

THE INCIDENCE OF DEATH AMONG LOW-RISK POPULATIONS IN  
AMERICA: A MULTI-LEVEL ANALYSIS

A Thesis

by

CHRISTI NICOLE LEWINSKI

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree  
of

MASTER OF SCIENCE

May 2006

Major Subject: Sociology

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**ABSTRACT**

The Incidence of Death among Low-Risk Populations in  
America: A Multi-Level Model. (May 2006)

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Chair of Advisory Committee: Dr. Dudley L. Poston, Jr.

This study utilized a multi-level model to examine the impact of religion as an occupation on mortality. Death certificate data were used to examine clergy mortality and compares them to census categorized professionals, counseling professionals and unmarried clergy. Individuals mortality exist in, and is influenced by the state they resided and died in. Because of this, they are not only examined on the individual level, they are also nested in their respective state of death. A series of hierarchical linear models were estimated in order to determine the effects of the different influence levels (individual and state). Findings suggest that clergy have a significant life advantage over professionals and counseling professionals. Married clergy have significant years of life disadvantage when compared to unmarried clergy. Implications of this research are discussed and considerations for future research are presented.

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## CHAPTER I

### INTRODUCTION

There are many reasons to study mortality. Mortality as a demographic indicator points to the development of a society, the progress of industry and the effectiveness of medical technology. Death is often thought of as the great equalizer. However, more often than not, the factors that impact death do not apply equally to everyone. Inequality is present in mortality as it is in almost all other social phenomena.

Death is impacted by a number of factors. A person's demographic characteristics impact their mortality. Their education, employment status, wealth, social relations and exposure to environmental hazards are just a few of the distal causes that can influence the timing of a person's death (Rogers, Hummer and Krueger 2005).

Not surprisingly, a person's health also has a direct impact on longevity. Whether or not a person has a current or past health condition may impact time of death. If persons engage in unhealthy behaviors, such as smoking, excessive eating or involving themselves in excessive

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This thesis follows the style of *The American Journal of Sociology*.

stress, they are more likely to have an abbreviated lifespan. Health issues that can not be mediated by the individual, such as genetics and environmental quality, also impact longevity (Rogers, Hummer and Krueger, 2005).

Mortality is an individual characteristic but is deserving of social study because all of the individual, distal, and behavioral factors that effect mortality are impacted by society. A comparison of mortality rates for similar individuals from different societies will likely not be the same. This is due to the structure of society. A male from the dominant race and class with a college education and a high status job is likely to fare better in the U.S. than a comparable male from Russia. The Russian man and the U.S. man could both be white medical doctors, but the quality of life in the society will impact how these social characteristics influence time of death. This makes international comparison of mortality rates somewhat inappropriate when attempting to discern the influence individual aspects have on affecting mortality.

If one is interested in studying what it is that individuals do to increase or decrease their longevity (either consciously or not), one should study a homogenous population. The observation of a similar population will allow one to discern the acute details of personal behavior

that impact longevity.

Mortality is a universal phenomenon; the fact of a person's death is not surprising. We are only shocked by an excessive length of life or an unusual cause of death. Mortality affects different groups of the population at different times. An American at birth can be expected to live to around age 78 years (PRB 2005). This is an average expectation and does definitely not apply to everyone.

The demographic literature has shown that "the force of death is not the same for everyone" (Rogers, Hummer and Nam 2000). Socioeconomic status, along with demographic and sociocultural characteristics, impact our longevity and chances of fulfilling our life expectancy. Death is more likely to occur when people engage in certain damaging behaviors, such as smoking and excessive drinking, as well as if they have a lower social status. On the other hand death is less likely to occur for the religious, the well educated, those employed in higher status occupations and those with healthy behaviors.

The link between occupation and mortality is well documented. Many studies use occupational data to measure a persons' risk of death; often those who are not employed are at a higher risk of mortality (Rogers et al 2000, Pavalko, Elder and Clipp 1993). Another body of work looks

at the influence of an occupation and its status on mortality with the general conclusion that those employed in higher status occupations experience greater longevity (Gregorio and Walsh 1997, Ladbrook 1990). This increased longevity has been linked to professionals' higher socioeconomic status along with access to adequate health care. Moreover professionals are less likely to be smokers or heavy drinkers.

