental difference between the two approaches is that in diffusion models, the behavior 'spreads' and is adopted by individuals irrespective of their socioeconomic positions. Adopting the new behavior occurs as a result of reevaluation of one's choices in the light of other people's behavior, not as a strategic response or accommodation to a realignment of resources associated with one's position in the social system. One expectation is that as diffusion becomes more advanced with greater number of individuals having adopted the new behavior, the consequences of adoption become visible providing increasing and enriched information, the resistance of non-adopters fades away, and uncertainties about risks, costs and benefits diminish (Casterline, 2001).

Another important feature introduced in the diffusion models is the notion of 'individual thresholds' that might be different even in a micro-level personal communication network due to different combinations of psychological and social factors (Rogers 1983, Valente 1995, Palloni 2001). The notion is based on the idea that individuals may resist adoption only up to a certain point as the process proceeds within the group, therefore each individual is a carrier of a different threshold and can be characterized by this "unique individual-specific value identifying the percent of total adoption below which efficient individual resistance to adoption will be exerted" (Palloni 2001, p.95). Valente uses the term 'network thresholds' to compare the pace of adoption between the system- and network-level, thus incorporating another layer that would help to differentiate those individuals who adopt early in the diffusion process but are late relative to their immediate social network partners, from those who are the late adopters despite earlier exposure to the new behavior through network partners.

The channels by which diffusion spreads, on the other hand, are best addressed by Montgomery and Casterline (1996) who identify 'social learning', 'social influence' and 'institutional constraints' as the three distinctive elements of the process inducing change. Social learning that might take place interpersonally when the other actors in social network provide information, or impersonally when the information set is shaped by communication emanating from impersonal sources such as the mass media, is defined as the "mechanism by which the powerful but otherwise abstract and remote forces of modernization can be rendered intelligible to individuals in the form of stories, examples, and metaphors"(1996, pg. 160).

A second distinctive element of the diffusion process, 'social influence', refers to the product of interpersonal interactions that derive their power from factors that are 'intrinsically' social and expressed in individuals' information sets and final preferences. The avoidance of conflict in social groups, in the form of social conformity or the pressure to be similar to others, is the primary motivation in social influence. Lastly, the identification of 'institutions' as a key element draws attention to how established institutions have the power to enable or restrict individual behavioral choices, either by becoming most pertinent to changes in behaviors, or on the contrary, becoming resistant to changes. Institutions produce rather slow but strong 'social' effects in the sense they are one means through which the actions of some individuals might affect the attitudes and behaviors of others, as seen in the influence of systems for delivery of contraceptive and health services on reduced fertility outcomes.

Even though the diffusion explanations on fertility behavior, which often relied on the speed with which marital fertility due to birth control can occur in culturally homogeneous populations, emphasized diffusion's pervasive nature in all economic sectors, this neither testifies to the insignificance of micro-economic forces, nor justifies the exclusion of socio-economic determinants from diffusion models. Theorizing about social structures and positions that individuals occupy in them has significance due to their conditioning effect on decision-making processes that lead to the adoption of new behavior, and potential constraints faced during this process. Behaviors are 'responsive' to structural factors and diffusion processes that create changes in behaviors cannot proceed independently of socio-economic factors that characterize the environment where individuals act and decisions take place.

In turn, socio-economic theories have a lot to incorporate from diffusion theory, and its central concepts, including 'social networks', 'individual thresholds' and 'social learning and influences'. Without diffusion models, we miss the emphasis on the spread of new ideas as a requirement for social change in societies, and tend to neglect the cultural and traditional obstacles that may delay individual transitions into modern behaviors. This is problematic in pre-transitional and transitioning populations characterized by high levels of mortality and fertility, where the new ideas or methods to be adopted are often of Western origins.

Even though the studies of socio-economic determinants, and of cultural determinants of behavioral change have evolved rather separately, we conclude that the explanatory power lies not in culture versus economics, but in culture and economics. There are not many studies that do not exclude neither type of variables from consideration, but the relevance of both group of factors to the understanding of behavioral changes is empirically proven by findings in classical studies such as that by Rogers (1987), who argues that the early adopters in the social system are no different than late adapters except for higher levels of literacy and education, and in general, higher levels of social status and upward social mobility. Another well-known contribution is by Burt (1987) and his 'structural equivalence' argument, based on the idea that the relations between individuals can be evaluated as a function of similarity of structural positions occupied within a given network or in the wider social system, rather than being swayed by the overall prevalence of certain attitudes and behaviors in the social network.

More recent theoretical work has shown that individuals are more affected by the attitudes and behaviors of those persons with whom they share a 'structurally equivalent network position' (Casterline 2001). Palloni (2001) suggested that as the process of adoption of an innovation progresses, the social and economic environment are modified by the process of adoption itself. Durlauf and Walker (2001) described the parallels between the view that diffusion and structural change is inseparable, and the emergent economic theory of social interactions where "the role of individual incentives emphasized by economists are integrated with the social norms and networks stressed by sociologists".

Theories examined in the previous sections show that the structural and cultural arguments of mortality decline explain the reduction in death rates as a product of one of the two fundamental sources of change at the societal level; as primarily a function of structural changes, or somewhat independent of changes in social and economic structures and dependent on the diffusion of certain knowledge and attitudes. In the case of infant and child mortality, this distinction becomes more specific as the one between the knowledge of, and attitude towards diseases, hygiene and nutrition, on the one hand, and material standards of living, on the other, determining access to nutrition, healthy environments and medical treatments. If ideally neither group of structural and cultural factors

should be dismissed from the analysis of mortality, as demographic evidence suggests, we end up with the question: How can we formulate a theory or framework that improves on what we have?

The answer is: in two steps. The first step is the introduction of a conceptual precision and a more granular description of health improvements and mortality decline. The second step is a formalization that would help to implement into models the socio-cultural conditions from which mortality consequences stem. The conceptual foundation and formalization are developed and refined in Part II and III respectively. Part II starts with the brief discussion of a intermediate-variable framework from the area of fertility studies, which would help in the next step to be more specific about what exactly it is that matters in a particular mortality decline.

PART 2. Exposure, Resistance/Recovery and Mortality

In the field of fertility, the study by Davis and Blake (1956) is primarily concerned with the role of 'institutional' factors in producing higher rates of reproduction in underdeveloped regions than in industrial societies. 'Institutions' refer to 'social structures', such as family and kinship organization, agricultural or industrial mode of production, or mechanisms related to control of property. For Davis and Blake, high fertility consequences stemming from cultural reasons are 'by-products', often being unanticipated and unrealized by members of the society. The framework that the authors suggest is based on a classification of intermediate variables through which any social (i.e. cultural) factors influencing the level of fertility should operate, and is followed by a broad outline of how some types and elements of social organization, acting through these variables, appear to enhance or depress societal fertility.

By formulating that any cultural factor affecting fertility must do so in some way classifiable under one or another of the eleven intermediate variables, Davis and Blake group these variables as (i) those affecting exposure to intercourse (e.g. the age of entry into sexual unions, proportion of women never entering sexual unions, voluntary or involuntary abstinence), (ii) those affecting exposure to conception (e.g. the use of contraception, fecundity or infecundity) and (iii) those affecting gestation and parturition (fetal mortality from voluntary or involuntary reasons).

Davis and Blake factors are directly related to the three necessary steps involved in the process of human reproduction; intercourse, conception, and gestation and parturition. Societies differing in their social organization do not necessarily have different values (i.e. effects) with respect to all the variables, due to which the framework is able to accommodate a wide range of cultural influences on fertility across different stages of the reproduction process, including those related to the 'arranged marriages' often early in the lifetime of prospective mates, 'restrict extra-marital intercourse' in some societies, 'social insulation of the two sexes' that is particularly observable in regard to sexual behavior which tends to be surrounded by taboos and rituals, 'occasional' taboos on gestational abstinence, and 'post-widowhood celibacy' in pre-industrial cultures where the widow is subject to a distinct prejudice against remarrying.

Since the main goal in the current part of the paper is to define a more precise conceptualization to approach the granular mortality gains, the next section starts with a discussion of a framework for infectious disease mortality, that would be helpful in a way similar to the intermediate variable framework of Davis and Blake in fertility analysis, in terms of which the relevance of cultural factors to mortality can be judged.

a. The Framework

At least until the 1940s, excess mortality rates in less-developed countries reflected the disproportionate disadvantages to which young children are exposed under conditions of 'slow' socio-economic development. In the wake of World War II, however, substantial and fast declines in mortality that were achieved in these countries were attributed to the import of medical technologies from industrial nations, introduced and diffused to populations through wide-scale public health interventions. In contrast to the effects of income increases on mortality that are slower to act and more likely to be scattered, public health measures have had a biologically superior effectiveness, with the ability to act immediately to protect populations from deleterious health consequences of the existing infectious diseases.

One early country-specific yet strong demonstration of the power of effective and pervasive public health measures is Japan, which held a unique place in modern mortality history as the first non-Western country to make

the epidemiological transition from cause-of-patterns dominated by epidemic and endemic infectious diseases to patterns dominated by degenerative diseases affecting the older age groups. What singled out Japan was the exceptional government inputs in public health from the 1870s onwards, which brought death rates down even in the absence of meaningful increases in income and nutrition levels (Johansson & Mosk, 1987). Studying the case of Japan, Johansson and Mosk (1987) argue that the continuing debate over the principal determinants of mortality change may be in fact re-framed as a dispute over which factor is more important in preserving health and reducing mortality: protection from the major causes of premature death, which is delivered through means of public health, or the maximization of human body's natural resistance to those diseases most responsible for artificially shortening life, through nutrition. The answer from a biological stand-point is that protecting members of a population from the most lethal forms of disease is as important as the threshold standards of nutrition below which survival chances are dropped significantly.

The framework proposed by Johansson and Mosk (1987) for infectious disease mortality; 'Exposure and Resistance/Recovery framework', is based on the idea that there are two major factors that are involved in the differential distribution of disease levels in any one population at any one time, and over time: (i) protection from exposure to lethal pathogens, and (ii) resistance to/recovery from exposure. Each of these factors has two components: a natural one, and one that is achieved through investments at the community and household levels. For instance, a high degree of protection from diseases achieved in remote rural populations and relatively healthy ecological settings is 'natural protection'. In urban areas, on the contrary, protection from exposure is achieved by 'publicly managed' control measures, with the ability to significantly modify and manage disease environments, such as piped and pure water, clean milk, vaccination campaigns, or quarantines. These public health measures can effectively onset low standards of living.by acting immediately to protect the population from exposure to certain diseases, characterizing this type of mortality achievement as a product of choices made by governments.

The complex of variables that belong to the resistance/recovery set of factors also has a natural component, and an unnatural one that is achieved through investments. Natural resistance involves many processes through human body's immune system, and is not constant but varies exogenously with the prevalence of acquired immunity

to specific diseases, the pathogen virulence, the frequency and intensity with which exposure takes place, and the degree to which individuals and populations are chronically or acutely stressed. At the household level, resistance and recovery depends on various factors including home nursing care, compliance with medical information, ability to purchase medicine, and other factors that are closely related to living standards, such as housing conditions in terms of space and warmth, clothing, and nutrition. At the community level, resistance and recovery are achieved through the provision of medical care and information, antibiotics and vaccinations, but also by broader welfare measures in the form of financial aid or social insurance.

b. Illustration of the framework for infant and child mortality

This section will illustrate some of the applications of the Exposure x Resistance x Recovery to address the problems of disease processes leading to deaths in infants and young children. If at any given time, the early-life mortality will reflect the balance between 'factors of exposure' that establish barriers between disease pathogens and hosts, and the 'factors of resistance / recovery' that influence the immunity or susceptibility of hosts, and the biological response to combat disease in hosts, the mortality determinants of a variety of nature that particularly affect children can be grouped under these dimensions. For instance, living in overcrowded housing conditions due to poverty may increase the risk of 'exposure' to infectious agents, especially if one of the children in the household is already infected, and malnutrition can be seen as a predisposing condition determining resistance to disease.

The exposure, resistance and recovery factors that result in the mortality of children under age five can also be broken down to components that are natural, or achieved by investments at the community and household levels. The natural factors in each category is similar to ones in the original framework: Natural protection and natural resistance/recovery are achieved by effects that operate at the ecological and biological levels respectively, such as climate or altitude, and genetically determined characteristics of the immune system. Protection from exposure that is achieved by investments at the household level are based on behavioral traits such as personal hygiene and food preparation and storage practices, whereas resistance and recovery of infants and children are achieved by factors related to living standards such as nutrition or housing space or warmth, and others such as home nursing care or

purchase of medicines. Investments at the community level, on the other hand, are extremely significant in terms of introducing parents to scientific medical methods, with consequences that protect from exposure from infection, and enhance resistance and recovery in the case of contracted infection. These type of public investments require additional layers of health infrastructure that specifically target pregnant women and young children, among which the provision of prenatal care by maternal and child health care units and trained medical personnel, immunizations against infectious diseases, and the medical methods of treatment for sick children, seem to be the most significant.

Lack of prenatal care implies lack of protection from exposure to most common risk factors that often result in neonatal deaths, involving both infection and obstetrics as the main causes of death. One common risk factor in the absence of prenatal care is neonatal tetanus that was once noted for its 'peculiar quietness', and has been frequently under diagnosed and underreported by health authorities in developing countries (Gray 1989, p. 40). The disease is caused by the contamination of the umbilical cord stump due to unhygienic methods for the ligation and dressing of the severed cord, and the onset of illness with unremitting muscle spasms is between three and twenty-eight days of age. Protection from this condition can be provided by the vaccination of the mother, which is why the incidence of neonatal tetanus itself directly reflects lack of obstetrical care, condition of delivery practices and environmental contamination as sources of tetanus spores. Low birth weight due to intra-uterine growth retardation is another major risk factor in the neonatal period, and untreated infections during pregnancy is a common cause of low birth weight. Prenatal care ensures prevention and treatment of infectious diseases among pregnant women including the treatment of STIs, and the management of medical conditions such as anemia, as a result of which, the risk of adverse outcomes, e.g. low birth weight, is substantially decreased.

If exposure to infectious disease agents has already taken place, protection from the disease primarily depends on whether the host can resist to and stay immune against the disease. As mentioned above, malnutrition is a great risk, since it predisposes children to infectious diseases. Additionally, a 'recurring' disease in malnourished children is likely to be more severe, prolonged, and carry an increased risk of death or permanent damage. In spite of these generalizable effects, it is also known that not all infections are affected in the same way (Lunn, 1991). For instance, while nutritional status can exert an strong effect in the case of tuberculosis, other respiratory infections, diarrhea,

intestinal parasites, cholera and measles, its influence is variable in the case of diphtheria and influenza, and only slight in the case of smallpox, yellow fever, malaria and tetanus.

When the reverse relation between infection and nutrition is studied, there found to be multiple mechanisms of weight-faltering during illness (Scrimshaw 1968, 1997). Virtually all infections are associated with some degree of anorexia and this is particularly marked in children. Episodes of pain, vomiting, abdominal distension, fever and general malaise undoubtedly decrease the appetite. Exacerbating the anorexia, however, is the widespread tendency for normal foods to be withdrawn during episodes of illness and replaced by a more liquid diet with diluted levels of most nutrients.

Secondly, food may not be effectively absorbed even when it is consumed. For example, diarrheal diseases of virtually any origin are associated with decreased absorption of all three major nutrients - carbohydrate, fat and protein, in addition to vitamin deficiency. Thirdly, 'metabolic changes' may occur since inflammation occurring in response to any infective organism, even the mild challenge imposed by vaccination, initiates a series of biochemical reactions within the body known collectively as 'the acute-phase response'. This is the process by which the body mobilizes tissues and reserves to provide energy and substrates to fuel the response to infection.

A final mechanism through which infection deteriorates nutritional status operates through 'catch-up' growth. During illness energy stores of glycogen and fat are used up, but the major cause of weight loss and the most difficult to replace post-infection is the loss of protein from skeletal muscle. Following an infection, a well-nourished child markedly raises his food consumption and can quickly make-up the nutrient-losses suffered during the illness. On the other hand, for a child who lives in an area of limited food supply, the substantial increase in intake required is simply not available, and the rate at which catch-up occurs depends by heavily on food supply. Therefore, in areas where infections are frequent, this restriction will mean that individuals are unlikely to recover their pre-infection rate before becoming ill again. In this context, growth faltering becomes cumulative with each episode of illness and results in a gradual downward spiral in nutritional as well as in health status.

Vaccines are critical because they provide an acquired immunity that creates immunological memory after initial response to a specific pathogen, leading to an enhanced response to subsequent encounters with that same

pathogen. Vaccination is one of the two major determinants of resistance in infants and very young children other than nutritional status, and effective against many traditionally fatal diseases such as respiratory tuberculosis, smallpox, diphtheria, malaria or measles. In contrast to prenatal and delivery services, immunizations are provided exclusively by formal practitioners through both immunization campaigns that visit most cities and towns, and locate children in their households, and regular clinic-based services. On the other hand, if the child is already exposed to disease pathogens and not able to resist the spread of infection, there are only two possible outcomes: He / she will either recover from, or succumb to disease. At this stage of infectious disease morbidity, process of recovery depends on whether the child is medically treated and attended by pharmaceutical drugs, particularly by anti-biotic and sulpha-drugs, in addition to his/her immunological response or ability to recover from disease.

The Exposure x Resistance x Recovery framework has the virtue of synthesizing the most commonly cited proximate determinants of mortality that are biological, social and economic, giving each a "potential role" but implying "nothing about the relative contribution of a single factor to any particular historical case" (Johansson & Mosk, 1987, p.214). The framework does not favor one structural explanation of mortality change over the other, assigning to both nutrition and public health investments a significant role due to their parts in providing resistance to disease, and protection from exposure to disease respectively. Even though an adequate access of the population to the benefits of higher standards of living is more difficult to accomplish than the diffusion of more accessible medical technologies, the model does not neglect the role of socio-economic factors in primarily affecting dietary intakes, and the incidence and severity of infections. It also aligns with the argument that the effects of medical innovations are conditioned by socio-economic development, as medical treatments alone do not suffice, but need to be supported by the lifting of constraints in feeding and health practices and a transformation in hygienic conditions, both dependent on socio-economic status of households.

In addition to the economic and institutional factors, the balance between exposure to infectious agents and resistance to infection on the part of members of a population, can theoretically be influenced by a variety of 'cultural' factors in addition to structural ones. For instance, Landers argues that such balance may be substantially different across subgroups in a population, defined geographically and culturally in addition to socio-economically,

resulting in a "segmented" epidemiological regime under such circumstances (1992, p.4). Johansson and Mosk draw attention to how their framework provides a basis for understanding why maternal education has frequently appeared as a socio-economic correlate of infant and child mortality change in developing countries, and the most important determinant of mortality differentials at the sub-national level (Johansson & Mosk 1987, p. 214-215).

Overall the framework offers an opportunity to be more specific about what it is that matters for infant and child mortality decline, similar to the intermediate-variable framework of Davis and Blake (1956): We can similarly hypothesize that the factors through which, and only through which, cultural conditions affect mortality should do so through one of the components of the Johansson and Mosk framework. However, even though the framework is able to synthesize the contributions of a variety of economic, institutional and cultural factors to mortality reductions, we are still limited in the sense that the structural-cultural contrast can now be carried out for each of the three dimensions of exposure, resistance and recovery. The remedy for this problem is a new 'behavioral' model for the study of mortality decline from infectious diseases, which would make use of the Exposure x Resistance x Recovery as an intermediate variable framework through which any non-structural factor (in addition to structural) should operate. This is the main goal in the next part of the paper that will take the reader for a detour of fertility arguments, which is helpful for what needs to be done in the case of mortality. To this end, the next subdivision summarizes the state of affairs in fertility by drawing attention to a theoretically similar false opposition between structural and cultural determinants of fertility decline, and by introducing an adopted solution that moves beyond this dichotomy, before presenting for the case of mortality a formalization of an integrated theory.

PART 3. A New Conceptual Framework for the Study of Mortality: Ready-Willing-Able

a. Behavioral Change and Fertility Transition

Demographers have long struggled to explain differences among countries in the timing and speed of fertility changes as well as how prior mortality declines, socioeconomic changes, organized family planning programs and the diffusion of various norms and ideals related to childbearing contribute to these differences. Among these different explanations, the theory of demographic transition had emerged as the overriding paradigm, which explains that the

modernization of societies changes the economics of childbearing in such a way that high fertility becomes disadvantageous to individuals. Decline in fertility is thus seen as a "rational, though perhaps lagged, accommodation to changes in objective economic conditions", as the shift from familial and agricultural to larger-scale modes of production reduces the labor utility of children while increasing their cost. Being developed as a branch of the theory of consumer choice, the demand theory approach to fertility was later advanced with the work of Becker with his emphasis on a trade-off between the quantity and quality of children.

These micro-economic approaches to fertility transitions were later advanced by studies that combined the economic decision-making process with the social and biological constraints to which it is subject. In fact, the empirical record appeared to reject such simple statements of demographic transition theory, and showed that changes in reproductive behavior are only loosely correlated with economic and social change, as they tend to occur at different paces. Two very important studies completed in the mid-1980s, the Princeton European Fertility Project and the World Fertility Survey, both demonstrated that the structural explanations were not enough to explain the fertility transitions in both developed and developing countries: The Princeton European Fertility Project analyzed aggregate historical demographic data from the time of fertility transition in Europe, approximately from 1880 to 1930, for many of the provinces in the region, and the World Fertility Survey was based on a cross-sectional surveys of women in developing countries. Both datasets showed the inability of demographic transition theory to accurately predict the timing and pace of fertility transitions, and directed attention to the relative importance of a different set of factors that contributed to fertility decline within particular 'cultural' contexts.

This way, the findings of the two major research projects prompted attempts to articulate how diffusion processes might be affecting the timing and pace of fertility change (Bongaarts and Watkins, 1996, Knodel and van de Walle, 1979; Cleland and Wilson, 1987; Coale and Watkins, 1986), as an alternative to the theories relying on rational decision-making in response to economic and structural change. Cleland, for example, noted that the fact that parental education and cultural factors as denoted by language, ethnicity or region emerge as major independent determinants of the onset of decline is more consistent with ideational than structural theories. What set diffusion explanations apart from the mainstream economic theories was that fertility decline is not simply an adaptive

response to changes in material domains, but that it reflects the spread of certain key attitudes (e.g., about the costs and benefits of children) and behaviors (e.g., birth control strategies).

For most scholars who have argued the case for diffusion theory, one crucial point was that the spread of attitudes and behaviors is not bound tightly to societal changes, but rather has an 'independent' dynamic of its own with the ability to account for a unique portion of the variation in the timing and pace of fertility change. However, with the exception of Cleland and Wilson (1987) who argue that diffusion theory can substitute for theories that feature economic and social structural changes, a more common stance was that the two sets of explanations are complementary, not competing, and that diffusion theory adds further independent factors to an enlarged theory of fertility decline. That is, theories about economic development and theories about diffusion are both rational explanations for fertility transitions, and it seems quite plausible that people change their fertility behavior in response to changes in their socioeconomic status, changes in their knowledge about and access to contraceptives, and changes in norms about family size.