Religion is another factor found to have a negative impact on mortality, owing perhaps to the positive impacts it has on behavioral factors that influence death (Rogers et al 2000, Hummer, Rogers, Nam and Ellison 1999, Oman and Reed 1998, Strawbridge and Cohen 1997). However, currently there is no consistent explanation for why religion provides a buffer against mortality. Some of the justification deals with increased social networks, while other studies are inconclusive. This thesis will attempt to address this void.

Some explanations offered for why religion provides protection from mortality have to do with the strictness of the particular denomination. This does not seem to make much empirical sense, however, since the majority of the studies measure "religion" by attendance. The gist of the results points to the fact that the more a person attends

the greater their longevity (Rogers, Hummer and Nam 2000).

Many scholars shy away from the impact that spirituality has on longevity. They are hesitant to point to faith as the factor that decreases the religious person's risk of mortality. But some scholars measure time praying or time meditating as a proxy for religious conviction.

It may be that the reason why faith is not studied as a factor that reduces the risk of mortality is that it would be nearly impossible to measure. A study could be conducted that measured a person's vital signs while praying. The researcher could look at the calming of the heart beat and breath, and measure brainwaves for signs of rest. Still this would not directly measure the amount of the person's faith, though it would be a fair measure of the benefit of formal prayer. But would miss the person's feelings of constant protection that they believe to be given by faith; this is what Catholics term grace.

It is difficult to imagine how research could adequately capture the impact of religion on any aspect of a person's life. It is also very hard to see how the ancient practice of religious ritual could impact a population's chances of mortality. There is evidence that religious ritual participation offers individuals some sort

of protection from early death; so there is obviously something about religion that is directly linked with mortality.

There may be a way to measure the impact of religion on mortality in a less direct manner. By concerning the subject of the study with the impact of religion as an occupation on mortality, it might be possible to show the role religion has in protecting against mortality.

There have been a handful of studies looking at the mortality of clergy of various denominations (King and Bailar 1968, King 1971). Other studies look at clergy as a low-risk population for mortality (King and Locke 1980, Lock and King 1980). Religious occupations, or clergy, are classified as professionals (Census 1990). As such, their mortality may have been studied much more often as part of that professional group. There may be an added benefit for examining the role of mortality in clergy in order to look further at the impact of religion on a professional group that is already at low risk of mortality.

One might think that clergy enjoy identical benefits as other professionals. Indeed it is usually required that clergy be highly educated as is the case for most professionals. Clergy and professionals both are likely to

have access to healthcare. Clergy and professionals are also likely to have the benefits of elaborate professional networks and support. It would seem that the only substantial professional difference between the clergy and professionals is the aspect of religion.

Religion plays a major role in American society. A somewhat influential faction of our government, the religious right, takes the mantle of religion as their calling card and has had a degree of success influencing American politics. President George W. Bush advocates giving money to community churches so that they may take up the business of the government in providing help for the disadvantaged members of their community. Religion in the U.S. has strong supporters.

In light of the prominent role religion has in American society it is appropriate to consider its impact on our society. Studies of religion and its effect on morality are numerous (Pickering 1984). There are more than thirty American academic journals dealing with religion (JSTOR 2006). The impact of religion on society has a prominent effect on individual's mortality and quality of life.

Religion and individual characteristics are not the only factors that impact mortality. A person's environment

may have a direct effect on their health and longevity.

The effect of the quality of the environment on mortality is a relatively new phenomenon in human history. The first documented air pollution disasters date back to Belgium 1930 (Scwartz 1994). It is not hard to see the effect of pollution on the environment. After the agrarian revolution people began the first historic migration to urban areas. This was also the time of plagues and abbreviated life expectancy. These phenomena are directly related; the first time large concentrations of people congregated in one area brought about a decline in the quality of the natural environment which, in turn, brought about increased disease and mortality.