Related arguments are presented by Lesthaeghe and Surkyn, who compare the cultural dynamics and economic theories of fertility change (1988). After mentioning an increasing fragmentation and even competition between various social science disciplines on fertility and family formation, the authors draw attention to particular opposition between economics and sociology of behavior, which have each created their own social realities, different goals and methodologies. The article attempts to reintegrate the sociology and economics of fertility after stating that each has been able to provide workable and systematized theories about preference formation. However, authors' main focus is on the cultural change in preferences, values and ideational goals, as past empirical work has produced a patterning worthy of further consideration and integration. Their approach does not underplay the importance of material conditions, changes in opportunity structures, the role of human capital and cost-benefit calculation, but rather recognizes that ideational goals must be structured as they are never random or constant. Universes of meaning are constructions of reality in the sense that they are grounded in a social base with a social, economic and political order.

This means that ideational systems; individual and shared meaning structures, also undergo economic, political and environmental change, which may lead to the alteration of knowledge, beliefs, attitudinal systems, values and

other significant symbolisms among individuals. When Lesthaeghe and Surkyn focus on the building of ideational systems and patterning of preferences within societies, they find it to be strongly related to the particular social stratification systems (1988). Following the classic theses of Tarde (1890) and Sorokin (1947), the authors argue that cultural innovation takes place in the highest social strata as a result of privilege, education and concentration of resources, whereas the lower strata adopt the new preferences only through imitation. Unless the code is transmitted, the coded item will remain within the cultural domain of the initiated (Bourdieu 1979, pg. 14-15), therefore social stratifications potentially may inhibit such downward cultural mobility, which otherwise can only be enhanced if the boundaries between classes are less distinct.

If it is assumed that social stratification remains at the same level of rigidity so that the boundaries between classes do not structurally change, does behavioral change take place immediately once material conditions improve at the level of individuals and families? Lesthaeghe and Surkyn argue that upward 'economic' mobility may not always be accompanied by ideational changes in family and household systems, which they discuss by referencing the Chicago School's assumption of the 'endogeneity of preferences'. The assumption emphasizes the translation of the changing material conditions through a cultural filter, and is set against the classical utility theory that would explain the formation of new tastes and the upward movement on the hierarchy of needs as a result of greater affluence. In contrast, endogeneity assumption holds that the changing material conditions are not sufficient to produce a cultural shift in some domains whereas in others such shifts may occur without any increased affluence.

b. Formalization of the framework for the study of fertility

According to Coale (1973), earlier explanations of historical fertility decline with their almost exclusive focus on either the macro- or micro-level economic causes (e.g. quantity/quality swap and structural modernization explanations: urbanization, industrialization, rising income and literacy levels, and mortality decline) were missing crucial ingredients. Coale proposed a new theory based on a set of three preconditions, readiness, willingness and ability that had to be jointly met for a successful fertility transition to take place. One critical assumption of the model is the presence of an 'unmet need' before transition into the new form of behavior can occur, which refers to the use of contraception in the case of fertility.

In his review of the European fertility transition, Coale identified three conditions: a) Fertility must be within the calculus of conscious choice and parents should consider it an acceptable mode of thought and form of behavior (Readiness: R), b) Reduced fertility must be advantageous and perceived social and economic circumstances must make reduced fertility an advantage (Willingness: W), and c) Effective techniques of fertility reduction must be available, and procedures that will in fact prevent births must be known (Ability: A). The outcome variable success (S) with respect to the adoption of a new form of behavior is dependent on meeting the three preconditions jointly formulated as:

$$\mathbf{S = R \cap W \cap A}$$

Following this formulation, Lesthaeghe and Vanderhoeft (2001) provided further adaptation of conceptualization. Lesthaeghe and Vanderhoeft (2001) conceptualized the readiness condition differently than Coale: Couples adopt a new form of behavior only if this yields a number of benefits for them and for their already born children. These new forms of behavior must be advantageous to the actor, in other words, their utility must be evident and outweigh their disutility. Formulated this way, the condition of readiness simply refers to the micro-economic cost-benefit calculus that actors utilize in decision-making processes.

For Lestheghe and Vanderhoeft (2001), the notion of willingness refers to the considerations of legitimacy and normative (mainly ethical and religious) acceptability of the new pattern of behavior. This evaluation occurs against the backdrop of internalized normative structures existing in societies at any point in time. The basic question addressed by willingness is to what extent new forms of behavior run counter to established traditional beliefs & codes of conduct, and to what extent there is a willingness to overcome moral objections and fears.

The willingness condition represents the moral dilemma and cultural lag during the transition into a new mode of behavior. The European Fertility Project has linked it to the concept of secularization, referring to the reduced credibility given to religious prescriptions. However the condition may be conceptualized more generally to refer to the legitimacy of interfering with nature / with a 'natural order' as a cultural construction. This way, it deals with the belief in the power that individuals have to alter this natural order, therefore depends on dimensions such as 'fatalism versus self-directed destiny'. Lastly, it takes into account individuals' trust in modern institutions and their

public services as one component of acceptability. Perceptions and social definitions play a key role in the acceptability of the new mode of behavior as they shape beliefs about the relative efficacy of modern health care methods when compared to the traditional alternatives.

The last condition of ability was formulated the same way as in Coale's conceptualization: This condition requires that the effective means of achieving the desired outcome are available and accessible, and procedures that will produce fertility limitation are known by the couples. The ability condition represents the economic dimension with an emphasis on the technical means, which are material, legal and organizational (often at the macro-level).

Lesthaeghe and Vanderhoeft (2001) provided further modeling by introducing heterogeneity of R, W and A scores at the level of individuals, and traced how new innovations are adopted under different conditions of shifting population distributions of R, W and A (see Figure I). If the outcome variable success (S) with respect to the adoption of a new form of behavior is dependent on meeting the three preconditions jointly, and if R, W, and A are distributions on a zero to unity scale, then for an individual i:

$$\mathbf{Si = Min\ (Ri\ ,\ Wi\ ,\ Ai\ )}$$

For each individual in a population, a score is available on all three preconditions. Lesthaeghe and Vanderhoeft formulated S to be a continuous variable, and therefore also assumed that R, W and A are continuous and take a score between 0 and 1. In this formulation, a score of 0 for R means that limiting fertility would have zero advantages and only entail disadvantages. A score of 0.5 is be the typical situation where advantages and disadvantages are in perfect balance, and a score of 1 indicates that there are only advantages perceived to be associated with adoption of the new behavior. Accordingly, a score of 0 for willingness show that fertility control is ethically or religiously totally unacceptable, a score of 0.5 identifies the point of indecision, and a score of unity indicates that there are no moral or cultural obstacles to adopting the new form of behavior. Finally, a score of 0 for ability means that the individual has no means of controlling fertility, a score of 0.5 implies that there would be only ineffective traditional methods, and a score of 1 correspond to complete ability in controlling fertility.

This is the weakest link model where the smallest of the three scores determines the outcome. For instance, precondition A would be bottleneck if Ai is the lowest score: the individual is highly ready and willing, but has few

means of controlling the outcome. The authors explained that what would be equally appropriate to the weakest link model is using an index that would convert these scores into a dichotomy (controller/non-controller) if the score on the outcome variable is larger than a given cutting point, for example, 0.5. The values larger than 0 but smaller than 0.5 would be converted as not-ready, not-willing and non-able, whereas scores belonging to the other half of the scale would be converted as ready, willing and able following the three preconditions of the model. If two of the three preconditions take a value above the cutting point, then the lagging precondition would be the bottleneck, that is responsible for delaying the adoption of the new behavior.

Lesthaeghe (2010) discussed that the conceptual model built around "ready, willing and able" may have many applications in a variety of fields and may apply to any matter that has both an economic and moral dimension. A number of important features of the R-W-A paradigm are identified:

1. No transition to a new form of behavior will occur for as long as one of the conditions is not adequately met. This lagging condition constitutes a bottleneck or a limiting condition.

2. If two conditions are met, whereas the third still shows a great degree of heterogeneity, then the maps with leads and lags of the dependent variable will strongly reflect the spatial differences that exist in that third condition. For instance, if Readiness and Ability would no longer be issues, then the adoption of a new behavior will be determined mainly by the degree of Willingness. Similarly, if there are no cultural, legal or technical obstacles, then the perceived differences with respect to the economic utility of the new form of behavior, i.e. differential Readiness, will determine differences in outcome.

3. Any of the three, R, W or A, can be the limiting condition, and this will depend on the historical context and the nature of the outcome variable.

4. It is not necessary that a single condition remains the limiting one during the entire transition process. In fact, the slowest moving condition at the onset can be “leapfrogging” over the others, so that another condition can become a new bottleneck later on.

5. The model draws attention to a variety of conditioning factors of an economic, cultural, institutional or technical nature, and is sufficiently flexible to accommodate a wide variety of historical experiences.

6. The R-W-A model typically produces the well known elongated S-shaped growth curves (e.g. Verhulst's logistic growth curve) during this process of increasing adoption of a new form of behavior, and it is fully compatible with the "contagion"-model of diffusion.

7. But the R-W-A model does not exclude the possibility for the emergence of a subgroup in the population which follows a different pattern or evolves at a different speed of change. In that case, more heterogeneity will appear, with subgroups that meet all three conditions and others that meet just one or none at all. Also backlashes are possible with a subgroup reacting to the changes occurring in the mainstream population. The outcome can be bimodality as far as the new forms of behavior are concerned, or a long drawn out distribution with respect to both opinions and behavior.

8. As a result, the R-W-A model stops the debate between the economics and the sociology of behavioral innovation and diffusion: any of the three conditions can be the limiting one, and it is that one which will essentially produce the differences in outcome.

Given its main features, the R-W-A is a potent framework for the study of innovations and behavioral changes as it presents the patterns in the shifting or overtaking distributions of readiness, willingness and ability in a population over time. Because any condition can lead or lag, the model is flexible and dynamic, and is open to historical and contextual influences. When the willingness factor, therefore the cultural acceptability and legitimation, is the slowest moving distribution in transitions, this situation signals that the demographic maps are shaped by 'cultural evolution'. Persistent differences that are mainly produced as a result of different degrees with respect to willingness do not imply that the other two conditions, readiness and ability, are irrelevant. Actually quite the opposite is true; the readiness and ability conditions are needed to be met to a significant degree, otherwise, the role of the willingness factor cannot emerge as the one that produce the lags.

c. Formalization of an integrated theory: the case of mortality

i. Behavioral change and mortality transition

If Coale's model can conceptually be applied to behavioral changes with both an economic and moral/cultural dimension, the R-W-A framework can be used to study behavioral changes in relation to the utilization of modern

health care methods in societies undergoing mortality transition. The import of health knowledge and modern methods to non-Western countries can be associated with substantial infant and child mortality reductions, only and only if these 'new' methods are adopted on a wide-scale in populations. The limits of adoption, however, are conditioned by a set of economic, institutional and cultural characteristics that can be assumed to be peculiar to societies.

Therefore, unique combinations of these factors during the process of a continued health transition from high to low mortality levels may result in successful and rapid mortality decline in some countries, whereas the stalled transitions and lags of significant consequence may be the defining features in others. In the case of infectious disease mortality that affects infants and young children in particular, R-W-A paradigm can be applied to parents' decision-making processes regarding the health of children, where the use of a modern medical method, either preventive or curative, can be assessed as the new behavioral outcome. Whereas the outcome variable success would be formulated to refer to successful transitions to the use of a variety of maternal and child health-care services, a wide-scale adoption of these methods would depend on the all three conditions being met to a significant degree at the population-level.

One contribution of the R-W-A framework to studies of mortality is its analytic focus on the 'health decision environments' at the household level, which might show variations according to the economic and cultural characteristics of families, and division of social roles between individual family members. At the household level, matters related to health of children and concerning the utilization of modern medical methods, are discussed in familial decision-making environments that are themselves positioned within the broader economic, social and institutional structures. In health decision-enviroments, the agency that refers to individual family members' capacity to make health choices, is restricted by these endogeneous structural effects, including a country's performance in socio-economic development indicators, and to what extent public health investments and general health infrastructure are evenly distributed across space, including the most remote rural locations.

Other than these broad societal factors, however, the R-W-A model has the capability to capture the most important determinants of formal health care utilization in families, by building a bridge between the financial

abilities and cultural family characteristics, and modern health institutions and their services. Consequently, the framework "puts us on the path of confronting permitting versus limiting conditions, or more classically, on the path of detecting sufficient, necessary or non-redundant conditions" (Lesthaeghe, 2010) in mortality and health transitions, especially in societies that experience lags that cannot be exclusively explained with economic reasons. Applications of R-W-A model might give results suggesting that cultural beliefs and attitudes, and moral and religious objections to modern health methods, are the bottleneck that is responsible for delays in mortality trends.

ii. Formalization

In mortality analysis, the first of Coale's conditions would require that parents are "Ready" to improve the health and well-being of their children, in the sense that they would engage in the classic cost-benefit calculus with regard to the new form of health behavior. Readiness condition requires that parents consider their health options within the calculus of conscious choice, thus a rejection of fatalism, and taking control of one's own children's survival chances, are the most important prerequisites of the readiness condition. The requirement will not met if parents leave it up to God to determine children's health outcomes, while rejecting any rational consideration of medical options available.

The second condition 'Willing' would require that the moral dilemma related to the use of health care services is no longer relevant, as a result of which new forms of health behavior become culturally acceptable to parents. As different from the readiness condition which represents parental awareness and rationality in decision-making, the willingness condition emphasizes the societal constraints imposed on parents but more often on mothers, by traditional family and community relations, with the potential to delay transitions despite the recognized benefits fulfilling the 'Ready' condition.

It should be noticed that in contrast to the readiness condition that deals with the 'legitimacy' of interfering with a natural order of events and taking control of children's survival chances, the willingness depends on the 'power' that individuals have to alter the natural order and therefore, on the degree of previously internalized traditional beliefs and codes of conduct, as well as the severity of sanctions attached to the breaching of normative

prescriptions. It is here that the systems of gender and age stratification within extended, traditional families and culturally homogeneous communities might exert significant influences on health outcomes in children, through operating on, limiting or enabling parents' actions, therefore modifying their willingness to engage with new health behaviors.

Coale's last condition of ability would require that the effective means of using formal health services for children are available and accessible for parents. As opposed to the other two conditions which represent the cultural determinants of health transitions, the essence of the ability condition is structural; both economic and institutional. When not met, the condition either emphasizes financial obstacles, or legal and organizational difficulties that deny parents' access to modern health care services that would otherwise significantly improve newborns' and children's mortality risks.

Based on this reformulation of the three conditions of the model for mortality would respectively require that family members engage in rational modes of thought regarding the use of foreign-origin maternal and child health services, that they consider them favorably and are willing to transition to these new but now culturally acceptable forms of behavior, and finally, that these methods are available and accessible. In this formulation, the ability condition represents the structural determinant of change in health behaviors, formulated to assess families' economic well-being and the institutional accessibility of health facilities, to the extent that they would or would not allow the new behavioral transitions. The other two conditions represent the cultural determinants of change in health behaviors, and their formulation can accommodate the shift from uncertainty, error and misconceptions to the correct perceptions and social definitions of mortality risks, both in the early stages of mortality decline and over time, due to social influences, learning and the diffusion of information either from inter-personal interactions in social networks or impersonal sources.

But to what are we to refer the three dimensions of R-W-A? Answer to this questions leads us to the distinction made between Exposure x Resistance x Recovery in Johansson and Mosk framework (1987), to keep our focus on the most influential axes of factors in infectious disease. These central dimensions are integrated into the R-

W-A model as outcome 'success' variables, where prenatal care is an important determinant of 'Exposure' in infants, vaccination gives 'Resistance' to children, and medical treatments provide "Recovery" from disease.

iii. Decomposition of changes in infant mortality rates

The RWA model with the above formulation of three conditions locates individuals in one of the eight classes established by the three-way classification of the model, ranging from those Ready-Willing-Able (RWA), to none of these three (raw). In order to decompose the difference between rates or proportions:

Let C (j,t) be the proportion of individuals in group j in year t

Let Q(j,t) be the infant mortality rate (predicted average in the group) of individuals in group j in year t

Let Q(t) be the mortality in year t

The following equation can help us estimate how much of the changes in Q (jt) over time are due to changes in composition of population and in changes in the Q(j,t)'s:

$Q(t)=\Sigma j \; Q(j,t)* C(j,t)$

The equation indicates that the total infant mortality in each time period is determined by two functions: the set of group-specific death rates (1 Q 0 (rwa→ RWA)) and the proportionate distribution of women across these groups (C (rwa→ RWA)). Overall death rates are the weighted averages of group-specific infant mortality rates, where the weights are supplied by the proportions across eight categories of the R-W-A model. By applying this technique of decomposition, it is possible to answer how much of difference between the death rates from two time periods, for example between (1 Q 0 (t1-t2)) and (1 Q 0 (t2-t3)), is attributable to differences in proportional distributions rather than differences in group-specific mortality rates.

Whereas one would expect to find that individuals would increasingly satisfy one or more conditions of the R-W-A model over time, and therefore the contribution of compositional differences to infant survival gains would not be insignificant, the contribution of differences in group-specific mortality rates (for example, between 1 Q 0 (rwa, t1-t2) and 1 Q 0 (rwa, t2-t3) would indicate the exogenous effects that have pulled down infant death rates. Table I serves as an example of this method by using two hypothetical time-periods, 1988-1993 and 2003-2008, and offers

a visual demonstration of the use of the R-W-A model as a new tool to study changes in infant mortality during the course of twenty-years.

Conclusion

Among a number of social and economic areas in which economic development is associated with sweeping change, mortality is one area where the change is difficult both to perceive and to understand, requiring some probabilistic thinking even to judge the direction of change (Montgomery, 1998). High-mortality environments are likely to experience high variance in mortality, adding to the difficulties that individuals face while extracting signal from noise and learning about decreased mortality risks associated with modern health behaviors.

Objectives of the chapter was to offer an explanation of the mortality lags from economic and cultural perspectives, to discuss theoretical conjectures, and offer a new conceptual model to apply to stalling transitions. The first part of the paper laid out the main explanations of mortality decline and demonstrated the false dichotomy between the structural and cultural determinants of change. The importance of nutritional improvements, and the role played by the mediating functions of social institutions were discussed as the most significant structural influences. Among cultural determinants of mortality decline, the distinction made by Caldwell (1986) between economic modernization and Westernization was implicitly but extensively discussed, in addition to the emphasis on the need to communicate information about mortality and health change to populations through presentations in the media and the discussions of health personnel. These cultural arguments pointed out to that with the diffusion of information, social learning about the preventability of deaths is facilitated, matching individuals with the 'correct' mortality perceptions and risk assessments related to modern health beliefs and practices.

Whereas the second part was focused on an important theory by Johansson and Mosk (1987) on infectious disease mortality, it offered an opportunity to be more specific about what exactly is it that matters in a particular mortality decline; exposure, resistance or recovery, much as in the fertility intermediate variable framework by Davis and Blake (1985). Faced with the problem of false opposition between the structural and economic factors that can now be carried out for each of the three dimensions, the rest of the chapter proceeded with showing how to get out

of this trap by re-tooling a well-known framework that is originally designed to deal with fertility. A new modeling strategy was developed in the final part of the chapter, focusing on the problematic of under-utilization of maternal and child health services, conceptually derived from Coale's well-known framework designed to study fertility, but reformulated here to study transitions to new and modern health behaviors.

This new formulation offers a more integrated and comprehensive understanding of mortality decline in countries that experience lags of significant consequence, with its ability to accommodate a wider set of influences, and thus to relate to exceptional experiences. This analytical attempt that originally stems from the diffusion theories of fertility, does not suggest that economic concerns are of secondary significance, especially given the often-encountered uneven levels of development across regions and cities in less-developed countries, and extreme forms of poverty even in the most-developed areas in these countries. However a clear benefit is the assessment of the role played by cultural determinants, theoretically acting separately from families', communities' and countries' economic conditions, but nevertheless holding the power to either eliminate or sustain some of the most important survival risks affecting newborns and children.

Having established the potential role of cultural gap in generating Turkey's excess death rates in Chapter One, and the important qualities of the RWA model in Chapter Two, the final chapter of this dissertation proceeds to the application of the R-W-A framework to Turkey, in order to explain its laggard status relative to countries in Southern Europe.

CHAPTER III. ANALYSIS WITH TURKEY – DHS DATA

Introduction

The previous chapter introduced a new conceptual model to study the relation between behavioral change and mortality outcomes in populations that have yet not reached their optimal survival gains in demographic transition. Behavioral change has been argued to be one of the main prerequisites of mortality decline from infectious diseases, in the absence of which, under-utilization of maternal and child health services may stall transitions and fail to halt preventable deaths. The new conceptual model developed in the previous chapter, which was a reformulation of Coale's framework to study fertility reductions, was focused on these transitions into new and modern health behaviors as the successful behavioral outcomes. The three prequisites to make these successful transitions, on the other hand, that are identified as readiness, willingness and ability, are dimensions that we are not capable of measuring directly. In this chapter that presents the analysis and results from the application of the R-W-A model to data from Turkey, these three are therefore treated as 'latent variables', whose measurement would require equally complex models.

Quantifying behavior is known to present the difficulty of accurately measuring key concepts and often requires multiequations to capture the relationships among variables. Structural equation models (SEM) refer to techniques that are equipped to handle multi-equation models, multiple measures of concepts and measurement error (Bollen and Noble, 2011). Latent variable SEMs are models that deal with variables centrally important to the model but capable of being only indirectly measured. Latent variables can be described with 'observed' variables or 'indicators', even though model parameters can describe any of the causal link between unobserved variables, between observed variables, and between unobserved and observed variables.

This chapter starts with a brief description of data to be used in analysis, followed by a model specification section laying out the two components of SEM: The measurement model, which relates observed responses or 'indicators' to latent variables, and the structural model, which specifies regressions of (endogeneous) latent variables on (exogenous) independent variables. The results of the model are followed with another section on post-estimation strategies for determining cutting-off values, dichotomizing readiness, willingness and ability distributions, and finally, the assignment of eight R-W-A groups. While until this point all procedures described are only to be

able to locate individuals across the R-W-A categories, this crucial identification is followed first with indirect infant mortality estimations by the Brass method, and second, an application of the decomposition method to be able to determine what proportion of change in mortality is due to more and more individuals meeting the specified requirements of the model. Since utilization of formal health care methods are conceptually the 'successful' outcomes in behavioral transitions, the chapter closes with a number of tables of proportions, calculated from mothers' retrospective responses about antenatal care and delivery services and vaccination schedules, and also from anthropometric measures.

Part 1 . Data and Model Specification

a. Data

Data consists of four cross-sections of Demographic and Health Surveys (DHS) in Turkey between 1993 and 2008, which present a nationally representative sample of (ever-married) women in their reproductive ages. A weighted, multistage, stratified cluster sampling approach has been used in the selection of DHS samples. The samples are designed in this fashion because of the need to provide estimates for a variety of characteristics for various domains, including Turkey as a whole; urban and rural areas (each as a separate domain); and each of the conventional major five regions of the country. Clusters, on the other hand, are established by selecting 25 households for each cluster per standard urban segment, and 15 households per standard rural segment.

While various combinations of domains create the sample strata, there have been important changes over the years. The first of these is the use of the NUTS-1 system as strata in the 2000's, which stands for "The Nomenclature of Territorial Units for Statistics", a statistical classification that is used by member countries of European Union (EU). This is a different sampling strategy than in 1993, when the criteria for subdividing the five major regions to sub regions were the infant mortality rates of each province, estimated from the 1990 census data with indirect techniques, and also measures of geographical proximity. A second significant change from the 1990s is the use of seven metropolitan cities (with one million plus populations) as separate stratum. A final one is the addition of Istanbul and the Southeastern Anatolia as separate strata in the 2003 and 2008 surveys, as a result of which, a

comparatively larger share of the total sample having been allocated to these regions. Even though our analysis results and estimates in the second half of the analysis period might be slightly affected with these changes, DHS reports claim that later sample designs are methodologically and conceptually consistent with previous surveys.

Despite these minor setbacks, DHS data is optimal for this study: Even though these surveys are most commonly used to address research questions related to fertility and reproductive health in general, they present an ideal sample for addressing the research questions of this project, as they collect rich data on the prenatal, natal and post-natal periods, provide extensive information on individual and household socio-economic characteristics, and include gender survey modules. As a result of these properties, the data presents and enables the development of various socio-economic, and cultural / attitudinal measures. The next section "Model Specification" starts with the measurement of our key latent concepts.

b.Model specification

i. Measurement model in SEM with latent variables

In the measurement model, we have three latent concepts, as follows:

- Readineness that refers to whether the calculus of conscious choice is operating at parents' decision-making related to health and survival of their children
- Willingness that describes the power to overcome societal constraints imposed by traditional or beliefs and normative prescriptions, family and community relations.
- Ability that requires the availability and accessibility of modern health services, in terms of both cost and distance.

Each latent trait is captured by a pair of indicators that are binary variables. In the usual measurement model where both observed and latent variables are continuous, y* can be defined by the vector of continuous indicators of η as follows:

$$y^* = \Lambda_y \eta + \varepsilon$$

where E (ε) = 0 and ε is uncorrelated with η. When the indicators are categorical, however, we do not observe y*, instead we have y with some, or possibly all, indicators in y, categorical versions of y*. Analogous arguments hold for x and x*, so that:

$$y \neq \Lambda_y \eta + \varepsilon$$
$$x \neq \Lambda_x \xi + \varepsilon$$

The corrective procedure is a non-linear function relating observed binary variables (y and x) to latent, continuous ones (y* and x*). This is done simply by adding a threshold model to the measurement model of SEM, where a binary indicator is

$$y_1 = 0, \text{ if } y_1 * \leq a_1$$

$$y_1 = 1, \text{ if } a_1 < y_1 *$$

where a_1 is the threshold (of the underlying latent variable) above which the indicator changes from 0 to 1.

The following three sections compare the latent traits of readiness, willingness and ability; the objects of measurement, to their selected indicators.

i.i. Readiness

In the formulation of behavioral changes regarding the utilization of modern health care services, the readiness condition required a rejection of fatalism and choice of self-directed destiny over fatalism, only as a result of which one might take control of children's survival chances by taking matters into own hands. Fatalistic attitudes are explored in demography with fertility transitions (Coale 1973, Cleland and Wilson 1987, van de Walle 1992). World Fertility Surveys (WFS), Demographic Health Surveys (DHS) and field studies in less developed countries have asked questions to women on the number of children wanted, and interpreted non-numeric responses and answers such as "up to God" or "as many as God will send" as a sign that these women have not yet reached the first stage of fertility transition, when the awareness of family size (as well as the possibility of influencing it) arises.

Irrational responses to the question on the ideal number of children indicate those cases where family size is formed as a result of happenstance (God's Will), not design. In contrast, numeracy is an indicator of rational

thinking. For instance, Van de Walle (1992) argues that the word 'calculus' in Coale's phrase 'calculus of the conscious mind', evokes 'numeracy' about children, referring to the perception of a particular family size as a goal in a long-term strategy of couples. Without this perception it is unlikely for family limitation to exist.

Building on the description of numeracy in fertility studies as a cultural trait that is present in some places and times but not in others, the construction of readiness for mortality as a measure of a individuals' fatalistic attitudes as opposed to self directed destiny follows the same strategy as fertility approach, and uses the question on the ideal number of children. The primary indicator for readiness is constructed as a binary categorical variable where respondents who indicated five or less children as the ideal number are coded '1' whereas those who gave a non-numeric response or indicated a multitude of children (equal to or more than six children) are coded '0'.

The second indicator that is used for the measurement of readiness is also binary, constructed from respondents' attitudes about family planning, more specifically from a question assessing whether birth control methods are against religion. Perhaps contradicting the widespread notion of Muslim fertility in demography and the impression that fertility rates for Muslims are typically high, and always higher than those of non-Muslims in the same region or country (Kirk 1966, Weeks 1988), there are no a priori reasons for contraception prevalence to be lower simply by virtue of Islamic teachings. Theological considerations in Quran even permit abortion if it is performed within 120 days of conception, which is perhaps why as a birth control method abortion is widely practiced among Muslim populations worldwide, including at those locations where it is forbidden or only allowed under very restrictive conditions. While it is possible to reject the claim that Islam is pronatalist, it is important to note that there is still great variation in the methods and levels of contraceptive practice in Muslim-majority countries: Whereas some countries have high levels of modern hormonal contraception (such as the pill, injectable and implants), other have high levels of IUD use in combination with the use of traditional and folk methods.

Given this background, the binary indicator created from respondents' statements indicating whether birth control methods are against religion aims to measure the same dimension of fatalism or general reluctance to temper with the natural order of things. This is obviously a less direct measure that operates through individual's degree of religiosity, however, it is based on a strong assumption that respondents who reject birth control on the basis of

religion are left with no options but to be fatalistic about the number, timing and spacing of future births. While the measure primarily aims to identify this attitude as a cultural trait in mothers, the connection with mortality is based on the assumption that the same group of people would be less likely to be receptive or responsive to decreasing mortality risks arising from improvements in health care and knowledge, and medical advances, and therefore be less likely to take the correct rational actions to prevent or treat sickness in newborns and young children. In both matters of fertility and mortality then, the individual leaves it up to God to determine the outcomes, suggesting that there is no practice of rational calculation and conscious decision-making.

i.ii. Willingness

Formulation of the willingness condition to understand behavioral changes leading to the utilization of modern health care services is centered around the concept of power that mothers have to move beyond the societal constraints imposed by traditional family and community structures. Willingness is directly connected to some of the long-established themes in demography, such as gender equality and status of women, that have been discussed both in relation fertility (Cochrane, 1979) and mortality outcomes (Caldwell, 1986) in less developed countries. Among other terms used in social demographic literature, 'female autonomy' (Dyson and Moore, 1983), 'patriarchy' (Cain et al, 1979), 'rigidity of the sex stratification system' (Safilios-Rothschild, 1980) and 'men's situational advantage' (Caldwell & Caldwell, 1991) are closely related to the conceptualization of the willingness condition for mortality. However, it is important to note that the construction of willingness condition is strictly non-material here, and reflects nothing of the sexes' relative control of the resources in families.

We are primarily concerned with the effect of gender inequality on familial decision-making processes regarding the health of children, such that a positive value on selected indicators would suggest that the mother actually has a say in health decisions about children. The reverse scenario would imply that the mother does not have a voice in these health decisions, therefore whether she would get antenatal care from a doctor or other medical professional during pregnancy, assistance at delivery, post-partum care (especially in high-risk situations such as premature delivery and very low birth weight or some kind of congenital disorder that needs to be closely

monitored) and finally, medical diagnosis and treatment in the case of contraction of an infectious disease, is decided by other members in the family.

The first indicator for willingness is a binary variable that measures whether mothers enter the decision making processes in families, with regard to both prevention and treatment of infectious diseases in children. If the DHS respondent has reported that important health decisions are given by herself, or joint decisions are made with the husband, then the value of this variable is '1', otherwise it is '0'.

Since behavioral controls on women are often supported by severe sanctions attached to the breaching of normative prescriptions in families, these traditional rules are often internalized by women who eventually do not question the unacceptability of punishments. Perhaps one severe sanction is intimate-partner violence, the degree of internalization of which, reflects men's control over women in the household, that we would like to capture as the immediate determinant of health and mortality outcomes in children. Domestic violence has a direct effect, too, on infant and child mortality, and there is more than one pathway through which domestic violence may lead to elevated risks for mortality (Ahmed et al, 2006). While one possible pathway is the direct effect of blunt physical trauma and the resultant fetal death or subsequent adverse pregnancy outcome and a second is elevated maternal stress levels and poor nutrition, both of which are associated with low birthweight or preterm delivery and are well-known risk factors for perinatal and infant mortality, a third possible pathway is the deterrent effect of violence on women's use of preventive or curative health services during pregnancy, delivery, and after the birth.

Responses to a question asking DHS respondents whether it is acceptable for an husband to beat his wife if she disagrees with him, are used to generate a binary variable, where those mothers who answered 'yes' take a value of zero on the second indicator variable of willingness, and '1' otherwise. . The obvious assumption is that those women who tolerate domestic violence are more likely to have internalized traditional and patriarchal norms, and therefore less likely to be willing to make the transition to the utilization of formal health care services that may not be culturally and ethically acceptable in families and social communities.

i.iii. Ability

The last of the three conditions was ability, requiring that the effective means of using modern health care methods, more specifically, those in the area of maternal and child health care services, are available and accessible to parents. As opposed to the other two conditions of readiness and willingness, the essence of the ability condition was 'structural', in terms of measuring both financial and institutional resources at the disposal of families to preserve or restore the health of their children.

The relation between socio-economic status and mortality outcomes in infants, and children under age five, has been well documented for developing countries. In addition to malnutrition and other poverty-related factors such as overcrowding or access to clean water, a less direct outcome that is importantly determined by the socio-economic status of households is modern health care utilization. Despite the heavier burden of disease and illness among the poor, it is usually this very group who utilize less formal care. For instance, evidence from 44 countries in Africa, Asia and Latin America shows that the immunization rates for the poor are only around half that of the rich, whereas the uptake of oral rehydration therapy is up to 20% higher in upper socio-economic classes (Gwatkin, 2000). Data from low- and middle-income countries suggest consistently large differences by social class in the use of seven representative basic maternal and health services; antenatal care; use of oral rehydration therapy; immunization; medical treatment for childhood acute respiratory infection and fever; contraceptive use; and attended deliveries (Gwatkin et al., 2000).

The first indicator of the ability condition is created from the wealth index data of DHS, a composite measure of a household's cumulative living standard. The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets; materials used for housing construction; and types of water access and sanitation facilities. Out of the five categories provided with the original dataset; 'The poorest', 'Poorer', 'Middle', 'Richer' and 'the Richest', the first two were recoded to take the value of '0' on the first indicator of ability, and the remaining three were recoded as '1'.

The second indicator of ability is another binary measure of household coverage by health insurance, including the insurance provided by social welfare to vulnerable groups. Very important nutritional and prenatal care

interventions have the power to avoid premature or low birthweight infant deaths. In high-risk situations such as preterm births or congenital anomalies, surveillance at a health facility is the most correct form of post-natal care. In the case of a sickness, it is only through health insurance that the problem can be diagnosed by medical professionals and treated by pharmaceutical drugs. On the contrary, lack of health insurance for the less privileged eliminates all chances of recovery by access to modern medical knowledge and technologies. In the DHS sample, mothers who live in a household covered by health insurance are coded '1', and those who live without health insurance are coded '0'. Table I gives the descriptive statistics for all indicators in the measurement model.

ii. Structural model in SEM with latent variables

Since each pair of indicators for three latent constructs in the measurement model are in the form of dichotomous outcomes, the latent variable model parameters are estimated with maximum likelihood. In latent variable SEMs, in general, the distinction between exogenous and endogenous variables is very important. Exogenous variables are variables that are not explained within the model and that are uncorrelated with all disturbances in the system. Endogenous variables are variables that are directly influenced by other variables in the system other than its disturbance.

In the latent variable SEM with binary response variables, the probability of a positive outcome (success) is defined by:

$$\Pr(y_{ij} = 1 \mid \eta_j) = \frac{e^{(\alpha\eta+\beta\eta_i+\Gamma\xi_i+\zeta_i)}}{1+e^{(\alpha\eta+\beta\eta_i+\Gamma\xi_i+\zeta_i)}}$$

where qi is a vector of latent endogenous variables for unit i, $\alpha\eta$ is a vector of intercept terms for the equations, β is the matrix of coefficients giving the expected effects of the latent endogenous variables (η) on each other, ξi is the vector of exogenous variables, Γ is the coefficient matrix giving the expected effects of the exogenous variables (ξ) on the latent endogenous variables (η), and ζi is the vector of disturbances. The i subscript indexes the ith case in the sample, j indicates the number of exogenous variables. Two assumptions of the model are that $E(\zeta_i) = 0$, and $COV(\xi_i', \zeta_i) = 0$, and there are two covariance matrices as part of the model: $\Sigma\xi\xi$ is the

covariance matrix of the exogenous variables (ξ) and $\Sigma\zeta\zeta$ is the covariance matrix of the equation disturbances (ζ). The mean of ξ is $\mu\xi$.

The common explanatory variables that enter into equations predicting readiness, willingness and ability are basic demographic indicators, including the age group, educational attainment, type of place of residence (urban / rural) and ethnicity of the DHS respondent. The remaining exogenous variables are chosen specifically for each latent trait, as will be briefly discussed in the following paragraphs. The descriptive statistics for all independent variables in the structural model can be found at Table II.

The age-group of DHS respondents are coded across seven categories, in five-year intervals starting with the '15-19 year-olds' and ending with '45-49 year-olds'. The second age-group ''20-24 year-olds' is selected as the omitted category in regression estimations. The educational attainment of the respondent is a variable with three categories; 'No education', 'Primary Education' and 'Secondary Education and Higher', where the middle category is the omitted. Both measures, 'type of place of residence' and 'ethnicity', are constructed as binary categorical variables, respectively where 'Rural' and 'Turkish' DHS respondents are the null categories (with the 'Urban' and 'Kurdish' taking the value of '1').

In estimation of readiness, the new independent variable that enters into the equations is a binary categorical variable that is constructed to measure the proximate educational context, which takes the value of '1' if at least half of the women in the same (DHS) cluster have 'formal' schooling, and '0' if more than half are uneducated. This variable is a measure of diffusion theory in its application to mortality (Montgomery 1998, 2000, Goldman et al. 2001, 2002), that indirectly assesses whether social learning through interpersonal contacts might be a significant determinant of infant mortality outcomes. It is an indirect measure because social learning and influence (through conversations with better-educated women in social / kinship networks) would favor medical knowledge regarding the causes and treatments of disease, leading first to the ideational shift required by 'readiness', that in turn determines the utilization of health care services and this way mortality outcomes.

In the case of willingness which is centered on the influence of women's position on the utilization of health services , a binary categorical variable that identifies whether the respondent was 15 years-old or younger at the time of marriage is included in the model. A second addition to the equation is the current living arrangement of the DHS respondent, differentiating between nuclear and extended families. Both measures aim to capture the status of women as important determinant of the willingness condition.

The age at marriage has meaning in the individual life cycle as a pivotal variable, truncating life experiences by cutting off some experiences and opening other, different ones. In modern societies, single marital status allows exposure to experiences in ways that married marital status does not, and often, a meaningful translation of the marriage postponement is expected in the form of educational attainment or work experience. Whereas marriage postponement has a payoff in non-traditional marital behavior of women in transitioning societies, early age at marriage has an impact on the enactment of the traditional role of the wife, therefore having implications for nut just the kind of person a woman is upon entering marriage, but also for the kind of wife and mother she will be within marriage. When treated as an indicator of the traditional wife-mother role, the variable early age at marriage is expected to have an inverse relationship with the concept of willingness and thus with the utilization of formal health services.

A second independent variable added to the model as a predictor of willingness classifies DHS respondents' family type, distinguishing between nuclear-families and patriarchal extended families. One characteristic of patriarchal extended families is the control of nuclear family by the head of the patriarchal extended family. That is, the father has great power over his sons and the sons over their wives, indicating non-egalitarian relationships. Sociologists have defined the emergence of small nuclear family as a consequence of urban-industrial revolution, while extended families are thought to be more prevalent in rural preindustrial societies and thus, to eventually be superseded by nuclear / conjugal living arrangements with progressing modernization. The significance of this measure as a predictor of the willingness condition is due to at least a number of reasons, including its implications for health-decision processes (where all members are under the authority of the patriarch and all important family

decisions, including the monetary, are made by the patriarch), given the gender role ideology and the degree of dominance patterns in families, as well as the value of children and their degree of prioritization. In other words, the relevance of the measure to the willingness condition is due to the concept of patriarchy, defined as a set of social relations with a material base that enables men to dominate women, and describes a distribution of power and resources within families such that men maintain power and control of resources, and women remain powerless and dependent on men.

Finally, equations predicting ability consider the educational attainment of husbands, as the most critical addition that would predict household economic status. Just like with maternal educational attainment, the variable is coded across three categories; 'No education', 'Primary Education' and 'Secondary Education and Higher'. This is the only part of the latent SEM model that considers the effect of fathers' characteristics as a determinant of health outcomes in newborn and children, and rightly so since the latent trait in question is 'ability' and it often husbands' socio-economic status that determines financial resources at the household-level (often of more than one male in patriarchal extended families). As an indicator of socio-economic status, the educational attainment of respondents' husbands is the only addition to distinguish those who are able from non-able, which is in turn expected to produce different rates of infant mortality, and health care utilization according to the R-W-A model.

Even though these are the final versions of equations predicting readiness, willingness and ability, other predictor variables have been tried but later eliminated due to insignificant regression estimates. These variables include geographical regions, mothers' current employment status, whether a religious marriage took place prior to legal marriage and whether brides money was paid, and mother's age at first child-bearing. Other important variables such as the occupation of mother and of father, or indicators of media exposure could not be used in the model due to measurement or coding inconsistencies across four DHS cross-sections. Figure I presents a path diagram that summarizes all causal relations in this analysis, as specified in the sections above.

Part 2. Results

a. Model Results

The number of observations used in the analysis is 25,133. Model results presented in Table III presents numerical definitions for three latent variables, regression relationships between dependent and independent variables, correlational relationships (i.e. covariances) between latent variables, the thresholds and residual variances. The first column gives estimates, the second column gives standard errors, and the third column is obtained by the division of the first by the second (z-score). Only those estimates in the measurement and structural model of SEM, which are statistically significant at the 95% confidence interval, are shown. The table also provides an R-square value for each latent variable, indicating the amount of variation in the indicator that is explained by the latent variable (given the equations in the measurement model).

When the regression results for readiness are studied, it is seen that neighborhood educational attainment has a stronger positive influence on the outcome variable than urban place of residence, for instance, where this influence is almost comparable to the effect of highest educational category; secondary education or higher, on the dependent variable. Among negative effects, being Kurdish (instead of Turkish) has a stronger effect than the effect of having no education (in comparison to the omitted 'primary education' category) on readiness. In fact, the third column shows that the largest z-score belongs to the ethnicity variable. Finally, the older age groups have negative influence on the outcome, this effect getting gradually higher between ages 30 and 49. The coefficients for the 15 to19 year-olds and 25 to 29 year-olds are not statistically significant.

When willingness regression results are examined, the largest positive coefficient belongs to the category of highest educational attainment. The largest negative coefficient, on the other hand, belongs to the category of no education, followed by the youngest age category; 15 to 19 year-olds, when compared to the omitted category of 20 to 24 year-olds. All other age groups have positive effects. In stark contrast to its strongly negative influence in the case of readiness, the ethnicity variable have a positive effect on the probability of willingness. In comparison to rural type of residence, urban areas have a positive effect on willingness, and this relationship is stronger than the one predicting readiness. Finally, two significant additions to this part of the model, namely, two binary variables

indicating whether the individual was 15 years-old or younger at the time of marriage, and the nuclear or extended patriarchal family type, give results in expected direction. That is; both have negative effects on willingness, even though the degree of causal relationships can be described as 'modest', when other variables of the model are comparatively considered.

The logistic regression results for the last latent variable reveal that maternal education remains a sign cant predictor of household ability even after we control for paternal education, although the father's lowest educational category has a greater negative effect on the outcome. The oldest age categories have large positive coefficients, whereas the coefficient for the youngest age group has a negative sign. We also note that urban residence has a stronger positive causal relationship with ability than with willing or ready, as evident with its coefficient being the largest of all regression estimates. Ethnicity has a negative causal relationship with ability and just like in the case of urban place of residence, its coefficient is larger than in other equations predicting readiness and willingness.

b. Post-Estimation Strategies and the Assignment of R-W-A Groups

Mplus generates a set of factorscores for each observation unit, as a result of which, every DHS respondent is assigned 3 scores for readiness, willingness and ability respectively. Even though SEM was run with all years combined between 1993 and 2008, it is possible to analyze these factorscores across four cross-sections of data, in order to be able to catch the progress, at the population level, towards meeting the three requirements necessary for significant infant mortality reductions to take place, through successful behavioral transitions to the utilization of formal health care services.

In order to be able to do this, however, we need a cutting point value for dichotomizing the distributions of readiness, willingness and ability. Given this cutting point value, the population would obviously be split over Ready and Not-Ready, Willing and Not-Willing, and Able and Not-Able, after which we shall try to locate the proportions of women in eight categories, ranging from 'Ready, Willing and Able' (RWA) to none of these three (rwa), establishing the following eight categories:

1. RWA
2. Raw
3. RwA
4. Rwa
5. rWA
6. rWa
7. rwA
8. rwa

A rough assessment of readiness, willingness and ability distributions shows that the calculated values range from negative to positive for all three conditions, which suggests that the value of '0' would be a reasonable choice for the cutting-off value. Before however, it is useful to briefly examine the change in distributions by using the simplest measure of central tendency; median values. One unexpected observation is that the median value for readiness does not move forward over time, but to the contrary: The median value which is -0.065 in 1993 becomes -0.061 in 1998, but then is pulled back first to -0.13 in 2003, and then -0.184 in 2008. The median value of willingness distribution moves forward over time, starting at 0.267 in 1993, and becoming 0.616 and 1.061 in 1998 and 2003, respectively. The enormous progression between 1993 and 2003 is followed by a little regression in 2008 when the median value is 1.04. Finally, an examination of ability distributions shows that the median value equals to 2.727 in 1993, 2.878 in 1998, 3.253 in 2003, and 2.675 in 2008. Therefore, we can infer that the ability distribution somewhat moved forward until 2003, and then experienced a huge setback when the median value in 2008 is smaller even than in 1993.

Figure II illustrates the change over time in proportions of Ready and Not-Ready, Willing and Not-Willing, and Able and Not-Able, after the cutting-off value of zero is applied to distributions. Table IV gives numerical representations of change in the dichotomized latent traits. The trend we observe in readiness is that the proportion of individuals meeting the 'Ready' requirement have gradually declined over time, from 43.45% to 32.75%. The

trend in willingness is the opposite, showing signs of significant progress towards the fulfillment of the condition at the population level, as the proportion 'Willing' has gradually increased throughout the survey years, moving up from 58% to 82.2%. The trend in ability is similar to that in willingness at least until 2003, even though size of change is relatively smaller: During the ten-year period between 1993 and 2003, the proportion 'Able' has increased from 83.51% to 89.21%. By 2008, the proportion of this group has declined by less than 1%, appearing at 88.86%.

Considering the conceptualization and operationalization of latent traits with selected indicators, these numbers roughly suggest that over time DHS mothers have become more fatalistic and religious, and less rational-calculating actors, that at the same time there is a sign of significant progress at the population level towards the fulfillment of willingness condition, thus of improvements in the decision-making power and status of mothers in families, and finally, that the population has become more resourceful over time, in terms of both the declining number of households classified as 'poor', and the accessibility of health institutions and their services for household family members.