There are other environmental factors over which people have little control. Individuals have little impact in their access to healthcare. They usually have no control over the number and quality of hospitals that are available to them. Individuals are also not in command of the amount of poverty in their areas of residence. Indeed, they may be relegated to their areas because of their own economic standing. These issues are largely situational happenings to which people are exposed. Though they exercise little control over these factors they do impact the quality and length of their life.

It is important to distinguish among populations exposed to mortality risks and compare them with similar individuals. In this way it is possible to control for certain behavioral, health, distal and environmental factors that may otherwise influence mortality.

By examining a homogenous population this thesis proposes to contribute another dimension to the overall body of literature on the effects of religion on mortality.

This thesis will analyze several populations at low risk for mortality; professionals, counseling professionals and clergy. In contrasting these populations this thesis will address the impact of religion on mortality for low risk populations. HLM will be utilized in order to consider populations individual and state-level mortality factors.

The next chapter of this thesis addresses current literature dealing with mortality and low-risk populations. A number of factors will be reviewed. The review expands on individual mortality factors and look at state-level mortality factors as well.

## CHAPTER II

### LITERATURE REVIEW

This chapter will review theory and current literature in religion and mortality. The place of religion in society will be established in order to address the importance of religion in society and orient the reader to its possible impact on mortality. This chapter will also review individual-level factors that effect mortality. Contextual mortality factors will also be reviewed in order to make an inclusive overview of the literature dealing with mortality.

#### **The Place of Religion in Society**

Emile Durkheim's theory of society recognizes modern society as a functionally differentiated institutional order constructed from a collective morality (Giddens 1971, Pickering 1984). This morality has its origin in religion (Pickering 1984). Durkheim's treatment of religion was crucial to his theory of society. He saw religion as providing the foundation.

Durkheim professed that individuals have a moral obligation to society. Individuals come to know their place in society through their own perceptions which develop through their participation in social life. When the individual is not well developed, both society and the

individual will suffer as a result of the individuals' lack of morality. Society will suffer because the individual is guided by some other (non-societal) interest. And this self-interest will lead to conflict between the individuals' self-interest and the moral obligation to society. This conflict results in unhappiness for the individual. For individuals to achieve fulfillment they must have their egoistic nature constrained. These constraints are developed within society and are necessary to establish the individuals' sense of duty expressed as morality.

Durkheim took a historical view of the organization of society. Society had its origins in the clan, a group of people that were organizationally very similar but different enough to need each other for subsistence. The clan was held together by a cultural unity that emerged from the clan's adherence to the same beliefs. As societies progressed from agricultural to more modern organizational forms, these clans grew geographically and a collective consciousness was born from their unified, but individual, responses to the world.

Durkheim saw the manifestation of these collective beliefs as religion. Religion is not infused with morality; it is society's collective beliefs that create

religion as a dimension of society where morality is located.

Religion reinforces society and creates unity through ritual, which reinforces community and society. Clergy may take advantage of this reinforcement and are exceptionally integrated into society, since they are the purveyors of societal unity. Durkheim saw religion and society as parallel forms. Religion houses the sacred forms of society (artifacts, rituals, deities) and the profane, or secular society, mirrors these forms with its own rituals (politics), artifacts (home as a castle) and deities (politicians).

Religion is the moral base of society but is made up of the representation of the group. The ceremonial practices of religion unify people in the society and reinforce society's morality (i.e. its religious belief). The importance of morality in a society can not be understated. Durkheim saw morality as the ideational formation of the parts of behavior and belief that are necessary for the survival of society.

A nice example of how morality reflects the interests of society may be found in the view of the Catholic Church towards usury. During medieval time the Catholic Church was staunchly opposed to usury and considered it a grave

offense. As the economic needs of society changed and the lending and borrowing of money became more prevalent, the Catholic Church revised its policy and took usury off the list of offenses.