We are ultimately interested in the eight possible combinations of readiness, willingness and ability, as established above. When DHS respondents are located across these categories, frequency distributions by survey year appear as in Table V. When the frequencies are studied, we notice that the second group consisting of individuals who are ready, willing and not able (RWa), and the fourth group consisting of individuals who are ready, not willing and not able (Rwa), have extremely small sample sizes across the four years of DHS. The first group consisting of individuals meeting all three conditions of the model; thus those who are ready, willing and able (RWA), the fifth group consisting of respondents who are not ready but willing and able (rWA), and the seventh group consisting of individuals who are neither ready nor willing but able (rwA), have the largest sample sizes.

If we focus on the distributional change of DHS respondents across the R-W-A categories between 1993 and 2008, the fifth group (rWA) has the biggest increase over time, by more than 25%. The groups which experienced the largest decrease include the seventh (rwA) with 12%, followed by the last (rwa) with 7%, and the first (RWA) with 6%. This suggests that both the category of individuals who met all three conditions and those who met none of the three, have shrunk over time, highly probably being absorbed by the (rWA) group that have experienced the

largest boost. These results are compatible with earlier observations on the simple distributional change in latent traits, that had indicated W distribution shifting to the right, A distribution modestly shifting to the right, and R distribution shifting to the left.

c. Indirect Estimations of Infant Mortality

This section uses the Brass method that generates estimations from reports of mothers about the survivorship of their children to estimate group-specific infant mortality rates. Similar to the procedure described in the first chapter of this dissertation, the average number of children ever-born and average number of children surviving by mother's age-interval, are first prepared for each R-W-A group in the earliest and latest cross-sections. However, this does not produce a total of 16 laps, as those groups which fall below the sample size of one hundred individuals are excluded from analysis in order to avoid unhealthy estimates. The same information that this time includes all R-W-A groups in 1993 and 2008, is also prepared. Finally, the average number of children ever-born and average number of children surviving by mother's age-interval are computed for mutually non-exclusive categories of readiness, willingness and ability: between Ready and Not-Ready, Willing and Not-willing and Able and Not-Able.

All input data is next transferred to the Mortpak software that produces a set of estimations of infant mortality, from which the South model estimates are chosen for Turkey. Group-specific infant mortality estimates are presented in Table VI . The panel B shows that the overall infant mortality rate is 61 (per 1000 births) in 1987 and 36 (per 1000 births) in 2002. While the 1987 infant mortality rate estimate for the group that meets none of the three conditions, the rwa, is more than double of the estimate at that same year for the opposite group, the RWA, the gap between the two groups is reduced but not closed by 2002. Nevertheless, the absolute decrease in infant mortality over the period of these fifteen years is experienced most strongly by the rwa (from 98 in 1987 to 65 in 2002) and the smallest difference in infant mortality between 1993 and 2008 is observed in the RWA (from 43 in 1987 to 36 in 2002).

For every other group in the analysis, we see that death rates decreased over time, even though the magnitude of change is different across groups. In 1987, the highest infant mortality rate after that estimated for the rwa belongs to the rwA (73 per 1000 births), which is the group that meets the economic, but neither of the cultural conditions.

In 2002, this same group still has the highest mortality estimate after the rwa (with 64 per 1000 births). Figure III demonstrates fertility differences between the RWA, rwa and rwA, that consolidate the important role of cultural conditions in influencing demographic outcomes. Similar to the ranking in infant mortality estimates, age-specific fertility rates in the rwA are in the middle of the rates in the first and the eighth R-W-A groups, consistently over time.

Even though we are limited with an inefficient sample size to evaluate the opposite group; those who are ready and willing but not able (the RWa), another observation is that the combination of any of the two cultural dimensions with the economic 'ability' requirement produces the lowest infant mortality estimates in 2002. With the same logic, we can also see that any unfavorable combinations of any of the two cultural requirements with non-ability, produces the highest infant mortality estimates. In totality, these relations explain the big divide in 2002, where two of the estimates fall around the value of 36 (per 1000 births), and the remaining three around the value of 64-65 (per 1000 births).

There are other clues suggesting that cultural conditions are at least as strong determinants of infant mortality as the economic condition: The importance of the willingness condition becomes apparent if one compares the RwA and RWA in 1987, with the corresponding infant mortality rates of 61 (per 1000 births) versus 43 (per 1000 births). Readiness is even a more important factor, which is an interpretation made on the basis of the observation that estimates of the Non-Ready groups (second half of the table, especially last three columns) are noticeably higher than that of the Ready groups both in 1987 and 2002, the only exception to this argument being the rWA group displaying the same level of infant mortality as the RWA group in both cross-sections.

Finally in this section, we will analyze the change in infant mortality rates by decomposing the difference between rates and proportions. If c (j, t) is the proportion of women in group j in year t, q (j, t) is the infant mortality rate (predicted average in the group) of women in group j in year t, and q (t) is the infant mortality rate in Turkey in year t, the following equation can help us estimate how much of the changes in q (j,t) over time are due to changes in composition of population and in changes in the q (j,t)'s:

$q(t)=\Sigma_j \; q(j,t)* c(j,t)$

The equation indicates that the total infant mortality in each time period is determined by two functions: The set of group-specific death rates and the proportionate distribution of women across these groups. Total infant mortality rates are the weighted averages of group-specific infant mortality rates, where the weights are supplied by proportions of women across categories of the RWA model at points in time.

With the technique of decomposition, it is possible to answer how much of difference between the death rates between two points in time is attributable to differences in proportional distributions rather than differences in group-specific mortality rates. Given the movement in dichotomized proportions of willingness and ability over time, we expect to find that the contribution of compositional differences to infant survival gains would not be insignificant. The contribution of differences in group-specific mortality rates, on the other hand, would show the 'relative' contribution of exogenous effects that have pulled down the infant death rates, independent of changes in population characteristics that we have previously measured. Theoretically, public health programs that provide nutritionally stressed pregnant women such food supplements as folate, iron and iodine, and or programs that take effective measures after birth to promote breast-feeding, are examples of exogenous effects that can substantially reduce morbidity and death rates among infants.

Table VII provides the input data for the decomposition method, presenting the c (j, t)'s and q (j, t)'s in 1987 and 2002. Since we have estimates of infant mortality in a consistent manner only for four of the R-W-A groups, the universe is assumed to consist of these groups only, reducing the total sample to 92.4% and 93.9% of the original size in 1987 and 2002 respectively. Table VIII illustrates the steps of decomposition procedure and presents the results. The results indicate that 41% of the change in infant mortality between 1987 and 2002 is attributable to change in compositional distributions, and 59 % is attributable to the 'exogenous' rate schedule differences.

In the next section we turn to differences in health utilization rates between the R-W-A groups, expected to be compatible with trends we observed in infant mortality rates.

d. Health-care Utilization Rates

Modern health behaviors corresponding to the three dimensions of Johansson and Mosk's framework on infectious diseases mortality (1987) were specified such that prenatal care during pregnancy was classified as an 'exposure' factor, immunizations were the 'resistance" factor, and medical treatments (for sick children) were the 'recovery' factors. This part of the chapter discusses the R-W-A group differences in the utilization of these very important maternal and child care services, directly by using detailed information reported by mothers for each child born within a five-year period preceding the survey date, and indirectly, by the use of anthropometric measurements taken at the time of the interview. After reshaping the mothers' file to children's file (to long data format), Pearson chi-square tests are used to establish whether the relationships between the R-W-A categories and various outcomes are statistically significant across the DHS years, as presented in Table IX. Only those outcomes that show significant variations by the R-W-A category are shown and discussed below.

i. Prenatal Care and Birth Services

Table X presents the sample sizes across four years, for four different types of measures of prenatal care and birth services. Two of these measure differential utilization of prenatal/antenatal care services between the RWA groups, and the other two are directly related to formal health care use for assistance at delivery. The first part of the table shows that the percent of children born with the mother receiving prenatal care from doctor or nurse/midwife has increased in all groups over time. Similar to the trend we observed in infant mortality rates, the first group that meets all three conditions of the R-W-A model and the last which meets none, have the highest and lowest percentages respectively, both in the first and last cross-section of DHS surveys. Even though the willingness condition cannot be discarded as insignificant, the other two conditions of readiness and ability seem to be stronger determinants than willingness, especially until 2003. The second sub-table that shows the percent of children born with the mother having at least four antenatal care visits during pregnancy is probably a more realistic measure of 'adequate' prenatal care utilization. The overall percentages are much smaller than in the previous measure,

however it is still the case that the ready and able conditions are stronger determinants than the willingness condition of antenatal care use.

Next, the third part of Table X outlines the percent of children born with the mother having some assistance at birth from a doctor or nurse/trained midwife. The table shows the same trends as in the previous two tables, perhaps ability having a slightly stronger effect than readiness, but each of these two still creating a greater impact in comparison to the willingness condition. The last sub table in this section displays the percent of children born at a health institution (rather than at home). Ability condition seems to be most decisive factor behind medical deliveries, and it is perhaps striking that R-W-A groups which do not meet the ability requirement have extremely low percentages even in 2008. In addition, those who are ready have significantly higher percentages than the non-ready, as evident in the last three columns of the table until 2003. Finally, the no willingness is a significant determinant of home deliveries, however, its contribution is less than that of the other two conditions.

ii. Immunization Schedules

Immunization rates are examined only for children who have already completed their one-and-a-half year birthday, thus further limiting the sample size to those children between 18 months and 60 months of age. Four different types of vaccines are studied. The first of these is Bacillus Calmette–Guérin (BCG) vaccine, which is primarily used against tuberculosis, and administered in one dose. The second, DPT, refers to a class of combination vaccines against three infectious diseases; namely, diphtheria, pertussis (whooping cough), and tetanus, and is administered in three doses. Third is the inactivated poliovirus vaccine (IPV) that is administered in three doses as well; and protects against polio. The last vaccine protects against one of the most contagious of all infectious diseases, measles, and is administered with a single dose. The proportions in Table XI indicate the percent of children (in each R-W-A group) who have been administered all three doses of DPT and polio vaccination, and the single doses of BCG and IPV.

Overall, these figures suggest that all three requirements of the R-W-A model are important determinants of vaccination against infectious diseases. While the lowest percentage of fully-vaccinated children is observed in the

rwa that meets none of the requirements, percentages for BCG are especially low (in this group and in the rWa). Readiness and ability conditions seem to generate larger inter-group differences than the willingness condition, which becomes apparent if one compares the difference between the RwA and the RWA, and the rWa and the rwa (both capturing the contribution of willingness), either to the difference between RWA and rWA (the contribution of readiness), or to the difference between the rwA and rwa (the contribution of ability). Such comparisons reveal that at least until 2003, ability is one of the two strongest dimensions in the R-W-A frame, along with readiness, that influence immunizations. Willingness is important, but generates smaller gaps in the proportions of fully-vaccinated children between willing and not-willing groups.

iii. Medical Treatments

In this section, differences in the stunting prevalence between groups are approached as an indicator of previous interactions between nutritional status and infectious episodes in a child's life. The assumption is that stunting should be more prevalent if a contracted infectious disease is not treated with the appropriate medical methods, which would refer to treatment with antibiotics in the case of pneumonia or oral-rehydration therapy to treat diarrhea, for instance. As stunting is primarily an indicator of chronic malnutrition, however, 'large' group differences through the ability condition are naturally expected.

Thus differences in stunting prevalence in Table XII between able and not-able groups are not surprising. The highest percentages of stunted children (up to 45% of sample size) can be found in the rWa and rwa, which are the only two 'unable' groups that would allow meaningful comparison. When the 'able' groups are examined, we see that stunting prevalence hardly goes beyond 20%. With regard to the contribution of readiness and willingness, the table shows that they have more modest but nevertheless significant effects.

e. Nutritional risk factors of infant mortality

The main goal in this section is to examine the contribution of nutritional improvements to infant mortality declines, which can act independently of formal health care utilization patterns yet might lead to significant

survival gains. These risk factors are unmeasured in the R-W-A model, which is built to understand transitions to modern health behaviors through the use of medical services, with three requirements specifically formulated to make such transitions. Even though nutritional risk factors studied below, birthweight and breast-feeding patterns, are conceptually outside the R-W-A model, we also cannot claim that there is no relation between them and the cultural and economic requirements of formal health care use. For instance, we would expect to see lower proportions of newborns with low birth weight in groups that meet the ability condition, or we would expect to see variation in breast-feeding patterns by readiness and willingness. Overall, though, the differences between the R-W-A groups with regard to these outcomes are expected to be smaller and thus much less significant.

The first outcome in Table XIII, 'low birthweight', refers to births resulting from poor maternal nutrition during pregnancy, where the infant weighs less than 2500 grams. The low-birth-weight infant remains at much higher risk of mortality than the infant with normal weight at birth. The proportion of low-birth-weight infants is a major determinant of the magnitude of mortality rates, especially in the neonatal period.

Unfortunately, the earliest DHS that gives information on birthweight is 1998 (instead of 1993) but it should suffice to capture time trends until 2008, if any exist. In Table XII, the smallest proportions of low birthweight is observed in the first group, the RWA, the largest proportions are observed in the last group, the rwa, and it is the case that the latter are at least two times the former across periods. The variation between the remaining groups suggest that 'Ready' and 'Willing' groups are less likely to have low-birthweight infants than their opposites, but readiness seem to have more influence than willingness. Overall, however, percentages are within a small range between 7.67% and 32.33, as opposed to larger variations we saw between groups in health care utilization rates. Change over time is almost negligible.

Finally, differences in breastfeeding behavior between R-W-A groups are examined in the second half of the table, with proportions of children never breastfed, or breastfed but for less than six months. Breast milk provides all the energy and nutrients that the infant needs for the first months of life, and it continues to provide up to half or more of nutritional needs during the second half of the first year. Exclusive breastfeeding for six months reduces

infant mortality due to common infectious diseases such as diarrhea or pneumonia, and helps for a quicker recovery during illness.

Proportions of infants across the R-W-A groups never breastfed or breastfed for less than six months fall within a small range between 21.33% and 46.94%. The highest proportion of infants never breastfed or breastfed for less than six months is observed in the RWA group in 1993, which had the highest utilization rates and lowest infant mortality levels as shown in previous section. Within this group, the proportion of not adequately breastfed infants drops from 41% to 23% over the course of fifteen years, indicating a decreasing risk factor for infant mortality. The rwa experiences a similar decline in proportions never breastfed or breastfed for less than six months, however this decline is from 39% to 25%. This means that while the rwa had a slight advantage over the RWA due to its higher breastfeeding prevalence in 1993 reducing the mortality risk, the change in breastfeeding patterns over the years more strongly favored the RWA, which regained its advantage over this factor in 2008. Lastly, the study of patterns in other R-W-A groups suggest that ability and willingness do not meaningfully correlate with breastfeeding behavior, whereas readiness seem to be positively associated with breastfeeding for at least six months. This is apparent if one compares the proportion between the RWA and rWA across all years.

Conclusion

One problem in measuring the cultural, rather than economic, determinants of demographic outcomes is the importance of social context. Rather than a society's value on a single variable, combinations of circumstances over long periods of time shape norms, beliefs and attitudes, that in turn influence fertility and health behaviors of individuals. Turkey's population is a very old and traditional society that has been undergoing modernizing influences of education, urbanization and industrialization since the establishment of the Republic in 1923. Even though 'secularism' disentangling religion from the affairs of the state or from public education, and 'emancipation of women' through education and employment opportunities, and through marital equity, were fundamental ideas in nation-state building processes, population's exposure to modernization policies of the Turkish state has been

uneven, creating enormous heterogeneity within the country, with regard to modern attitudes to gender roles, to the value of children and the value of scientific knowledge and methods.

'A nation of extraordinary demographic variation' (Fisek, 1973), Turkey has unusually large differentials to this day both in expectation of life at birth and fertility outcomes, implicating a complex system of determinants of mortality (see Table XIV). In order to break down this complexity, this chapter applied a novel approach to the study or infant and child mortality by operationalizing a well-known conceptual framework from fertility studies. The analysis was based on the measurement of Coale's key dimensions with their adaptations to mortality, theoretically framed as three 'indispensable' conditions jointly required for 'successful behavioral transitions' to maternal and child health care services. With operationalization, the ability condition representing the economic and structural determinants of mortality decline purely reflected the financial and institutional accessibility of formal health care for families. With DHS sample consisting of ever-married mothers in their reproductive ages, however, the measurement of the cultural or ideational emphasis of the diffusion theory intersected with 'gender' measures, reflecting mothers' capability to take matters into their own hands and perform rational health decisions for their newborn's and children's health.

The difficulty of accurately measuring latent concepts and quantifying mothers' health behaviors, requiring multiequations to capture the relationships among concepts and statistical controls for measurement errors, is overcome by SEM with latent variables. In addition, critical variables are used either as indicators or predictors of readiness, willingness and ability, in order to address the commonly encountered problem of context dependency in demography. For instance, readiness was measured with an attitudinal question on birth control (in a Muslim country), while the sale of contraceptives and dissemination of contraceptive knowledge in Turkey were forbidden by law prior to 1960, and abortion and sterilization could be carried out for medical reasons only, up until 1983. In a societal context where women's progress remained incomplete and major obstacles – not so much as legal restrictions but structural inequalities, social limitations and cultural biases- could not be eradicated, willingness was measured by mothers' participation in familial health decisions, and attitudes on domestic violence. Key predictor variables in the structural model of SEM were equally important, including the indicators of child marriages,

patriarchal families and the Kurdish ethnicity, that are known to be important determinants of differential demographic behaviors in Turkey.

After assigning DHS mothers to the categories of R-W-A, the analysis was focused on infant mortality rates and proportions using various maternal and child health care services in the second half. Overall, significant group differences in these outcomes confirmed the role of each condition in adoption of the new and western-origin health behaviors by mothers. Infant mortality estimates produced by the Brass method showed more variation in 1993 than in 2008, since the latest cross-sectional estimates indicated a sharp division between groups meeting at least one of the cultural requirements in combination with the ability condition displaying the lower infant mortality rate (36 per 1,000), and groups meeting none or only one of the three requirements (with the exception of RWa excluded from analysis due to extremely small sample size) displaying the higher value (65 per 1,000).

Even though the period of analysis was not ideal as it could capture only the very end of Turkey's mortality decline, and despite an observed regression in population's readiness distribution over time, the results of the decomposition method showed that the share of survival gains in children due to more and more (already ready) mothers becoming willing or able, was almost 45% between the first and last DHS cross-sections. When other outcomes such as prenatal care or proportions of vaccinated children were examined, readiness was found to be more important than willingness, but neither could be eliminated as insignificant determinants. These results seem to confirm the analytic capabilities of the R-W-A model which offers an integrated approach between the economic and cultural determinants of mortality lags in culturally-diverse, partially-resistant populations that are structurally bound by uneven development and modernization.

CONCLUSION

Overview of Findings

The focus of this dissertation was the problematic of high infant and child mortality in Turkey, which was one of the defining features of its demographic transition in the second half of the twentieth century. Main puzzle had been framed such that excess death rates were 'excess' given Turkey's performance in economic development indicators, as most typically measured by GDP per capita in cross-national analyses. Another piece of information from previous research was the existence of stark variations in infant and child death rates within the country. Main arrays of disparities were defined with the urban-rural differentiation from a modernization and development perspective, a regionalized ethnicity problem, and the educational attainment of Turkey's women that has risen over the last decades, but still remain substantially lower than in European countries.

The first chapter showed that despite the economic definition of Turkey's mortality puzzle, the decline in infant death rates was indeed highly responsive to income changes between 1960 and 2010. Application of the classic decomposition method to Turkey showed that 90 to 95% of all infant mortality reductions were due to improvements in economic conditions, and that Preston's structural effect was quite small in Turkey, in comparison to that calculated for the pool of middle income countries. The main problem was thus at the intersection of public health investments, on the one hand, and the reception of medical knowledge and methods by population, on the other. Women's low educational attainment was at the heart of this intersection, since indirect estimations of infant mortality showed the most uneven variations by maternal education. The findings of the standardization procedure with Southern Europe consolidated the idea that a 'cultural gap' was responsible, at least as much as national economies, for observed differences with European countries in infant mortality rates.

The second chapter examined the previous theories of mortality decline. This chapter explained the link between economic growth, nutritional improvements, and mortality decline. It emphasized that social interventions in public health require a different type of negotiation and planning that is ideological and political, and not simply a residual function of economic development. Theories of mortality decline focusing on ideational shifts and mortality risk perceptions brought us back to importance of the cultural aspect as a key determinant of success in any public health program or financial effort aiming to improve health outcomes of infants and young children.

The latter half of the second chapter was dedicated to developing a new conceptual model that would offer an integrated framework in order to understand the problematic of under-utilization of formal health care services. The model was developed from the well-known framework of Coale (1963) in the area of fertility studies, and adapted to mortality by studying behavioral transitions to modern health behaviors. The Ready-Willing-Able paradigm that integrated the structural and diffusionist theories of behavioral change was re-formulated to analyze behavioral transitions to the utilization of antenatal services, immunizations, and medical treatment for sick children.

These formal health services corresponded to the main axes of infectious disease mortality as identified in Johansson and Mosk's (1987) 'Exposure x Resistance x Recovery' framework. In the absence of antenatal care that ensures prevention and treatment of infectious diseases among pregnant women, and management of medical conditions, the risk of adverse outcomes is substantially increased. As those women who do not receive antenatal care are also more likely to give birth at home without trained attendants and adequate sterile procedures, the susceptibility of the infant to infection (and common newborn diseases such as neonatal tetanus) is greatly elevated. Once exposure to infectious disease agents has taken place, the protection from disease depends on whether the host can resist to and stay immune against the disease. Vaccines are critical because they provide an acquired immunity that creates immunological memory after an initial response to a specific pathogen. If the child is exposed and not able to resist the spread of infection, the process of recovery depends on whether the child is medically treated and attended by pharmaceutical drugs, particularly by anti-biotics and sulpha-drugs, at this stage of infectious disease morbidity.

After establishing the under-utilization of antenatal care, vaccinations and curative medical treatments as the source of Turkey's excess mortality in infants and children, third chapter moved on to demonstrating the application of the R-W-A mortality model to Turkish DHS data. We assumed a decision-making environment that is dictated by the economic and cultural characteristics of the family, where family members assess their various health decision options regarding the treatment and prevention of common diseases in children. Theoretically, agents involved in these decision-making processes were exogenously bound by the availability of choice options (between different forms of modern treatment, modern versus alternative treatment, or treatment versus no

treatment), accessibility of these options, and the degree to which choices make a difference to outcomes. In decision-making environments, economic and cultural family dynamics give answer to the main question; whether to invest family resources in a particular health behavior.

Three conditions of the model required that parents engage in rational modes of thought and make conscious decisions ('Ready'), that they regard these methods as culturally and morally acceptable ('Willing'), and finally, that the means are accessible ('Able'). The application of the framework in the third chapter to DHS nationally-representative ever-married sample of women in their reproductive ages, brought a gender-lens into its operationalization. Attitudinal and cultural changes in mothers, including the awareness that child deaths are in fact preventable, and that women have the right and freedom as individuals to decide responsibly on children's health matters, were operationalized as crucial requirements of behavioral adaptations of modern health methods, not necessarily tied to changes in families' economic well-being.