As societies progressed to the modern era, the power of religion to reinforce morality waned. More elaborate legal systems were instituted to regulate society's morality. Religion still plays an integral part in societal morality, but it has been institutionalized into the modern legal systems. Not many would argue that American laws reflect Christian values. The pervasive influence of religion is still personified by the powerful position of the clergy, although the need for secular moral authority is personified by judges and politicians.

The collective representation is personified in the clergy; they are people who have a direct hand in the creation of the connections that unify a society. Indeed they are often referred to as holy people. Supposedly they have special access to holiness (morality) by virtue of their choice of religion as an occupation. They have total access to rituals, performance and participation.

America is a religious society. Though America is a mechanical society, and displays an individual tendency towards morality, the government encourages people to turn

to religion for social support. The government recognizes its failure to provide adequate services to communities and identifies the churches as the center. Churches are thought to be positioned in a way that they are able to identify and meet the needs of the community. This establishes the authority of churches in a community. The church is able to enforce its morality with the backing of the American government.

Clergy are the leaders of their congregations. They are the practical and spiritual heads of the church. Clergy may be considered as fully integrated into society since they are a major purveyor of morality to the public. As fully integrated members of society clergy should be expected to experience the full benefits of society. One way this could be appraised is to compare the longevity of clergy to other sections of the population.

This thesis will consider the clergy fully integrated into society. The clergy should reap excess mortality protection from longevity. Religion is not the only influencing factor on mortality. Individual-level factors will also have an impact on length of life and should be reviewed in an attempt to understand the factors that impact mortality.

### **Individual-level Factors**

There are many demographic and ascribed factors that impact mortality, over which individuals have little or no control. These include sex, race and ethnicity, nativity, functional limitations, and mental and health disorders.

The effect of sex on mortality is a relationship that may be observed world over. In America women are expected to live about five years longer than men (PRB 2005).

Rogers, Hummer and Nam (2000) showed that women maintain a longevity advantage even after controlling for detrimental behaviors and economic factors. This leads one to believe that there may be biological factors connected with being female that provides a buffer against mortality.

The effects of race and ethnicity on mortality are not as obvious and pervasive as those of sex. Those who classify themselves as "not white" can be expected to have abbreviated years of life compared to whites (Rogers et al 2000). This relationship seems to be linked to the unequal social and economic status of non-whites. This can be inferred by the recognition that race and ethnicity do not impact mortality in every culture even though the relationship between mortality and social class does translate across cultures (Marmot, Kogevinas and Elston 1987).

Social class has an enormous impact on people's lives. A person's social class determines socioeconomic status and, "individuals at the lowest socioeconomic levels are several more times as likely to die as individuals at the highest socioeconomic levels" (Hummer, Rogers and Eberstein 1998:553). Social class influences other mortality factors such as whether or not a person has health insurance, the place of residence, and the sort of education received. Education is an important issue in mortality research. Education affects mortality directly and indirectly through occupation. The level of education will often affect the type of occupation in which persons are employed.

Many jobs require minimal formal education. There is a positive and well-established relationship between job status and education. Many professional jobs require advanced education beyond the high school and college levels. Professional occupations provide the worker with numerous benefits. Compared to other strata occupational professionals earn more money, have greater access to health care, safer work environments and more freedom and autonomy at their job. These benefits provide professional workers with a decreased risk of mortality.

Those in higher status occupations (professionals) are shown to have lower levels of mortality than the rest of

the working population (Moore and Hayward 1990).

Professionals engage in less destructive behaviors than the rest of the working population. Professionals are less likely to smoke and more likely to spend their free time in physically active activities. These behaviors may be a part of the reason professionals are at such a low risk of mortality when compared to blue collar and service workers (Rogers et al 2000).

Professionals' mortality risk is less than that of other workers, but there is variation within the professional community. Women employed in professional occupations tend to live longer than their male counterparts. Much of the evidence supports the finding that working women gain self-esteem and increased social support from working that provides them with increased longevity (Hibbard and Pope 1991, Kotler and Wingard 1989).