Results of the analysis confirmed the role of material factors as a major determinant of infant mortality and health service utilization rates, whereas the cultural requirements demonstrated the necessity of a wide-scale attitudinal change among the population with regards to *both* the scientific causes and treatments of infectious diseases, and to women's empowerment and status in society, to achieve maximal gains in survival. Results showed that when cultural conditions are the bottleneck, delayed changes with regard to the corrections of irrational and counterproductive beliefs and attitudes about health, and gender inequality in families and communities, can be influential on the outcomes of critical health decisions, by reserving families' social distance and isolation from maternal and child health services, and this way, sustaining the major risks of death from preventable infectious diseases in infant and children.

Limitations of Research

A major limitation is the inapplicability of the R-W-A framework to earlier stages of mortality transition. The analysis with DHS data in the final chapter could only capture the very end of Turkey's mortality transition in infants and children, whereas the process of mortality decline, as shown in the first chapter, witnessed not only the

highest death rates, but also the most striking differentials in death rates, during the early years of the Republic, following the war of independence (Shorter, 1985). If it was possible to possible to apply the R-W-A framework to study transitions at least as early as the 1960's (when health services were 'nationalized' across the country), we would probably come across very different distributions of readiness, willingness and ability, and more variation in death rates estimated for each of the eight R-W-A groups. Historical change to capture and provide a better picture, would not only reflect different levels of socio-economic development, but also diverse political and cultural influences. This is an unfortunate disadvantage since we know that the model's application to European experience showed that demographic indicators of fertility transition; the decline in marital fertility and the adoption of effective contraception, were strongly correlated with historical and contemporary indicators of secularization and voting for non-religious political parties (Lesthaeghe&Neels 2002, Lesthaeghe 2010).

Other limitations are due to characteristics of the data rather than to the period of analysis. These issues have been effective on the measurement of key latent traits. In the case of willingness, we miss a very important dimension: Mortality decline is a process that is not fully exogenous, but involving a new set of social and political actors and institutions constituting the modern health care system, whose methods may not be initially accepted. Over time, health fears > traditions, religion. Dolayisiyla duble onemli. Ability' de language barrier as a flag for inaccessibility, remote locations consistently measure edemedim. Readiness'de fatalism uzerinden olctum, ama o medical awareness ideal olarak baska nasil olculebilinirdi?

Readiness is the least problematic of the three latent traits. With the readiness condition, we are ultimately interested in measuring whether there is a calculating rationality; an assessment of medical options available to parents so that health risks in infants and children are minimized and survival chances are improved.

Even though the change in readiness condition should ideally echo an increasing recognition of the value of scientific methods and knowledge among the population (and a rejection of fatalistic attitude), we have used measures of rationality that are not specific enough to directly reflect rational decision-making on health options. Responses on ideal number of children and attitudes on the compatibility of contraceptive methods with religion, indicate rationality in reproductive health decisions; which should be close but not exact. A measure of previous

exposure to health information or campaigns, or survey items similar to the DHS question "Have you heard of HIV/Aids?", such as "Have you heard of neonatal tetanus?" or "Were you provided with vaccination schedule for child?", would have been more accurate indicators of readiness in medical matters.

The biggest handicap is with the measurement of willingness condition. We miss two very important aspects. The first is that the models of willingness do not include measures of mother's economic participation, and occupational category. The main reasons that these were excluded from analysis were either that they did not appear as consistent survey items across the four cross-sections of DHS data, or their labels could not be translated and thus harmonized between the cross-sections. However, they should be in the measurement and estimation of willingness, which was formally constructed as a pure gender measure, referring to the power that mothers have to go against patriarchal rules of the family, if necessary, to give birth at a health institution so that both maternal and neonatal mortality risks are reduced, or to reach out to receive medical treatment for a sick child who otherwise does not recover from the disease with home-made remedies and traditional care methods. Even though maternal education which is included in the models is known to be positively correlated with mothers' economic independence from husband and in-law family members, without a socio-economic occupational measure, willingness is an incomplete measure of women's status and autonomy.

The second crucial problem with wilingness is that 'motivations' for modern health care have not been taken into account in its measurement, while we know that the assumption for the endogeneity of the willingness condition is not likely to hold: Mortality decline in developing countries involves a new set of actors and institutions constituting the modern health care system - whose methods may not initially be accepted or judged to be clearly effective (Montgomery, 2000), or that counter-propogation or gossip about these new methods may reduce willingness considerably. Since positive motivation for formal health care is a separate concern than the measurement of mothers' power to reject traditional patriarchal limits, it is also wrong to assume in the case of every mother who is empowered, that health institutions and personnel have already established credibility and won the trust. This is an important limitation especially since we know that the remaining cultural obstacles are expected to be increasingly associated with health-related fears rather than with more general ethical, religious, or social

objections as the distribution of willingness shifts to the right over time (Lesthaeghe and Vanderhoeft 2001, pg. 23-24).

Measurement of ability is not as severely problematic as the measurement of willingness, however limitations seem to be more serious than in the case of readiness. The formulation of the ability condition was such that it required that the effective means of using formal health services are available and accessible to parents. In the measurement of ability, we have used two fundamentally important means of access to formal healthcare; household income and health insurance. Even though both are commonly experienced material problems, there are also non-material obstacles that might lead to under-utilization of maternal and child health care services, even when they are provided for free. One of these is the geographical remoteness of certain locations, suggesting a physical inaccessibility of child and maternal health clinics and hospitals, and thus the unavailability of the preventive and curative treatments they offer. Another obstacle is the language barrier that is generally encountered by the Kurdish population in relation to all central institutions of the state. However, this is perhaps most problematic in the case of health care services, where communication with patient is essential to avoid incorrect diagnosis and treatment. Without translators that would help with the communication between mother or child and the medical personnel, the Kurdish population as a group may prefer to get no medical health care assistance at all, especially considering other ideological and psycho-social factors that might come into play, for instance, perceived discrimination against (in particular illiterate) Kurds. Whereas geographical remoteness of some locations do not appear consistently across the four cross-sections of DHS data, whether Kurdish mothers can or cannot communicate in Turkish (in addition to their native language) could not possibly be included in the estimation of ability condition with interaction terms, due to small sample size.

Different from these restrictions imposed on us due to the limitations of DHS data, others limitations are modifiable. The first issue is the use of weights. Owing to the sampling characteristics of the DHS, each observation is assigned a country-level weight, and the sum of these weights is the same as the total sample size for that particular country, multiplied by one million. In the final chapter of this dissertation which presented the application of the R-W-A model to DHS data, weights were not applied. One primary reason for this choice was

very low response rate on some of key variables in the structural equation models. In other words, unweighted regressions were chosen since DHS weights are constructed to draw inferences that are representative of a country's population, and it is not clear how appropriate the weights provided are after exclusions due to missing cases.

After the assignment of eight groups defined by R-W-A classification, further exclusions were applied due to extremely small sample size in some of the groups (for instance, rwA), which were followed with indirect estimations of infant mortality and utilization rates of specific health services. Since Brass estimations use retrospective birth histories of women, potentially extending to births taking place decades ago, and weights are meaningful at the time period of surveys only, weights were also not applied to infant mortality estimation results. Finally, weights were not applied to utilization rates (and stunting prevalences) due to the fact that these were calculated from reshaping mothers' file into long format where each child became an observation. As the weights were assigned to mothers and not children, it is unclear what population of children such weights would lead our results to be representative of.

The analysis in the third chapter could nevertheless be improved if weights were tried and judged in terms of transparency and intuitiveness in comparison to the original results. Another strategy to test the robustness of observed findings is *directly* estimating infant and child mortality rates using birth histories of DHS mothers. Another is to keep the same formulation, operationalization and assignment of R-W-A groups, but estimate fertility instead of mortality outcomes, in order to test the assumptions and constructs of the model with behavioral transitions to the use of contraception. Lastly, structural equation models should be supplemented with sensitivity analyses, at the very least to show the sensitivity of our inferences to the choice of indicators, and to the choice of cutting-values.

Despite these limitations and further improvement opportunities, the R-W-A mortality model displays analytic capacities for understanding exceptionally poor performance of Turkey in infant and child mortality reductions, despite imported medical technologies and gradual improvements in national economy. The R-W-A model can also shed light on Turkey's highly heterogeneous levels in death rates, described in the first chapter of this dissertation with regional and ethnic variations of infant and child mortality, as well as with variations by maternal education. Calculations indicate that the Eastern regions, the most lagging region, accommodated the

highest concentration of one group that meets none of the three conditions, 'rwa', across all DHS years. Considering ethnicity, the proportion of mothers belonging to the same group (rwa) in the Kurdish population was four times as high as the Turkish population, while we know that during those years, mortality rates among Kurdish have been considerably higher. A strong correlation between R-W-A groups and levels of educational attainment exists as well: Cross-sectional examination reveals that percent of individuals who met neither of model's cultural requirements ranged between 0.50 to 0.75 among mothers who had no education, and did not exceed 0.02 among mothers who had secondary or higher education, throughout all DHS surveys. Thus the R-W-A group patterns outlined in the last chapter in mortality and formal health care utilization rates do not only align with well-documented disparities in death rates across the country, but also have important policy implications for how to address these disparities to achieve maximum survival gains from preventable infectious diseases in infants and children.

CHAPTER I

Table I. Significant coefficients of country dummy variables (di) in regressions relating national income to infant mortality rates in middle-income countries
(standard errors of coefficients in parantheses)

Angola	61.02	(6.12)	Lebanon		
Nigeria	48.39	(4.52)	St. Vincent and the Grenadines		
Turkey	46.57	(4.40)	Hungary		
Cote d'Ivoire	45.44	(4.39)	Costa Rica		
Gabon	36.12	(5.53)	Suriname		
Cameroon	34.07	(4.42)	Sudan		
Egypt	33.55	(4.41)	Maldives		
Algeria	33.16	(4.40)	Yemen, Rep.		
Pakistan	32.58	(4.46)	Saint Lucia		
Bolivia	31.30	(4.41)	Grenada		
Brazil	28.98	(4.58)	Dominica	-14.13	(5.46)
Peru	26.96	(4.43)	Mongolia	-14.25	(5.79)
Mexico	26.54	(4.48)	Mauritius	-14.34	(5.36)
South Africa	23.67	(5.21)	Kazakhstan	-15.31	(6.88)
Morocco	22.09	(4.42)	Syria	-15.50	(4.43)
Zambia	20.60	(4.47)	Paraguay	-15.63	(4.43)
El Salvador	20.51	(4.43)	Jordan	-15.68	(5.27)
Argentina	18.96	(4.99)	Fiji	-16.31	(4.44)
Tunisia	18.87	(4.47)	Tuvalu	-16.53	(6.88)
Swaziland	18.51	(4.93)	Thailand	-16.62	(4.43)
Iran	16.78	(4.82)	Malaysia	-16.98	(4.44)
Mauritania	15.37	(4.46)	Philippines	-17.08	(4.43)
Venezuela	14.33	(4.52)	Micronesia, Fed. Sts.	-17.34	(6.32)
Djibouti	14.29	(7.06)	Guyana	-18.45	(4.44)
Dominican Rep	12.68	(4.44)	Georgia	-18.67	(5.67)
India	12.17	(4.52)	Romania	-18.88	(5.67)
Senegal	11.19	(4.46)	Cabo Verde	-21.01	(5.76)
Nicaragua	9.31	(4.44)	Timor-Leste	-21.27	(9.13)
Congo Rep.	8.75	(4.44)	Cuba	-22.56	(4.95)
Palau			Albania	-26.65	(5.66)

Namibia			Vanuatu	-27.05	(5.57)
Libya			Ukraine	-27.21	(6.43)
Botswana			Macedonia, FYR	-29.10	(6.88)
Seychelles	6.27	(4.50)	Solomon Islands	-29.41	(6.87)
Papua New Guinea	5.92	(4.45)	Tonga	-30.63	(5.75)
Kiribati			Bulgaria	-30.66	(5.66)
Honduras			West Bank and Gaza	-31.06	(9.09)
Lesotho			Samoa	-31.84	(6.06)
Ecuador			Iraq	-33.48	(8.41)
Turkmenistan			Monte Negro	-36.59	(8.41)
Panama			Armenia	-41.14	(6.86)
Bhutan	2.36	(5.79)	Belarus	-41.33	(6.86)
Laos			Bosna Hersek	-44.42	(7.61)
Colombia			China	-44.77	(4.71)
Belize			Kyrgyzstan	-45.10	(6.32)
Indonesia			Sri Lanka	-45.63	(4.41)
Ghana			Moldova	-48.26	(5.64)
Jamaica			Serbia	-50.27	(6.84)
Azerbaijan			Uzbekistan	-58.00	(6.39)
Marshall Islands			Vietnam	-58.08	(6.05)

Table II. Under-five mortality 5(q)0 relative to adult mortality e(50) in Turkey

	Observed 5(q)0	Expected 5(q)0 with West Model	Expected 5(q)0 with North Model	Expected 5(q)0 with South Model
Central Anatolia e(50) in 1960 = 23.52	0.231	0.102 - 0.120	0.134 - 0.154	0.189 - 0.210
Northern Anatolia e(50) in 1960 = 26.49	0.169	0.027 - 0.039	0.051 - 0.066	0.096 - 0.117
Western Anatolia e(50) in 1960 = 23.60	0.163	0.102 - 0.120	0.134 - 0.154	0.189 - 0.210
Southern Anatolia e(50) in 1960 = 26.55	0.175	0.027 - 0.039	0.051 - 0.066	0.096 - 0.117
Ankara e(50) in 1960 = 24.24	0.127	0.085 - 0.102	0.116 - 0.134	0.170 - 0.189
Istanbul e(50) in 1960 = 26.32	0.139	0.027 - 0.039	0.066 - 0.082	0.117 - 0.133
Izmir e(50) in 1960 = 25.85	0.110	0.039 - 0.053	0.066 - 0.082	0.117 - 0.133

Table III. Six Geographical Divisions

Region	Represented by*	Mothers' sample (n) in Brass estimations		
		1985	1990	2000
Istanbul & Izmir	Istanbul & Izmir	62,015	81,626	113,187
Urban West	Aydin & Usak	1,941	3,062	4,077
Urban Central and East	Konya & Van	4,836	1,628	2,896
Rural West	Afyon & Kutahya	3,605	4,031	4,543
Rural Central	Kirsehir & Sivas	1,318	5,358	4,934
Rural East	Mardin, Hakkari, Siirt, Sirnak, Igdir, Ardahan	10,491	11,660	7,951

* These choices are arbitrary, and might be different than urban and rural units in the Shorter&Macura (1982) estimations.

TABLE IV. Estimated Infant Mortality Rates by Periods and Six Regional and Urban-Rural Divisions

	Istanbul& Izmir	urban west	urban east / central	rural west	rural central	rural east	Turkey
1945-49	182	208	241	222	330	274	260
1950-59	148	179	200	200	254	245	218
1960-69	112	145	154	176	171	195	164
1970-79	96	98	107	125	115	112	104
1980-89	65	74	80	86	81	78	80
1990-99	46	49	62	54	50	61	54

Figure I. Infant Mortality Decline in Regional and Urban-Rural Units

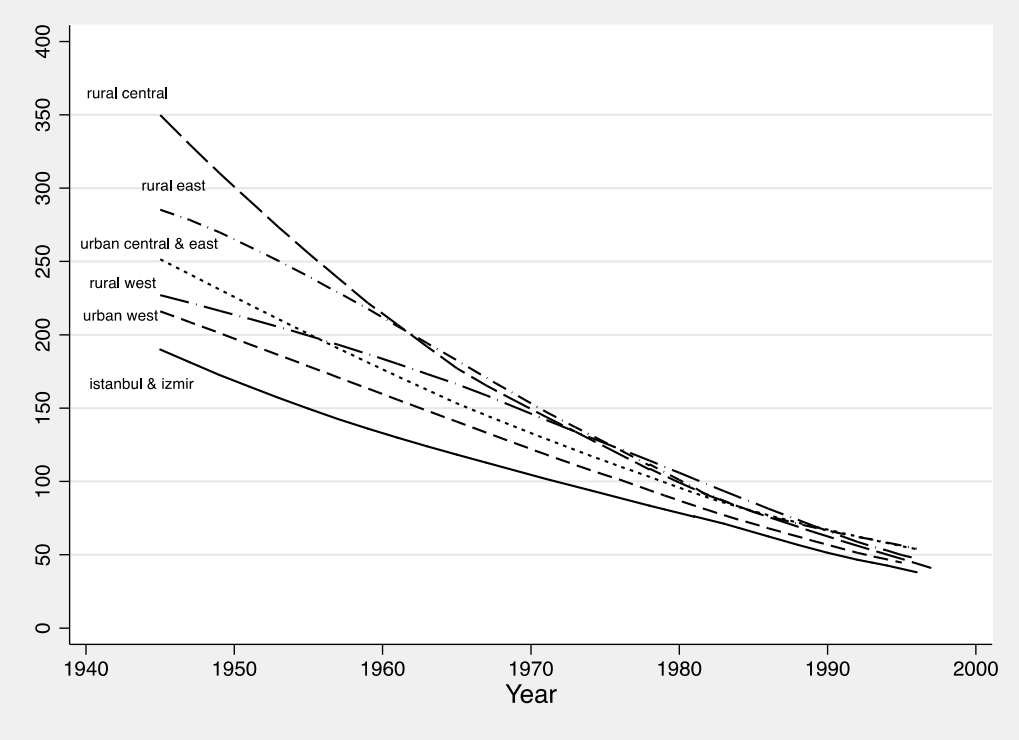
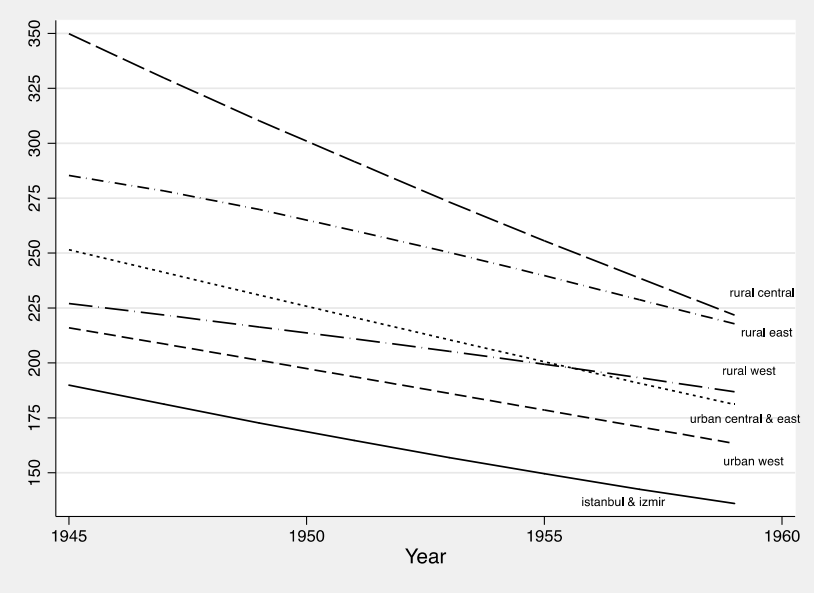
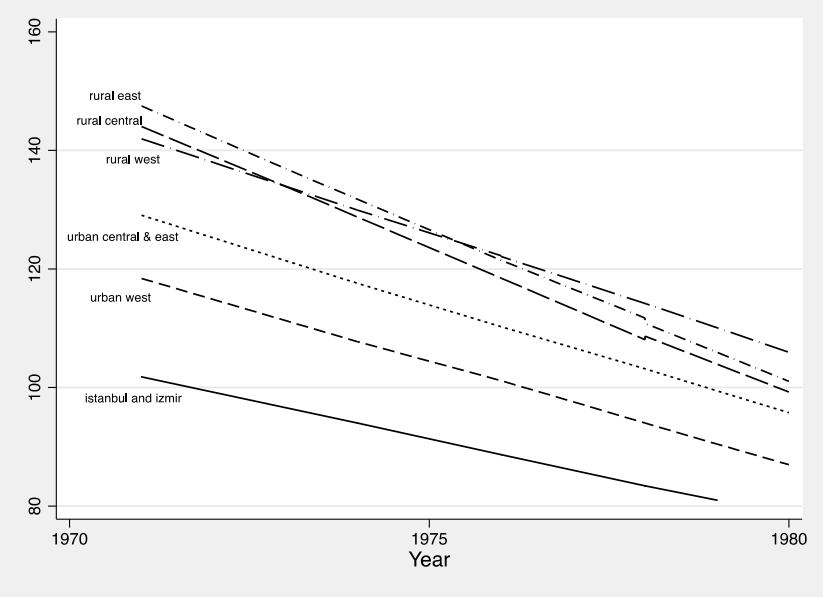


Figure II. Three Stages of Transition across Geographical Units

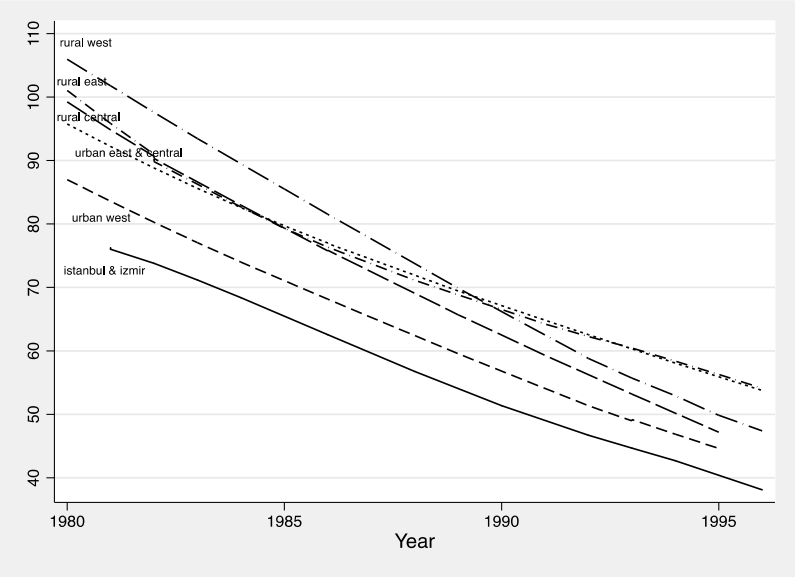


First Stage



Second Stage

Figure II. Three Stages of Transition across Geographical Units (Continued)



Third Stage

Table V. Significant Coefficients of Regression Variables Relating Infant Mortality Rates to Regional and Urban-Rural Variations

	Coef.	Std. Err.
Geographical Divisions *(Ref. Cat. Urban West)*		
Istanbul & Izmir	-31.00	9.10
Urban East & Central	21.20	9.10
Rural West	20.40	9.10
Rural Central	75.00	9.10
Rural East	65.60	9.10
Time Periods *(Ref. Cat. 1950-59)*		
1945-49	28.80	10.51
1960-69	-34.20	9.65
1970-79	-81.20	8.71
1980-89	-105.63	8.42
1990-97	-130.40	9.10
Interaction-terms		
1945-49 * Rural Central	46.67	14.86
1960-69 * Rural Central	-49.25	13.65
1970-79 * Istanbul & Izmir	29.33	12.32
* Rural Central	-57.60	12.60
* Rural East	-51.40	12.60
1980-89 * Rural Central	-67.13	11.63
* Rural East	-61.17	11.76
1990-97 * Istanbul & Izmir	28.00	12.87
* Rural Central	-73.80	13.26
* Rural East	-53.60	12.87
α - Constant	179.20	6.43

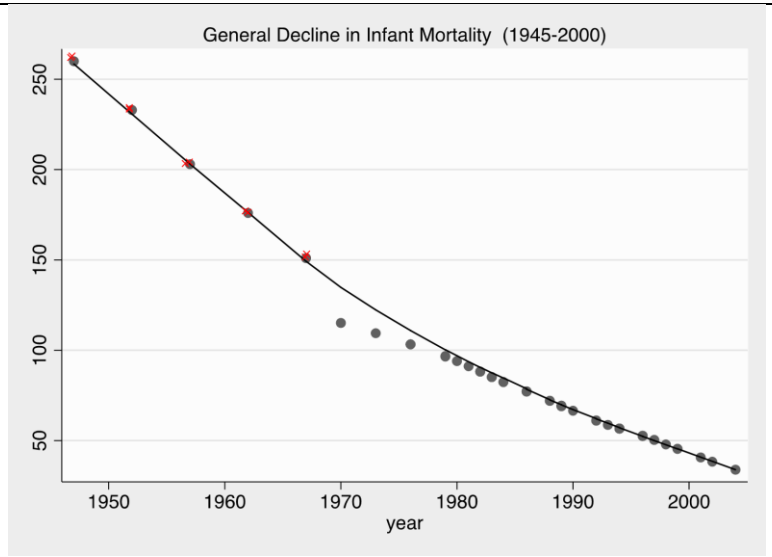
All results are significant at 95% confidence interval. Insignificant interaction terms are omitted from results.R-Squared .96

Table VI. Mothers' Samples (n) Used in Brass Estimations by Ethnicity

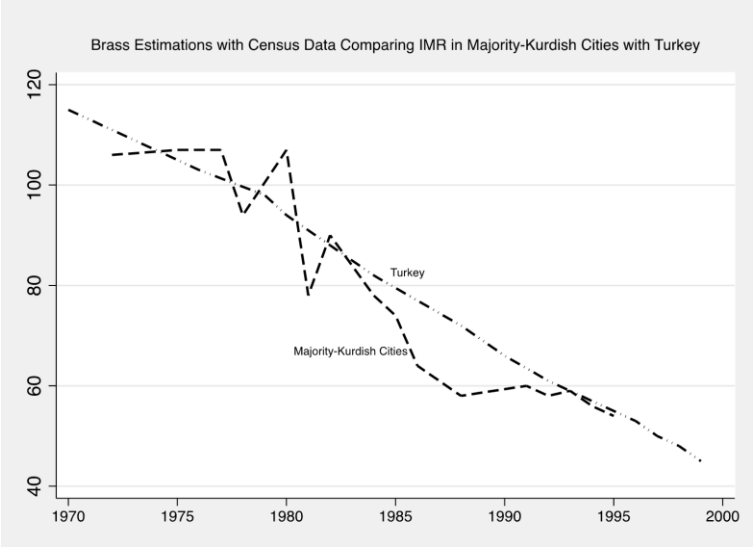
Year	Source for Estimations		
		Majority-Kurdish Urban Sample	Total Sample
1985	Census	22,641 (4.5%)	500,059
1990	Census	34,676 (4.9%)	705,564
2000	Census	42,282 (4.6%)	912,889
		Kurdish Sample	Turkish Sample
1993	DHS	665 (10%)	5,671 (90%)
1998	DHS	1,390 (17%)	6,879 (83%)
2003	DHS	1,529 (20%)	6,249 (80%)
2008	DHS	1,465 (20%)	5,700 (80%)

Figure III. Variations in IMR by Ethnicity

A)



B)



C)

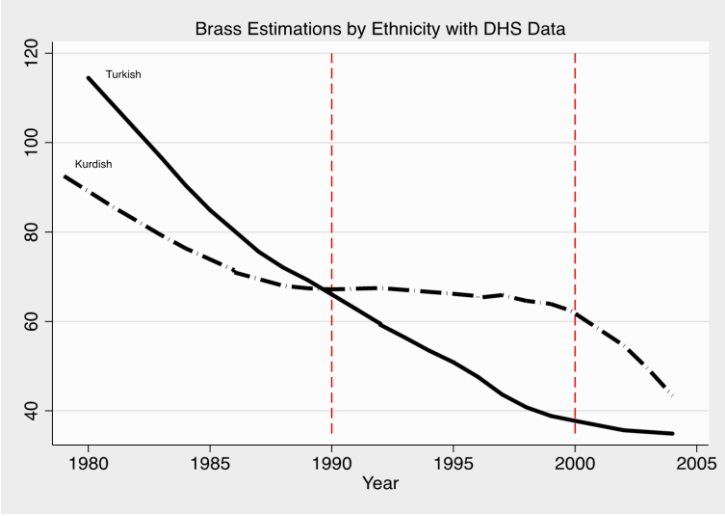


Figure IV . Relation between national income per capita (log-scale) and infant mortality in Middle-income countries and in Turkey (1960-2010)

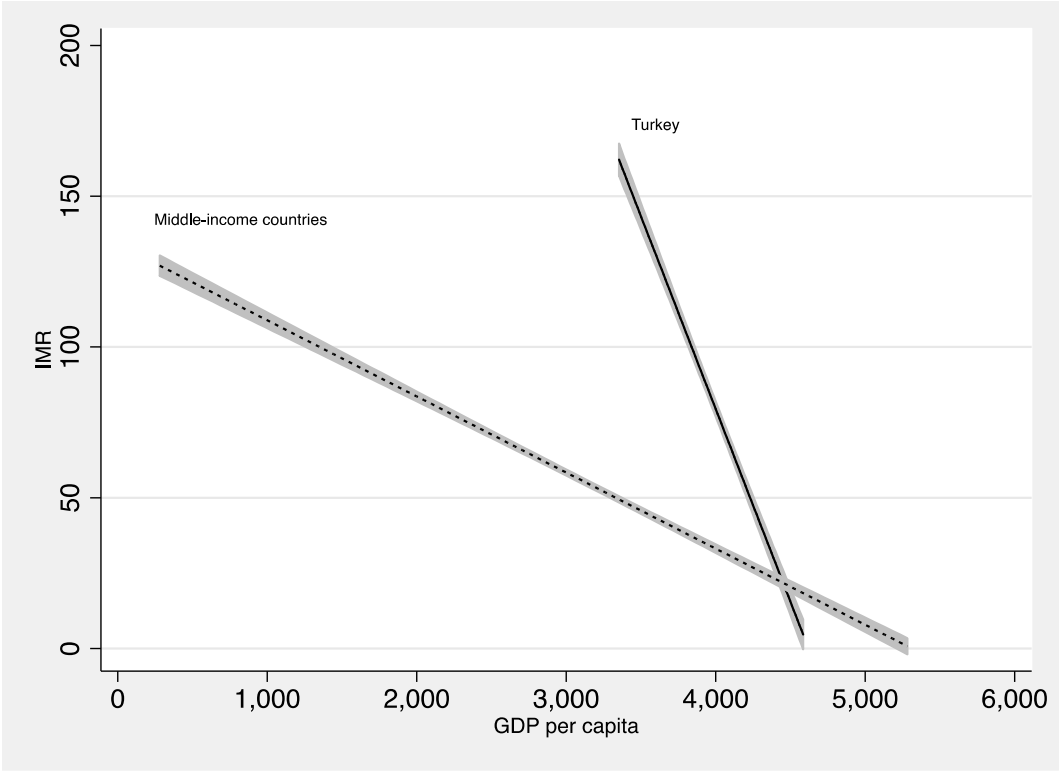


Table VII. Estimated reductions in infant mortality (per 1,000 births)

Base National Income	with $100 increase in GDP per capita		with $500 increase in GDP per capita	
	Middle-income countries	Turkey	Middle-income countries	Turkey
$1,000	2.35	12.18	10.01	51.82
$ 2,000	1.21	6.24	5.51	28.52
$3,000	0.81	4.19	3.81	19.70
$ 4,000	0.61	3.16	2.91	15.05
$ 5,000	0.49	2.53	2.35	12.18

Table VIII. Inputs for Decomposition Technique

Lower and Upper Middle-Income Countries

Relationship (1960-1984) $\frac{1}{0}q = 240.2 - 22.6 \cdot \ln\ (gdp)$

Relationship (1985-2010) $\frac{1}{0}q = 184.9 - 19.9 \cdot \ln\ (gdp)$

National income in 1960 = $ 1,056, $\frac{1}{0}q$ (1960) = 105.8

National income in 2010 = $2,551, $\frac{1}{0}q$ (2010) = 27.56

Turkey

Relationship (1960-1984): $\frac{1}{0}q = 1201.5 - 140.5 \cdot \ln\ (gdp)$

Relationship (1985-2010): $\frac{1}{0}q = 718.8 - 81.8 \cdot \ln\ (gdp)$

National income in 1960 = $ 1,560 , $\frac{1}{0}\mathrm{q}$ (1960) = 169.2

National income in 2010 = $5,350, $\frac{1}{0}\mathrm{q}$ (2010) = 19.5

Table IX. Infant mortality rates associated with combinations of national income change and relationships between national income and infant mortality, for Lower- and Upper-Middle Income Countries

Relationship between national income and infant mortality rate as observed in:	GDP per capita in: 1960	GDP per capita in: 2010	Estimated change due to increase in national income	
1960-1984, n=1327	a) 82.85	b) 62.92	(b-a) = -19.93	Average of (b-a) & (d-c) = -18.74 **(B)**
1985-2010, n=2439	c) 46.35	d) 28.8	(d-c) = -17.55	Share **(B)/(C)** =%34.7
	(c-a) = -36.5	(d-b) =-34.12		
Estimated change due to shift in relationship	Average of (c-a) & (d-b) =-35.31 **(A)**	Share **(A)/(C)** =65.3%	Total Change **(A)** + **(B)** = **C** =-54.05	

Table X. Infant mortality rates associated with combinations of national income change and relationships between national income and infant mortality, for Turkey

Relationship between national income and infant mortality rate as observed in:	GDP per capita in: 1960	GDP per capita in: 2010	Estimated change due to increase in national income	
1960-1984, n=25	a) 168.48	b) -4.67	(b-a) = -173.15	Average of (b-a) & (d-c) = -136.98**(B)**
1985-2010, n=26	c) 117.37	d) 16.56	(d-c) = -100.81	Share **(B)/(C)** =90.2%
	(c-a) = -51.11	(d-b) =21.23		
Estimated change due to shift in relationship	Average of (c-a) & (d-b) = -14.94 **(A)**	Share **(A)/(C)** =9.8%	Total Change **(A)** + **(B)** = **C** =-151.92	

Figure V. Estimated relationship between infant mortality and national income,1960-2010

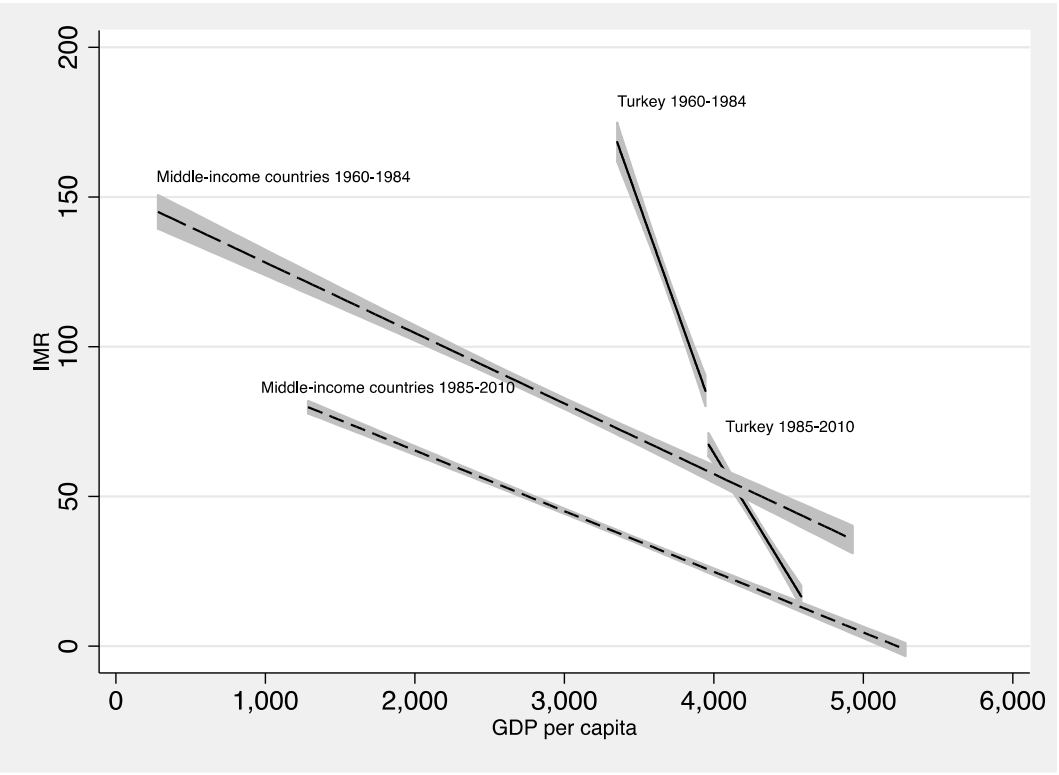


Table XI. Chronological Summary of National Immunization Programs (1923-2000)

1930s	-- Smallpox vaccine
1937	-- Diphtheria and whooping cough vaccine
1952	-- BCG, for tuberculosis
1963	-- Oral polio vaccine, for polio
1968	-- DBT, for diphtheria, tetanus and pertussis
1970	-- Measles
1981	-- Expanded Immunization Program
1985	-- Turkey Vaccination Campaign
1995	-- Polio National Vaccination Campaign
1996	-- Accelerated Measles Control
1997	-- Polio Mop-up
1998	-- Hepatitis B vaccine

Source: Buzgan T. (2011) History of Vaccination Policies in Turkey, *J Pediatr Inf 2011; 5 Suppl 1: 235-8*

TABLE XII. CHANGE IN THE SHARE OF SELECTED CAUSES OF DEATH UNDER AGE 5 (1956-1976)

UNDER AGE 1	**1956-59**	**1975-76**
Influenza / Pneumonia / Bronchitis	32.79%	25.90%
Diarrhea, gastritis, enteritis	21.69%	12.83%
Anaemia, avitaminoses, other nutritional deficiency	1.24%	0.43%
Heart disease	0.75%	1.22%
Tuberculosis of respiratory system, and other forms	0.70%	0.15%
Measles	0.50%	0.28%
Diphtheria	0.18%	0.01%
Whooping Cough	0.21%	0.05%
Meningitis	0.24%	0.62%
Malignant Neoplasms	0.07%	2.74%
	Number of deaths=32,697	Number of deaths=68,366
	Percent of deaths in this age category=31.7	Percent of deaths in this age category=28.6

AGES 1 to 5	**1956-59**	**1975-76**
Influenza / Pneumonia / Bronchitis	38.93%	36.74%
Diarrhea, gastritis, enteritis	28.09%	13.49%
Anaemia, avitaminoses, other nutritional deficiency	2.15%	0.80%
Heart disease	1.51%	3.68%
Tuberculosis of respiratory system, and other forms	4.86%	1.41%
Measles	2.28%	1.92%
Diphtheria	3.15%	0.09%
Whooping Cough	0.53%	0.07%
Meningitis	1.10%	3.90%
Malignant Neoplasms	0.53%	4.73%
	Number of deaths=11,223	Number of deaths=13,747
	Percent of deaths in this age category =10.9	Percent of deaths in this age category =5.6

TABLE XIII – Distributional Changes in Childhood Mortality (1978-2008

	1978	1983	1988	1993	1998	2003	2008
Among live births							
Alive by age 5	83.2	87.4	90.1	93.7	94.7	96.2	97.6
Not alive by age 5	16.8	12.6	9.9	6.3	5.3	3.8	2.4
Among deaths by age 5							
Died in childhood	20.2	20.6	17.2	15.9	18.9	23.7	29.2
Died in infancy	79.8	79.4	82.8	84.1	81.1	76.3	70.8
Among deaths by age 1							
Post-neonatal deaths	55.2	58	57.3	43.4	39.5	41.4	23.5
Neonatal deaths	44.8	42	42.7	56.6	60.5	58.6	76.5
Among neonatal deaths							
Early neonatal death	32	31	30	26	28	27	13
Late neonatal death	68	69	70	74	72	73	87

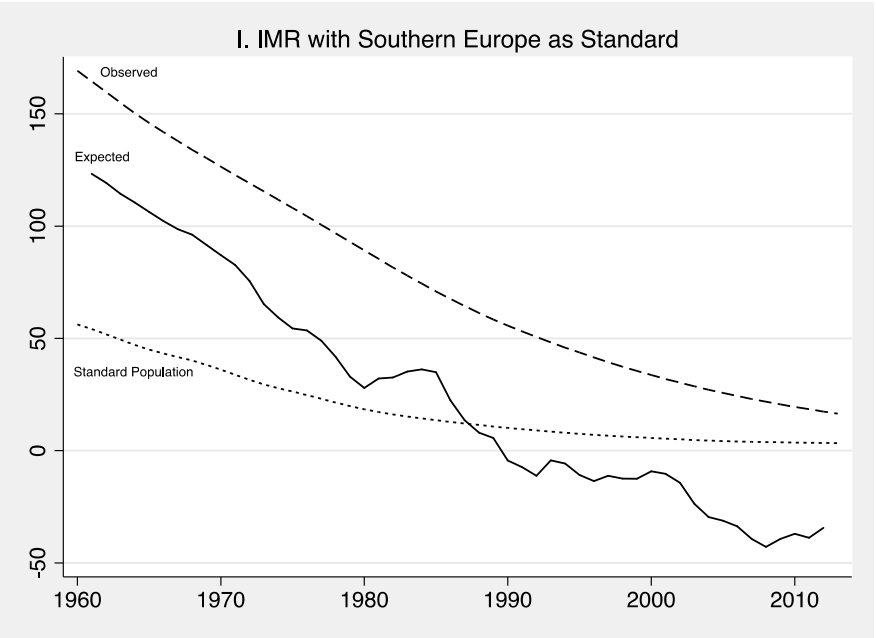
Table XIV. Linear Regression of IMR on Development Indicators (1960-2010)	Turkey			South Europe		
	model 1	model 2	model 3	model 1	model 2	model 3
ln (gdp per capita)	-41.4	4.8	-9.6	-12.3	*-2.6*	-10.0
% primary school enrollment		*-0.4*			*0.0*	
% secondary school enrollment		-0.2			*0.0*	
% urban population		-3.0			-2.0	
female to male ratio in primary school enrollment			-3.6			*-0.4*
Constant	386.9	242.9	457.6	125.7	164.8	144.9
Adjusted R-Squared	0.93	0.99	0.95	0.96	0.95	0.93

Linear Regression of CMR on Development Indicators (1960-2010)	Turkey			South Europe		
	model 1	model 2	model 3	model 1	model 2	model 3
ln (gdp per capita)	-23.7	4.7	*-3.2*	-2.4	*-0.2*	-1.5
% primary school enrollment		*-0.3*			*0.0*	
% secondary school enrollment		*0.0*			*0.0*	
% urban population		-2.0			0.0	
female to male ratio in primary school enrollment			-2.2			*-0.1*
Constant	209.5	122.1	246.9	24.0	27.9	21.5
Adjusted R-Squared	0.91	0.99	0.94	0.88	0.95	0.92

* Insignificant coefficients are indicated in italic

Figure VI. Produced infant and child mortality rates with standardized levels in socio-economic indicators

MODEL 1



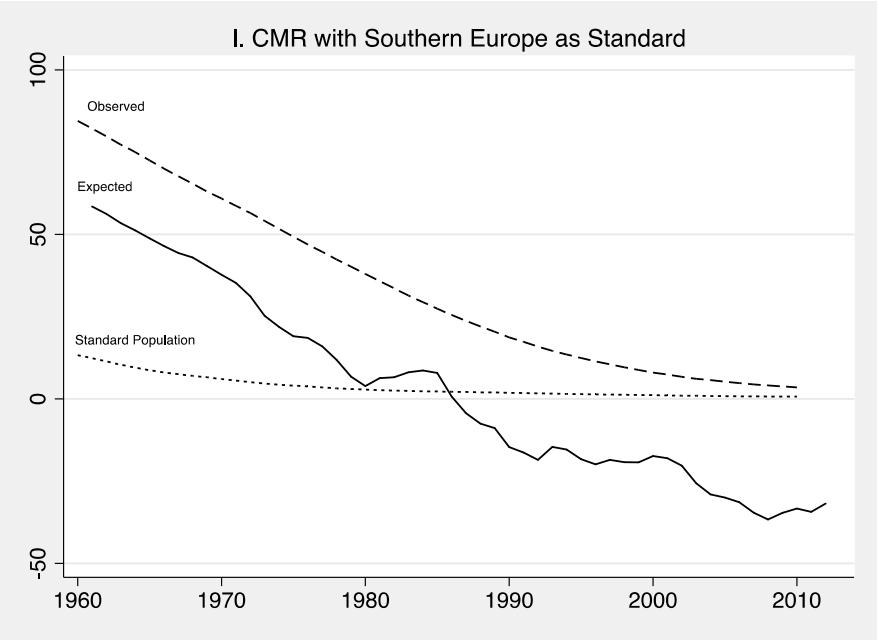
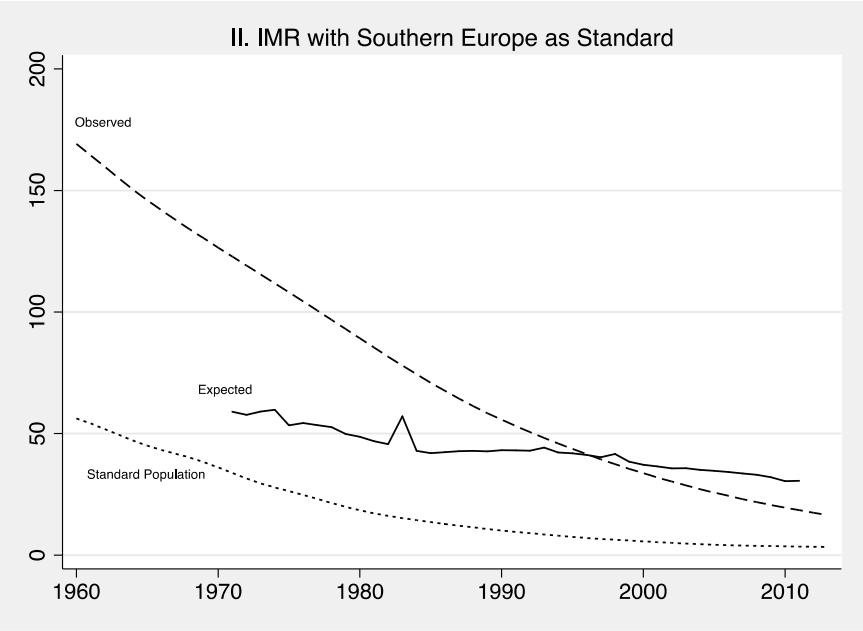


Figure VI. Produced infant and child mortality rates with standardized levels in socio-economic indicators (Continued)