The hierarchy of professional jobs and a person's ranking will have a positive impact on mortality (Ladbrook 1990). Hayward, Grady and Mclaughlin (1988) have shown that mortality increased when workers retired from a high status occupation and began working in a lower status occupation. So it may be inappropriate to compare certain professions with each other.

Religion is another achieved factor that has a

significant relationship with mortality. Not many find this relationship surprising. Many religions restrict the actions of their members in beneficially healthful ways. Some religions do not condone lives of excessive drinking and other religions do not permit smoking. In fact it has been shown that members of denominationally strict religions have a greater length of life advantage than the rest of the population (Kark et al 1996).

It is often the case that the impact of religion on mortality is determined by the amount of attendance at religious services (Hummer et al 1999, Comstock and Partridge 1972, Strawbridge and Cohen 1987). Frequent religious attendance has been shown to be associated with a lowered risk of mortality. One of the more popular justifications for this association is that the increased social networks to which people attending religious services are exposed decrease their risk of mortality (Ellison and George 1994). However, Strawbridge and Cohen (1987) followed a population for thirty years and found that social connections among frequent religious attendees had a minimal impact on mortality even when health practices were added to the analysis. This suggests there may well be unmeasured phenomenon in religion that is affecting mortality in a way that the literature has not

addressed.

One way to begin to focus in on this unidentified religious phenomenon would be to study the clergy. It is assumed that the clergy "are more likely to adhere to conservative standards of behavior" (Jarvis and Northcott 1987). Those employed in religious occupations are less likely to lead lives of behavioral excess and are employed in high status occupations (King 1971). By comparing the clergy to the professional population, the effect of this unidentified religious phenomenon may be made more apparent. We expect to see increased longevity for the clergy when they are compared to a population behaviorally similar and of like status such as those employed in other professional occupations.

Professional status has been shown to have a negative impact on mortality. This relationship increases when taking sex, race and ethnicity, education and region of residence into consideration. By treating religion as a professional occupation and controlling for the aforementioned variables, will it be possible to further discern the effect of religion on mortality?

Religion should increase the negative relationship with mortality. It would be logical to expect clergy to experience even greater longevity than the professional

population due to the impact of religion combined with their professional status. By controlling for the professional status of the participants the benefit of religion should become more apparent. The relationship between clergy and mortality should become even more evident when including other ascribed and achieved factors.

By restricting the analysis to those in professional occupations, it may be possible to tease out the impact of religion on mortality even further. Occupations that are similar to clergy involve counseling without the religious aspect of the job. The similarities between counseling professions and the clergy should also lead to similar effects of the two occupations on mortality. If this were not the case this would be further evidence for the positive impact of religion on mortality.

Religious and individual-level factors have direct and indirect impact on mortality. These variables are not the only issues impacting longevity. A person is exposed to their environment which may play a role in individuals' mortality. People live in a context and as such contextual effects on mortality deserve consideration in this thesis.

### **Contextual Effects on Mortality**

It would be a mistake to analyze only individuals. Mortality is impacted by numerous factors over which

individuals have only minimal control. The quality of the natural environment and the level of pollution to which populations are exposed have a negative effect on longevity (Dockery et al., 1993). People's access to healthcare facilities directly affects the type and quality of care they receive via emergency medical situations as well as through primary medical care. The access to healthcare directly impacts mortality (Guarliardo 2004). It is readily admitted that individuals' status has a direct impact on their level of healthcare, but personal income is not the only factor. A region's wealth also impacts the types of medical services and health care facilities that can be supported. By diversifying this analysis and utilizing two separate levels of effects, the individual and the state, it will be possible to analyze mortality risk in more detail. It will be possible to measure more thoroughly the impact of religion on mortality while recognizing that there are numerous factors involved.

There are many indicators of a society's or region's well being. The infant mortality rate, IMR, is often used as a general measure of a population's health (Reidpath, Allotey 2003). Infants are particularly vulnerable to death. Their complete dependence on adults and their weak

immune systems cause this population to have high death rates.