MODEL 2



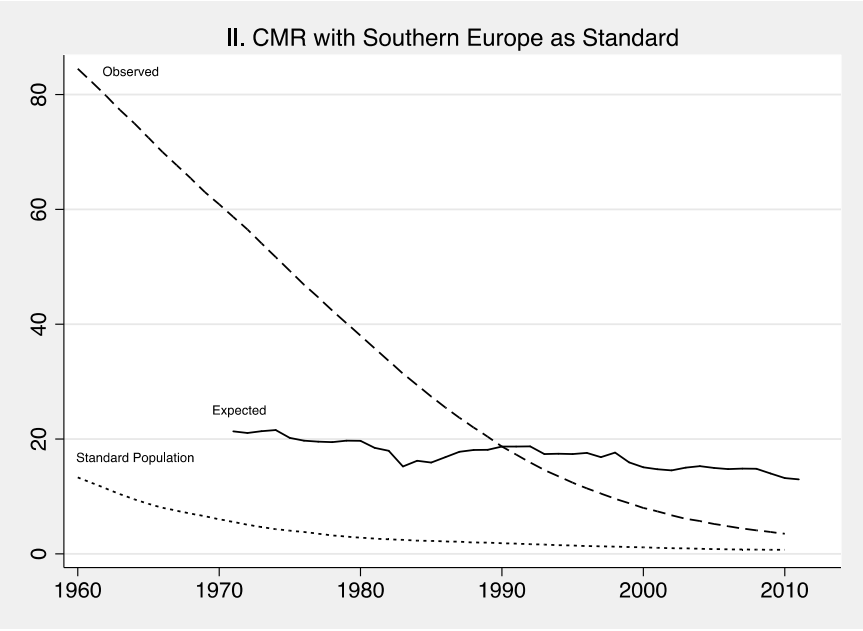
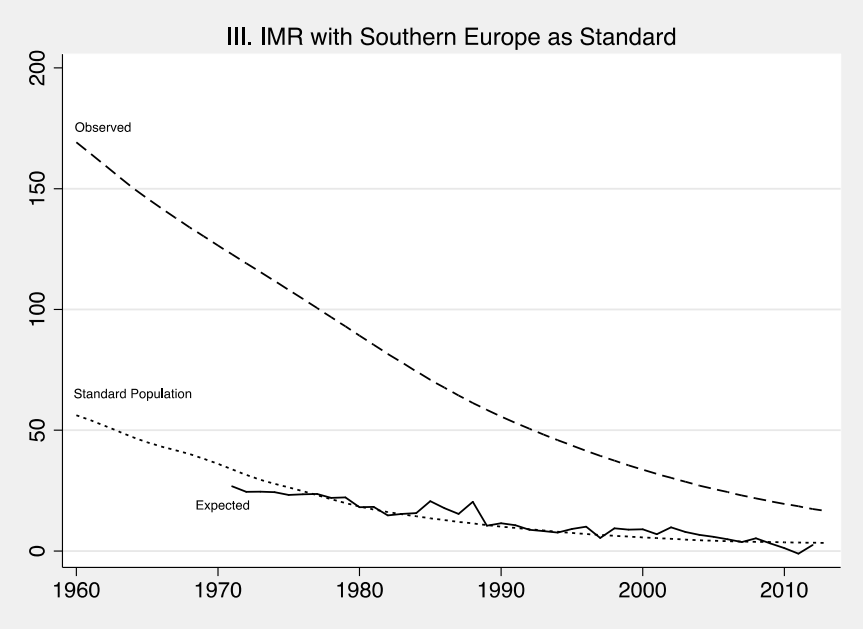


Figure VI. Produced infant and child mortality rates with standardized levels in socio-economic indicators (Continued)

MODEL 3



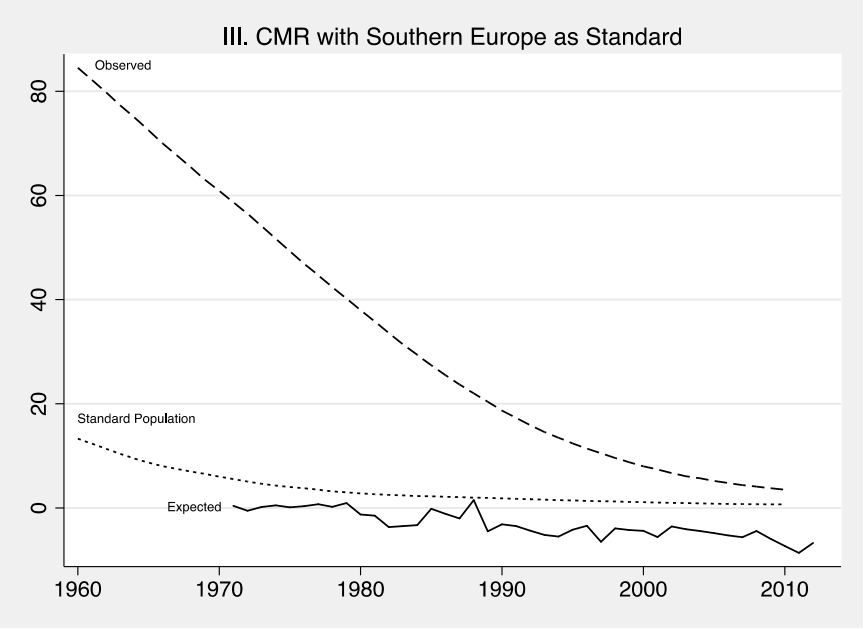


Table XV. Reductions in infant mortality using Southern Europe as standard

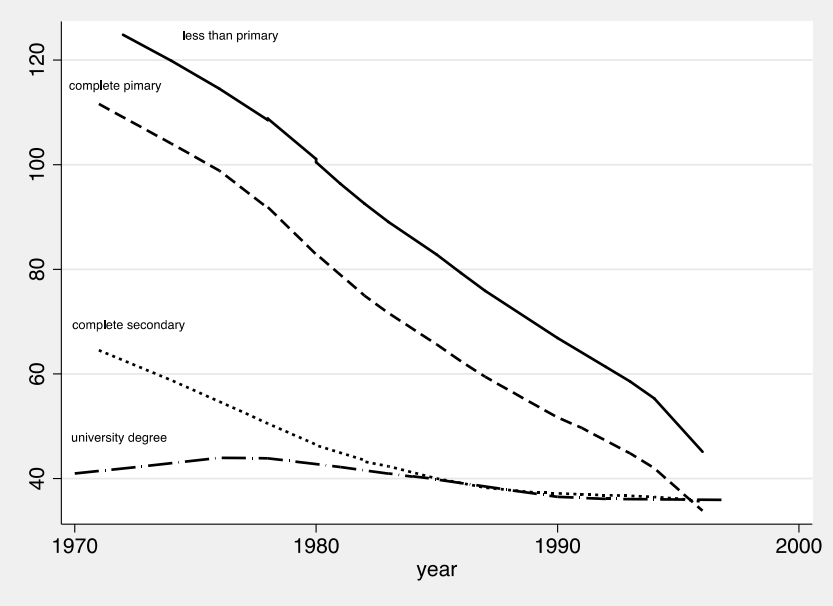
Year	Observed IMR	Expected IMR with national income and sex ratio in primary education	Expected IMR with national income only	Expected IMR with sex ratio in primary education only
1975	108.1	23.2	90.5	32.7
1980	89.2	18.1		30.7
1985	70.9	20.7	52.3	32.9
1990	55.7	11.5	38.1	26.1
1995	43.7	9.1	31.3	24.8
2000	33.7	9.0	36.4	20.7
2005	25.7	5.9	17.1	17.6
2010	19.5	1.2	2.7	10.9

Year	(i) Change due to national income and sex ratio in primary education	(ii) Change due to national income only	(iii) Change due to sex ratio in primary education only	Ratio of (iii) to (i)
1975	0.79	0.16	0.70	88.82%
1980	0.80	0.00	0.66	82.30%
1985	0.71	0.26	0.54	75.59%
1990	0.79	0.32	0.53	67.09%
1995	0.79	0.28	0.43	54.65%
2000	0.73	-0.08	0.39	52.76%
2005	0.77	0.34	0.32	40.90%
2010	0.94	0.86	0.44	47.03%

Table XVI. Mothers' Samples (n) Used in Brass Estimations, by Education

Year	Less than Primary Education	Primary Education	Secondary Education	University Degree	Total
1985	130,921	200,056	23,303	6,886	361,166
	0.36	0.55	0.06	0.02	1.00
1990	151,152	298,938	36,759	14,200	501,049
	0.30	0.60	0.07	0.03	1.00
2000	127,796	399,628	73,150	32,962	633,536
	0.20	0.63	0.12	0.05	1.00

Figure VII. Infant Mortality Rates by Maternal Education and Comparison with Southern European Levels



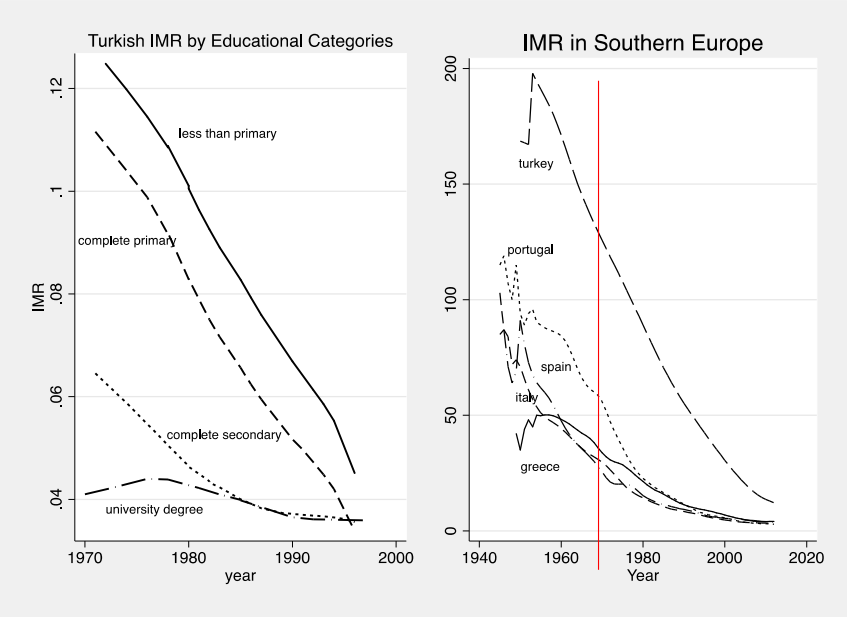


Table XVII. Infant Mortality Index by Maternal Education (1988-2008)*

	Years of Education		
	0 years	5 years	6-8 years
Mother's Age Category			
15 to 19	1.3040	1.0113	0.2446
20 to 24	1.0626	0.8220	0.1975
25 to 29	0.8981	0.6936	0.1659
30 to 34	0.9322	0.7201	0.1724
35 to 39	1.3541	1.0507	0.2545
40-44	1.7912	1.3962	0.3424
45-49	2.7615	2.1740	0.5481
Ethnicity			
Turkish	0.9926	0.7676	0.1843
Kurdish	1.2704	0.9853	0.2384
Region			
West	0.8691	0.6599	0.1569
South	1.1559	0.8805	0.2110
Central	1.1397	0.8681	0.2079
North	0.8316	0.6311	0.1499
East	1.1977	0.9129	0.2190
Place of residence			

Rural	1.2695	0.9682	0.2326
Urban	0.9453	0.7183	0.1710
REGIONS x RURAL/URBAN			
West			
Rural	1.0549	0.8024	0.1916
Urban	0.7833	0.5940	0.1408
South			
Rural	1.3996	1.0687	0.2575
Urban	1.0435	0.7936	0.1894
Central			
Rural	1.3803	1.0537	0.2538
Urban	1.0288	0.7823	0.1866
North			
Rural	1.0097	0.7676	0.1830
Urban	0.7493	0.5680	0.1345
East			
Rural	1.4498	1.1076	0.2673
Urban	1.0816	0.8229	0.1966

ETHNICITY x RURAL/URBAN			
Turkish			
Rural	1.2335	0.9403	0.2257
Urban	0.9181	0.6974	0.1659
Kurdish			
Rural	1.4884	1.1379	0.2751
Urban	1.1112	0.8459	0.2024
TOTAL	1.0481	0.7976	0.1906

* Index is the ratio of the predicted probabilities from the logistic regression of infant mortality between 1988 and 2008 on selected characteristics and survey year, to Turkey's national infant mortality rate (0.037) in 1998.

Figure I. Illustration of change in R-W-A distributions over time in Lesthaeghe and Vonderhoeft

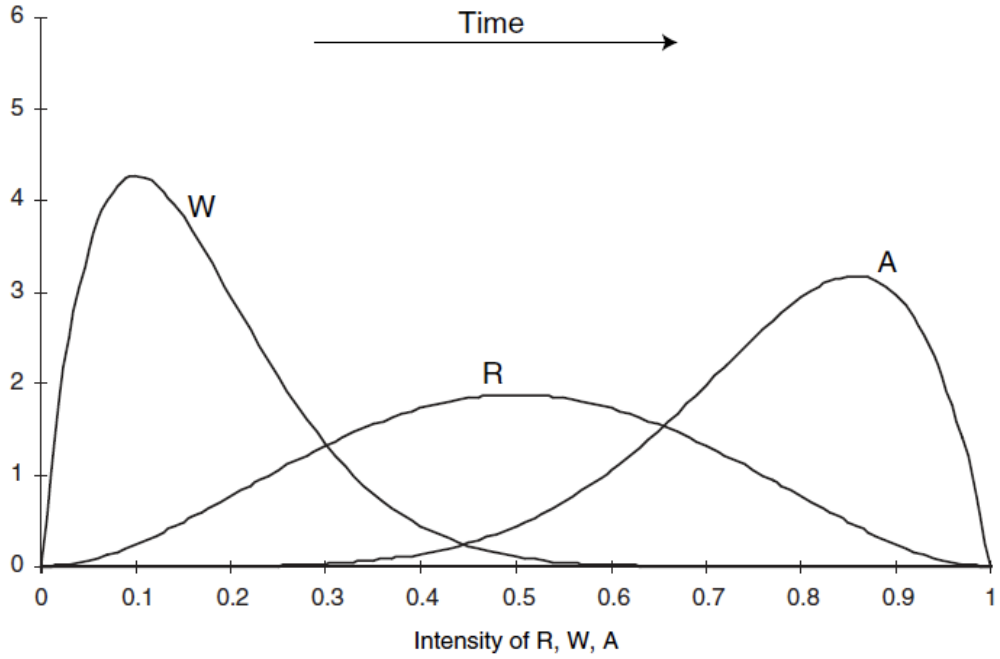


Table I. A simple illustration of decomposition method with R-W-A distributions

Groups → / Time Period ↓	I. **RWA**	II. **RWa**	**III. RwA**	IV. **Rwa**	V. **rWA**	VI. **rWa**	VII. **rwA**	VIII. **rwa**	**Total**
1988-93	${}_1q_{0(1988-93)}^{RWA}, C_{(1988-93)}^{RWA}$	${}_1q_{0(1988-93)}^{RWa}, C_{(1988-93)}^{RWa}$	${}_1q_{0(1988-93)}^{RwA}, C_{(1988-93)}^{RwA}$	${}_1q_{0(1988-93)}^{Rwa}, C_{(1988-93)}^{Rwa}$	${}_1q_{0(1988-93)}^{rWA}, C_{(1988-93)}^{rWA}$	${}_1q_{0(1988-93)}^{rWa}, C_{(1988-93)}^{rWa}$	${}_1q_{0(1988-93)}^{rwA}, C_{(1988-93)}^{rwA}$	${}_1q_{0(1988-93)}^{rwa}, C_{(1988-93)}^{rwa}$	${}_1q_0^{(1988-93)} = \sum_{i=rwa}^{RWA} {}_1q_0 \bullet C^{rwa \to RWA}$
2003-08	${}_1q_{0(2003-08)}^{RWA}, C_{(2003-08)}^{RWA}$	${}_1q_{0(2003-08)}^{RWa}, C_{(2003-08)}^{RWa}$	${}_1q_{0(2003-08)}^{RwA}, C_{(2003-08)}^{RwA}$	${}_1q_{0(2003-08)}^{Rwa}, C_{(2003-08)}^{Rwa}$	${}_1q_{0(2003-08)}^{rWA}, C_{(2003-08)}^{rWA}$	${}_1q_{0(2003-08)}^{rWa}, C_{(2003-08)}^{rWa}$	${}_1q_{0(2003-08)}^{rwA}, C_{(2003-08)}^{rwA}$	${}_1q_{0(2003-08)}^{rwa}, C_{(2003-08)}^{rwa}$	${}_1q_0^{(2003-08)} = \sum_{i=rwa}^{RWA} {}_1q_0 \bullet C^{rwa \to RWA}$

Table I. Descriptive statistics for positive responses in the measurement model

		1993	1998	2003	2008
Ready indicators	(a) 1.00 - Proportion non-numeric response to ideal number of children	0.97	0.94	0.97	0.95
	n	6,324	5,903	3,913	5,151
	(b) 1.00 - Proportion "Family planning is against religion"	0.78	0.80	0.13	no observations
	n	5,658	5,288	3,566	no observations
Willing indicators	(a) 1.00 - Proportion "A husband is justified in beating his wife when she argues with him"	0.48	0.63	0.71	0.84
	n	6,251	5,734	7,596	5,078
	(b) 1.00 - Proportion "Important health decisions should be given by men"	0.71	0.61	0.68	0.74
	n	2,831	5,795	7,655	5,151
Able indicators	(a) 1.00 - Proportion low-wealth status (household)	0.65	0.64	0.66	0.49
	n	6,324	5,903	7,754	5,151
	(b) Proportion with Health insurance	0.58	0.58	0.67	0.82
	n	6,198	5,850	7,738	5,143

Table II. Descriptive Statistics for Independent Variables in the Structural Model

			1993	1998	2003	2008
Age Group						
	15-19	N	318	255	225	83
		%	5.03	4.32	2.9	1.61
	20-24	N	997	889	1,035	547
		%	15.77	15.1	13.35	10.62
	25-29	N	1,201	1,152	1,464	863
		%	18.99	19.5	18.88	16.75
	30-34	N	1,239	1,081	1,452	926
		%	19.59	18.3	18.73	17.98
	35-39	N	1,053	1,034	1,346	1,005
		%	16.65	17.5	17.36	19.51
	40-44	N	854	828	1,247	910
		%	13.5	14	16.08	17.67
	45-49	N	662	664	985	817
		%	10.47	11.3	12.7	15.86
Educational Attainment	No education	N	1,716	1,338	1,517	1,248
		%	27.13	22.67	19.56	24.23
	Primary education	N	3,522	3,297	4,195	3,770
		%	55.69	55.85	54.10	73.19
	Secondary education or Higher	N	1086	1268	2042	133
		%	17.17	21.5	26.34	2.58
Type of Place of Residence	Rural	N	2,310	1,887	1,993	1,597
		%	36.53	32	25.7	31
	Urban	N	4,014	4,016	5,761	3,554
		%	63.47	68	74.3	69
Ethnicity	Turkish	N	5,659	4,957	6,230	3,786
		%	89.48	84	80.35	73.5
	Kurdish	N	665	946	1,524	1,365
		%	10.52	16	19.65	26.5

Table II. Descriptive Statistics for Independent Variables in the Structural Model (Continued)

Family Type	Nuclear Family	N	5,004	4,621	6,380	4,293
		%	79.13	78.3	82.28	83.34
	Patriarchal Extended Family	N	1,320	1,282	1,374	858
		%	20.87	21.7	17.72	16.66
Age at Marriage	Older than 15	N	5,184	4,848	6,680	4,361
		%	81.97	82.1	86.15	84.66
	15 or younger	N	1,140	1,055	1,074	790
		%	18.03	17.9	13.85	15.34
Husband's Educational Attainment	No education	N	490	406	417	272
		%	7.75	6.88	5.38	5.28
	Primary education	N	3,576	2,928	3,541	2,937
		%	56.55	49.6	45.67	57.02
	Secondary education or Higher	N	2258	2569	3796	1942
		%	35.7	43.5	48.95	37.7
Neighborhood Educational Attainment (only Women)	More than 50% with no education	N	643	341	959	530
		%	10.17	5.78	12.37	10.29
	At least 50% with some level of formal education	N	5,681	5,562	6,795	4,621
		%	89.83	94.2	87.63	89.71

Table III. Results of SEM with Latent Variables

Statistical definition of latent variables		Estimate	S.E	Estimate / S.E
Ready by				
	"Family planning is *not* against religion"	1.000	0.000	
	Numeric response to ideal number of children	2.470	0.165	14.975
Willing by				
	"Important health decisions should *not* be exlusively given by men"	1.000	0.000	
	"A husband is *not* justified in beating his wife when she argues with him"	1.217	0.054	22.373
Able by				
	Wealth status does *not* indicate that household is poor	1.000	0.000	
	Covered with health insurance	0.375	0.013	28.019

Regression relationships		ready			willing			able		
		Estimate	S.E	Estimate / S.E	Estimate	S.E	Estimate / S.E	Estimate	S.E	Estimate / S.E
Age Group										
	15-19				-0.486	0.083	-5.818	-0.593	0.109	-5.440
	20-24 (omitted)									
	25-29				0.190	0.051	3.756	0.380	0.066	5.740
	30-34	-0.140	0.045	-3.087	0.217	0.052	4.207	0.692	0.068	10.241
	35-39	-0.259	0.045	-5.729	0.227	0.053	4.284	1.056	0.071	14.830
	40-44	-0.425	0.047	-8.979	0.199	0.055	3.623	1.444	0.078	18.590
	45-49	-0.506	0.050	-10.089	0.261	0.058	4.482	1.722	0.085	20.310
Educational Attainment	No education	-0.220	0.031	-7.076	-1.069	0.045	-23.492	-0.934	0.056	-16.769
	Primary education (omitted)									
	Secondary education or Higher	0.134	0.038	3.502	1.712	0.064	26.631	1.479	0.076	19.417
Type of Place of Residence	Rural (omitted)									
	Urban	0.058	0.026	2.267	0.810	0.036	22.535	2.301	0.071	32.611
Ethnicity	Turkish (omitted)									
	Kurdish	-0.614	0.044	-13.843	0.275	0.041	6.746	-1.097	0.062	-17.804

Table III. Results of SEM with Latent Variables (Continued)

Regression relationships (continued)		ready			willing			able		
		Estimate	S.E	Estimate / S.E	Estimate	S.E	Estimate / S.E	Estimate	S.E	Estimate / S.E
Family Type	Nuclear Family (omitted)									
	Patriarchal Extended Family				-0.261	0.039	-6.623			
Age at Marriage	> 15 (omitted)									
	15 or younger				-0.146	0.038	-3.822			
Husband's Educational Attainment	No education							-1.189	0.088	-13.539
	Primary education (omitted)									
	Secondary education or Higher							1.315	0.052	25.252
Neighborhood Educational Attainment (only Women)	More than 50% with no education (omitted)									
	At least 50% with some level of formal education	0.135	0.038	3.508						

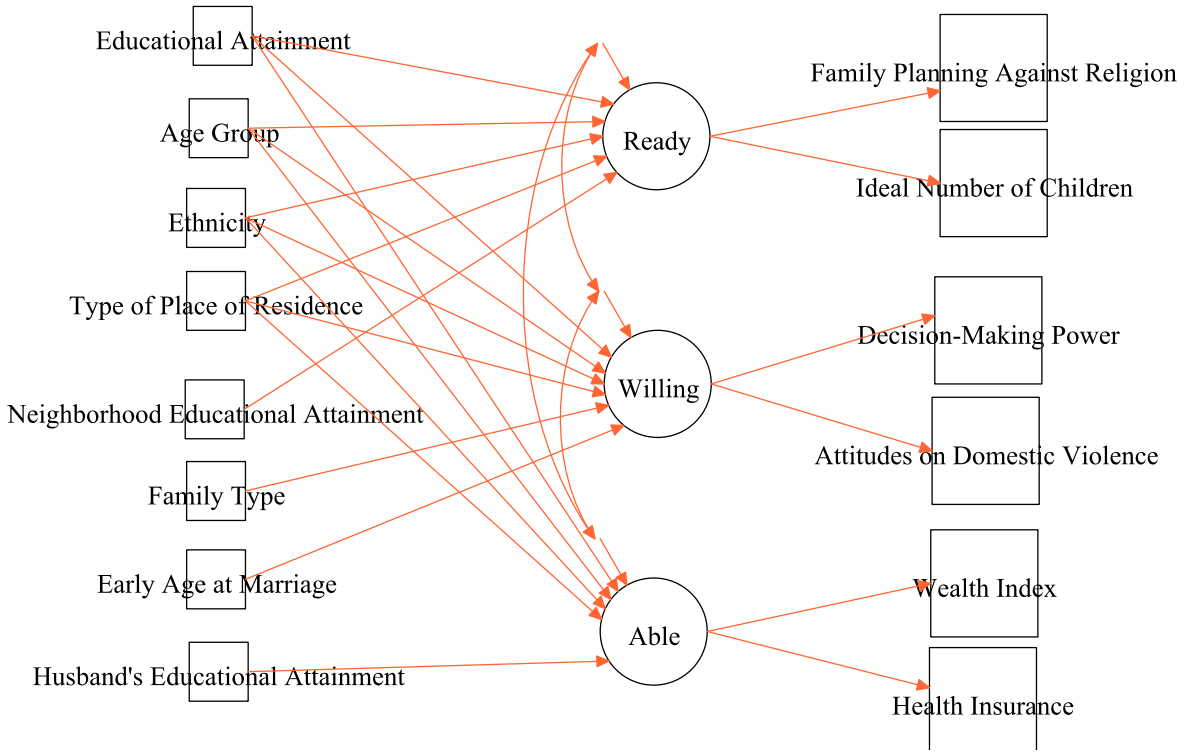
Correlational relationships			
	Estimate	S.E	Estimate / S.E
Willing with Ready	0.279	0.028	8.417
Able with Ready	0.256	0.038	6.695
Able with Willing	0.754	0.049	15.460

Thresholds			
	Estimate	S.E	Estimate / S.E
R: "Family planning is *not* against religion"	-0.703	0.054	-13.109
R: Numeric response to ideal number of children	-4.400	0.197	-22.316
W: "Important health decisions should *not* be exlusively given by men"	-0.303	0.051	-5.939
W: "A husband is *not* justified in beating his wife when she argues with him"	-0.182	0.061	-2.971
A: Wealth status does *not* indicate that household is poor	1.839	0.074	24.827
A: Covered with health insurance	0.265	0.031	8.469

Residual variances			
	Estimate	S.E	Estimate / S.E
Ready	0.136	0.043	3.136
Willing	1.713	0.103	16.620
Able	1.808	0.204	8.865

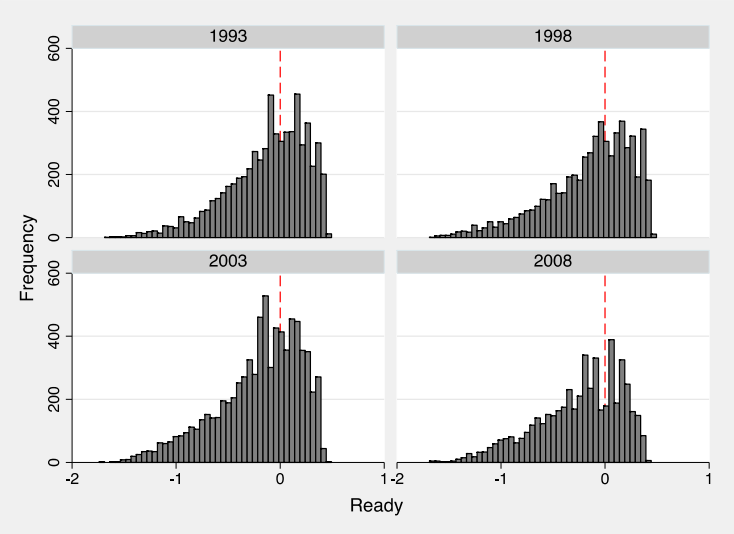
R-Squares	
Ready	51.3%
Willing	38.8%
Able	70.7%

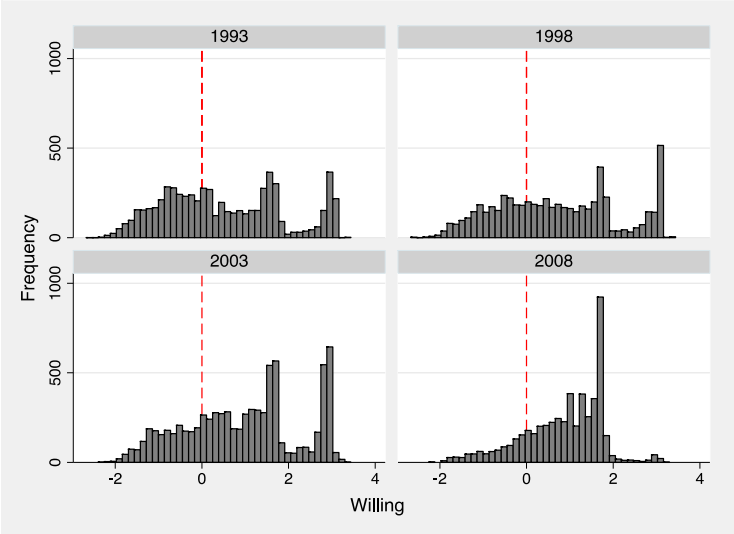
Figure I. Path Diagram of Latent Variable SEM *



* Covariances between independent variables are not shown

Figure II. Distributional changes in estimated latent traits





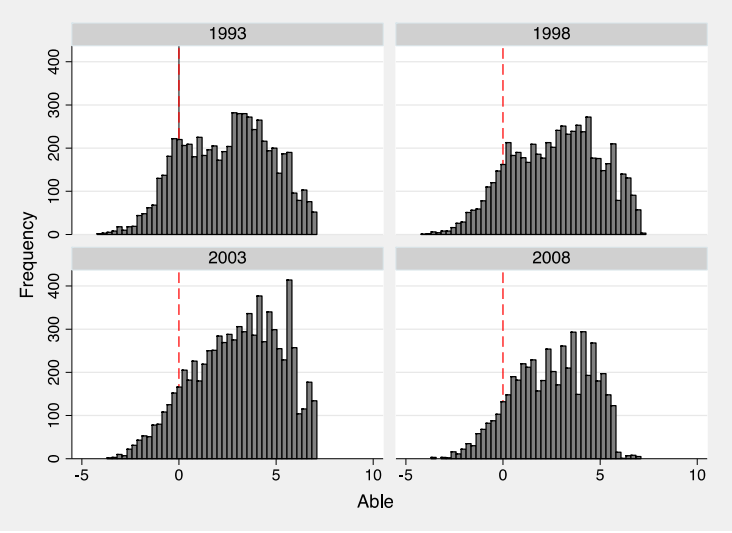


Table IV. Change in latent variables

Ready			Willing			Able		
1993								
	Freq.	**Percent**		**Freq.**	**Percent**		**Freq.**	**Percent**
Not-Ready	3,576	56.55	**Not-Willing**	2,656	42.00	**Not-Able**	1,043	16.49
Ready	2,748	43.45	**Willing**	3,668	58.00	**Able**	5,281	83.51
	6,324	100		6,324	100.00		6,324	100
1998								
	Freq.	**Percent**		**Freq.**	**Percent**		**Freq.**	**Percent**
Not-Ready	3,431	58.12	**Not-Willing**	2,093	35.46	**Not-Able**	780	13.21
Ready	2,472	41.88	**Willing**	3,810	64.54	**Able**	5,123	86.79
	5,903	100		5,903	100.00		5,903	100
2003								
	Freq.	**Percent**		**Freq.**	**Percent**		**Freq.**	**Percent**
Not-Ready	4,939	63.7	**Not-Willing**	1,989	25.65	**Not-Able**	837	10.79
Ready	2,815	36.3	**Willing**	5,765	74.35	**Able**	6,917	89.21
	7,754	100		7,754	100.00		7,754	100
2008								
	Freq.	**Percent**		**Freq.**	**Percent**		**Freq.**	**Percent**
Not-Ready	3,464	67.25	**Not-Willing**	916	17.78	**Not-Able**	574	11.14
Ready	1,687	32.75	**Willing**	4,235	82.22	**Able**	4,577	88.86
	5,151	100		5,151	100.00		5,151	100

Table V. Cross-sectional distributions of DHS respondents across eight R-W-A categories

	1993	1998	2003	2008
1 **RWA**	2,331	2,207	2,671	1,614
	36.86	37.39	34.45	31.33
2 **RWa**	29	22	11	12
	0.46	0.37	0.14	0.23
3 **RwA**	289	197	108	50
	4.57	3.34	1.39	0.97
4 **Rwa**	99	46	25	11
	1.57	0.78	0.32	0.21
5 **rWA**	1,245	1,491	2,926	2,368
	19.69	25.26	37.74	45.97
6 **rWa**	63	90	157	241
	1	1.52	2.02	4.68
7 **rwA**	1,416	1,228	1,212	545
	22.39	20.8	15.63	10.58
8 **rwa**	852	622	644	310
	13.47	10.54	8.31	6.02
Total	6,324	5,903	7,754	5,151
	100	100	100	100

Table VI. Infant Mortality Estimates with the Brass Method

PANEL A		
1 q 0	1987	2002
Ready	0.043	0.036
Not-Ready	0.080	0.046
Willing	0.045	0.036
Not-Willing	0.082	0.056
Able	0.051	0.036
Not-Able	0.094	0.058
Turkey	0.061	0.036

PANEL B		
1 q 0	1987	2002
1. RWA	0.043	0.036
2. RWa	-	-
3. RwA	0.061	-
4. Rwa	-	-
5. rWA	0.043	0.037
6. rWa	-	0.065
7. rwA	0.073	0.064
8. rwa	0.098	0.065
All Groups	0.061	0.036

Figure III. Differences in Fertility: RWA, rwA and rwa in 1993 and 2008

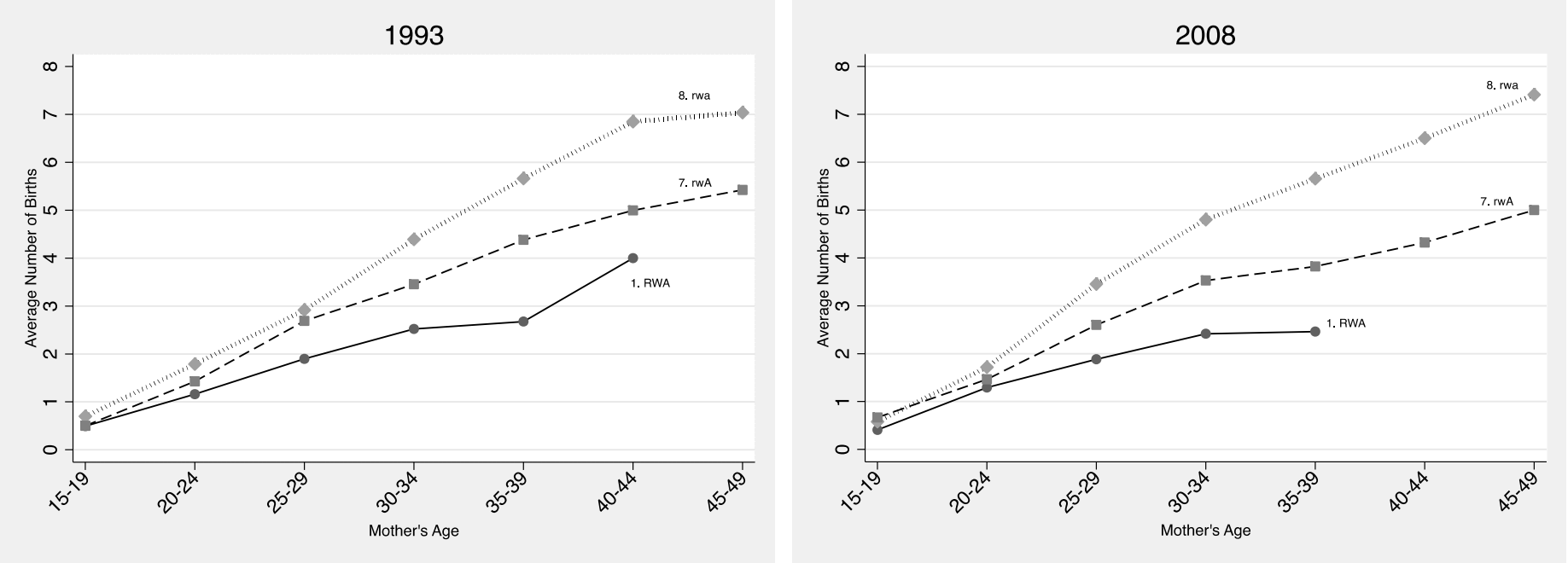


Table VII. Input data to decomposition method

groups→ / time	I. **RWA**	II. **RWa**	**III. RwA**	IV. **Rwa**	V. **rWA**	VI. **rWa**	VII. **rwA**	VIII. **rwa**	**Total**
1987	${}_1q_{0(1987)}^{RWA} = 0.043$ $C^{RWA} = 36.86$		${}_1q_{0(1987)}^{RwA} = 0.061$ $C^{RwA} = 4.57$		${}_1q_{0(1987)}^{rWA} = 0.043$ $C^{rWA} = 19.69$		${}_1q_{0(1987)}^{rwA} = 0.073$ $C^{rwA} = 22.39$	${}_1q_{0(1987)}^{rwa} = 0.098$ $C^{rwa} = 13.47$	${}_1q_0^{(1987)} = 0.059$
2002	${}_1q_{0(2002)}^{RWA} = 0.036$ $C^{RWA} = 31.33$				${}_1q_{0(2002)}^{rWA} = 0.037$ $C^{rWA} = 45.97$	${}_1q_{0(2002)}^{rWa} = 0.065$ $C^{rWa} = 4.68$	${}_1q_{0(2002)}^{rwA} = 0.064$ $C^{rwA} = 10.58$	${}_1q_{0(2002)}^{rwa} = 0.065$ $C^{rwa} = 6.02$	${}_1q_0^{(2002)} = 0.042$

Table VIII. The change in infant mortality associated with the contributions of compositional differences (4 groups: RWA, rwa, rWA and rwA) and rate schedule differences

			Contribution of compositional differences	
	c1	c2		
q1	a) 59 (per 1000)	b) 50 (per 1000)	(b-a) = -9	Average of (b-a) & (d-c) = - 7 **(B)**
q2	c) 47 (per 1000)	d) 42 (per 1000)	(d-c) = - 5	Share **(B)/(C)** = 41.2%
	(c-a) = - 12	(d-b) = - 8		
Contribution of rate schedule differences	Average of (c-a) & (d-b) = -10 **(A)**	Share **(A)/(C)** = 58.8%%	Total Change **(A) + (B) = C** = - 17	

Table IX. Chi-square tests between the RWA group and various outcomes

		Test Statistic	P-value
Infant mortality	1993	231.123	0.000
	1998	125.069	0.000
	2003	151.478	0.000
	2008	94.078	0.000
Child mortality	1993	30.372	0.000
	1998	30.335	0.000
	2003	36.545	0.000
	2008	17.859	0.013
Prenatal care	1993	747.408	0.000
	1998	753.334	0.000
	2003	1.10E+03	0.000
	2008	217.861	0.000
At least 4 ANC visits	1993	751.809	0.000
	1998	655.661	0.000
	2003	1.10E+03	0.000
	2008	306.777	0.000
Assistance at birth	1993	694.955	0.000
	1998	556.917	0.000
	2003	684.783	0.000
	2008	272.105	0.000
Delivery at a health institution	1993	809.199	0.000
	1998	686.985	0.000
	2003	1.10E+03	0.000
	2008	546.185	0.000
BCG	1993	173.605	0.000
	1998	249.614	0.000
	2003	342.996	0.000
	2008	27.305	0.000
DPT (3 doses)	1993	144.231	0.000
	1998	107.659	0.000
	2003	277.435	0.000
	2008	36.677	0.000
Polio (3 doses)	1993	86.084	0.000
	1998	151.137	0.000
	2003	127.501	0.000
	2008	34.864	0.000
Measles	1993	107.262	0.000
	1998	215.372	0.000
	2003	425.411	0.000
	2008	24.492	0.001
Stunting prevalence	1993	239.915	0.000
	1998	219.438	0.000
	2003	313.701	0.000
	2008	77.610	0.000
Low birth weight	1998	20.993	0.004
	2003	97.654	0.000
	2008	21.995	0.003
Breastfeeding	1993	13.808	0.055
	1998	27.952	0.000
	2003	28.070	0.000
	2008	3.881	0.793

Table X. Proportion of children born to mothers receiving prenatal care during pregnancy, or assistance at birth

Received prenatal care from doctor or nurse/midwife	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa
1993	85.85		67.12		62.43		50	30.01
1998	88.53		67.51		69.61	36.36	53.59	27.98
2003	95.27				76.07	29.8	62.91	37.46
2008	94.66				87.81	62.2	83.63	63.24

At least 4 antenatal visits during pregnancy	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa
1993	60.14		34.53		32.34		17.26	7.47
1998	64.41		31.12		37.47	10.81	26.19	7.92
2003	73.93				40.53	5.58	29.18	9.65
2008	78.95				57.45	26.83	49.12	25.41

Assistance at birth from doctor or nurse/midwife	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa
1993	97.84		90.7		86.55		80.54	53.04
1998	97.77		90.86		90.27		80.27	57.58
2003	98.3				86.38		86.41	58.93
2008	97.96				93.83		93.46	76.06

Place of delivery is health institution	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa
1993	83.44		70.85	51.16	57.84		54.1	24.21
1998	91.66		80.81		71.63	37.84	63.49	37.48
2003	95.55				75.78	38.58	69.23	36.72
2008	96.81				85.88	50.74	85.02	53.36

Sample Sizes	Prenatal ca	4 ANC visits	Birth Assist.	Place of De
1993	3,593	3,584	3,280	3,603
1998	3,328	3,306	3,103	3,331
2003	4,303	4,267	3,932	4,297
2008	2,021	2,016	2,471	2,683

Table XI. Proportions of children fully vaccinated

Percent Vaccinated	1. RWA				2. RWa				3. RwA				4. Rwa			
	bcg	dpt	polio	measles	bcg	dpt	polio	measles	bcg	dpt	polio	measles	bcg	dpt	polio	measles
1993	94.18	88.54	91.26	90.93	=	=	=	=	93.55	80.52	86.01	92.86	96.15	=	=	=
1998	98.29	71.88	94.80	95.19	=	=	=	=	98.21	68.57	98.73	92.73	-	=	=	=
2003	98.24	83.71	95.32	97.29	=	=	=	=	100.00	=	=	94.12	72.86	=	=	=
2008	97.21	92.46	95.61	94.70	=	=	=	=	=	=	=	=	=	=	=	=

	5. rWA				6. rWa				7. rwA				8. rwa			
	bcg	dpt	polio	measles	bcg	dpt	polio	measles	bcg	dpt	polio	measles	bcg	dpt	polio	measles
1993	88.48	79.10	84.68	80.38	70.59	57.69	-	70.00	84.27	75.42	80.15	80.29	71.76	64.30	73.65	73.63
1998	91.16	56.46	85.71	85.21	68.12	40.00	67.31	69.23	88.14	58.60	84.11	83.82	70.98	40.39	66.36	61.87
2003	90.84	72.86	89.71	86.67	71.93	42.86	80.72	62.50	85.82	61.63	84.59	80.69	68.65	41.40	74.38	59.17
2008	95.17	90.67	90.53	87.80	94.59	81.54	88.33	87.14	96.77	87.72	90.38	88.52	83.91	69.62	74.67	78.57

	All				Sample sizes (n)			
	bcg	dpt	polio	measles	bcg	dpt	polio	measles
1993	87.05	79.30	84.72	84.35	2,509	2,474	2,304	2,460
1998	90.72	61.64	87.03	86.48	2,009	1,898	1,588	2,005
2003	89.45	70.55	89.08	85.59	2,568	2,448	2,243	2,811
2008	94.97	88.21	91.05	90.04	775	721	693	763

Table XII. Proportions of Stunted Children

Stunting Prevalence per 100 Children	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa	All	
1993	10.78		21.20	18.29	23.28	44.78	26.70	38.01	21.22	n=3,416
1998	8.94		10.88		15.87	37.96	19.05	34.88	16.73	n=3,210
2003	5.84		18.48		17.55	29.63	19.61	33.48	16.16	n=4,164
2008	8.13		13.73		14.19	22.69	13.57	24.58	13.78	n=2,641

Table XIII. Proportional distributions of the nutritional risk factors of mortality

Proportion of children* never breastfed / breastfed < 6 months	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa
1993	41.46		34.32		31.43		37.00	38.60
1998	39.47		46.94		30.82		32.70	30.30
2003	33.18				32.03	33.80	34.63	24.85
2008	23.42				21.33	21.33	25.15	25.00

Low birth weight (<2500g)	RWA	RWa	RwA	Rwa	rWA	rWa	rwA	rwa
1998	10.81	=	10.76	-	14.58	-	16.2	22.22
2003	7.67	=	=	=	13.26	-	16.06	32.33
2008	11.75	=	=	=	15.23	-	18.4	24.73

Table XIV. Social Etiology and Under-Utilization of Formal Health Services

A) Breakdown of reasons for not receiving prenatal care among DHS mothers

	1998	2003	2008
	n=1,221	n=1,350	n=379
Not necessary / Normal birth with no problems	58.07%	35.41%	33.77%
Tradition / Religious objections	2.29%	6.30%	2.90%
Husband/Family Opposed	-	-	9.50%
Distrust in Health Institutions & Personnel	1.64%	0.67%	1.59%
Fear	-	-	1.59%
Shame	-	-	2.38%
Accessibility Problems	4.18%	3.93%	8.71%
Too Expensive / Insurance did not Cover	19.57%	46.52%	31.93%
Other	10.97%	6.37%	7.65%
Don't Know	3.27%	0.81%	-

B) Breakdown of reasons for not giving birth at a health facility among DHS mothers

	1993	1998	2003	2008
	n=1435	n=998	n=1,130	n=294
Not necessary / Normal birth with no problems	6.27%	-	14.69%	4.08%
Tradition / Religious objections	23.00%	3.11%	5.31%	2.38%
Husband/Family Opposed	-	-	1.50%	-
Distrust in Health Institutions & Personnel	13.45%	10.22%	6.37%	4.08%
Fear	-	-	-	7.14%
Shame	-	-	-	2.38%
Accessibility Problems	22.02%	16.93%	11.77%	24.83%
Too Expensive / Insurance did not Cover	15.96%	20.44%	41.86%	24.49%
Other	5.78%	30.06%	12.12%	20.75%
No Reason	12.47%	17.64%	6.28%	9.52%
Don't Know	1.05%	1.60%	0.10%	0.34%

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