The IMR is a good indicator of a population's life expectancy (Robine 2005) and as such is considered a strong indicator of numerous social factors such as access to healthcare, living conditions and a population's wealth. This becomes evident when comparing the IMRs of more developed and less developed nations. Many of the IMRs of Western Europe are around 4, whereas the IMRs of Western Africa range from the mid 60s to 150 (Population Reference Bureau 2004).

America currently has an IMR of 6.6 (Population Reference Bureau 2005) and ranks 23<sup>rd</sup> among industrialized nations (Brosco 1999). IMRs in the U.S. vary also by state. States with weaker economies and more minorities typically have higher IMRs. So it would be appropriate to use the IMR as an indicator of a state's overall health and longevity.

IMR is highly and negatively correlated with economic well-being (Robine 2005; Reidpath, Allotey 2003; Brosco 1999). Poverty status may thus be considered as an indicator of a population's longevity expectations. Populations with low economic status often lack adequate

resources to pay for healthcare in either a preventative or reactive sense (Jackson et al., 2004).

Kaplan et al., (1996) studied income inequality in America for all 50 states in relation to all causes of death and mortality patterns for all states. They found that "income inequality was also significantly associated with age specific mortalities and rates of low birth weight, homicide, violent crime, work disability... smoking and sedentary activities" (Kaplan et al., 1996: 999). All of these factors have been correlated with abbreviated life span (Rogers, Hummer and Nam 2000).

Poverty may also be a defining factor in living conditions. The extremely poor often live in areas without sufficient sanitation services. Poverty may be a factor in housing and, accordingly, result in the placement of as such place poor populations in environments with high levels of pollution (Jackson et al., 2004).

The quality of the natural environment may have a direct impact on a population's mortality. Studies have shown a positive association between level of air pollution and mortality rates even after controlling for various demographic, epidemiological and weather factors. Dominici et al., (2000) studied America's largest cities and found a consistent association of air pollution and mortality

rates. Schwartz (1994) was led by pollution induced mortality disasters in London and Pennsylvania to conduct a meta analysis of particle pollution and mortality rates. His findings lend evidence to the association of air borne pollution and increased risk of death.

There are factors associated with a population's longevity expectation that are directly impacted by an area's population and wealth. Access to healthcare was previously mentioned as an individual level factor, but it may also be considered a state level factor influencing mortality. A state's economic circumstances along with its population considerations have a direct impact on the resources the state is able to provide, including hospitals. If an area does not have hospitals, its population's access to health care is severely restricted. Consider the example of a stroke victim having to commute over an extended amount of time and distance for emergency medical treatment. Primary healthcare is also a major factor in maintaining population health, and access to primary healthcare can be impeded by rural isolation as well as urban congestion (Guagliardo 2004).

This chapter has reviewed the literature concerning mortality. The literature dealing with mortality is vast and this thesis has focused in on three major factors that

influence mortality: religion, individual-level factors and contextual effects on mortality. These factors influence mortality in different ways, some provide longevity advantage and some provide longevity disadvantage.

The next chapter of this thesis addresses the nuts and bolts of the analysis. I first look at the data sets that will be utilized in the analysis. Next, I deal with the methods used in this analysis. Finally I attend to the hypotheses.

## CHAPTER III

### DATA, METHODS AND HYPOTHESES

This chapter provides a description of the data sets used in this thesis. All of the variables are defined in this chapter. A brief statement of why multi-level modeling is appropriate for this analysis is included. Models 1-15 are also explained in this chapter. This chapter concludes with a description of my hypotheses

#### **Description of the Data**

This thesis uses data from the National Center for Health Statistics (NCHS) 1998 and 1999 Multiple-Cause-Of-Death file. The NCHS compiles death certificates from all 50 states. Because the content of death certificates varies among the states, the records included on a death certificate are not the same from state to state. Of the 50 states, 20 included usual occupation on the death certificate. These states are: Colorado, Georgia, Hawaii, Idaho, Indiana, Kansas, Kentucky, Maine, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Rhode Island, South Carolina, Utah, Vermont, West Virginia and Wisconsin; they provide over 200,000 records. The data on the death certificates are usually not validated. A medical doctor supplies the cause of death, but all the other information on the certificate is provided by others,

usually a relative or close friend of the decedent. This may be considered a shortcoming of the record system though this study does not consider it a significant factor. The primary exceptions scholars have taken with these data are the potential misrepresentation of age at death in the ages of 100 and above. The scholarly consensus is the methods of record keeping for birth certificates were not consistent a century ago and can lead to misinformation in the data.

When the data are restricted to include only the professional population who died of non-violent deaths and were not 100 years old, or more, at death, there are 123,970 records in the data set.

A second data set was constructed to include state level variables. The data set included all nineteen states (Rhode Island provided inadequate education data and was dropped from the study) that listed usual occupation in the data set. A single per capita pollution variable, measuring the additive dry pounds of air borne pollution for the years 1988-1997 was constructed using the United States Environmental Protection Agency (EPA) data ([www.epa.gov](http://www.epa.gov) 2005). The EPA collects data for its Toxic Release Inventory in order to provide information on the presence of hazardous chemicals released in communities by

manufacturing facilities. The EPA's list of hazardous or toxic chemicals varies from year to year. As of 1995 they were monitoring a core list including 615 chemicals, though over 8000 hazardous chemicals have been identified as being released by manufacturing facilities (Thomas and Qin 2001).

The state-level data set also included two variables constructed from census data for the year 1997 (www.census.gov 2004). These are state wide rates for hospitals and the rate of the state population at poverty level.

The infant mortality rate (IMR) for each of the 19 states was taken directly from the CDC (www.cdc.gov 2005). It was the average IMR for 1997-1999 for each state.

#### **Definition of Dependent Variable**

The study will analyze a single dependent variable, age at death among the professionals. This is the age of death that is reported on the death certificate. This is the standard way to measure age at death. It is appropriate to use age in years; it is a measure of longevity advantage or disadvantage.

Cause of death will be used to restrict the data set to records where non-violent deaths were the cause of death. This is done in order to restrict the sample to a more homogeneous population.

The first data set will be further restricted by the usual occupation listed on the death certificate; only the counseling professional records will be used. The counseling professional statuses of the records were determined by using the 1990 U.S. Census occupation codes. The use of the Census occupation codes will provide a standard with the current literature on occupations. It will be determined whether or not the decedent was a member of the clergy by the usual occupation indicator on the death certificate.

### **Description of Independent Variables**

The following list presents the thirteen independent variables that are included in my thesis. Of these thirteen variables nine are individual level variables, and four are state level.

#### Individual Level Variables

1. Sex

This is a dummy variable where 0 is male and 1 is female.

2. White

This is a dummy variable where 0 is non-white and 1 is white.

3. Other

This is a dummy variable where 0 is black or white and 1 is any other race.

#### 4. Black

This is a dummy variable where 0 is non-black and 1 is black.

#### 5. Hispanic

This is a dummy variable where 0 is non-Hispanic and 1 is Hispanic.

#### 6. Metro

This is a dummy variable where 0 is non-urban and 1 is urban.

#### 7. Marital

This is a dummy variable where 0 is not married and 1 is married.

#### 8. Clergy

This is a dummy variable where 0 non-clergy professional (or counseling professionals for model six through ten) and 1 is clergy.

#### 9. Education

This variable represents four categories in which the years of education spanning the category have been averaged. The average is used as the value for the category. Some education is coded six, high school graduate has been coded twelve, some college has been coded fourteen and more than undergraduate has been coded seventeen. It is treated as an interval variable.

#### 10. Pollution

Pollution is a per capita exposure over a ten year period ranging from 1988 to 1997 expressed in dry pounds.

#### 11. Hospitals

Hospital is a state rate of the number of hospitals per state population in the year 1997.

#### 12. Poverty

Poverty is a rate of persons in poverty to state population in 1997.

#### 13. Infant Mortality Rate

This is the average IMR for the state from 1997 to 1999.

### **The Hierarchical Linear Model**

This analysis will estimate fifteen multi-level models, using HLM, in order to ascertain whether the clergy experience a significantly longer length of life when compared to professionals. Models one through five will deal with professional longevity compared to clergy longevity. Models six through ten will deal with counseling professional's longevity compared to the clergy's longevity.

Multi-level modeling is theoretically appropriate, but it is important to first discern whether it is statistically appropriate. An analysis of variance (ANOVA) model will be estimated to determine the total amount of

variability in the outcome (age at death) within and between states (Bryk and Raudenbush 1992; Parks and Poston 2006). If there is any variance evident at the state level, it would be indicative of variance in age at death across the nineteen states and a signal that multi-level modeling (HLM) is statistically appropriate to use (Raudenbush and Bryk 2002 Parks and Poston 2005).

ANOVA models the individual professional age at death in each state with just an intercept, which in this case is the mean age at death for the state; as well as an error term for each individual in their respective state. There is also a level-2, or state level equation, with each state's mean age at death, modeled as a function of the grand mean on age at death plus a random error. These equations are combined into one individual-level equation, and are estimated via HLM.

For all professionals at the individual level, the variance is 107.1. At Level-2 (state level) the variance of the true state means around the grand mean is 1.5. These estimates show that much of the variation in professional's age at death happen at the individual level or within states. It is possible to identify the percentage of intra-state variance in age at death with the following formula:

$$\text{level 1 variance} / (\text{level 1} + \text{level 2 variance}) * 100$$

$$(1.5/1.5+107.1)*100=1.4$$

Though this is a small amount of intra-state variance in age at death, it is statistically significant and therefore multi-level modeling is statistically appropriate in this instance.

This same procedure (ANOVA) is repeated for analyses restricted to the counseling professionals. At the individual level the variance is 111.6. At the state level the variance of the true state means around the grand mean is .9. As in the professional population these estimates show that much of the variation in age at death occurs within states at the individual level. The percentage of intra-state variance in age at death is the following:  
 level 1 variance/ (level 1+level 2 variance)\*100  
 $.9/ (.9+111.6)*100=.8$

There is a small amount of intra-state variance among counseling professionals' age at death. But, again, it is a statistically significant amount and therefore multilevel modeling is statistically appropriate to use for these analysis.

### **Models 1-10**

Models one through three, as well as models six through eight will be typical micro-level analysis and can be interpreted much like ordinary least squares

regressions. The first and sixth models will only include the variable clergy.

$$Y_i = \beta_0 + \beta_1(\text{CLERGY})_i + r_i \quad (\text{Models 1, 6})$$

The second and seventh models will expand on the first and include the individual level ascribed factors sex, Hispanic, black and other (with white being the comparative group).

$$Y_i = \beta_0 + \beta_1(\text{CLERGY})_i + \beta_2(\text{SEX})_i + \beta_3(\text{HISPANIC})_i + \beta_4(\text{BLACK})_i + \beta_5(\text{OTHER})_i + r_i \quad (\text{Models 2, 7})$$

The third and eighth models will add on and include individual level achieved factors metro, marital, and education.

$$Y_i = \beta_0 + \beta_1(\text{CLERGY})_i + \beta_2(\text{SEX})_i + \beta_3(\text{HISPANIC})_i + \beta_4(\text{BLACK})_i + \beta_5(\text{OTHER})_i + \beta_6(\text{METRO})_i + \beta_7(\text{MARITAL})_i + \beta_8(\text{LVLEDU}) + r_i \quad (\text{Models 3, 8})$$

All of the variables included in the micro level models will be centered on the group mean, in order to give value to the intercept. This process gives the intercept meaning by not automatically assigning the value of zero, zero; is arbitrary, and after the variable is centered the independent variables will be scaled so that the intercept will be meaningful and the location of the independent

variables will also have precise meaning (Raudenbush and Bryk 2002).

This particular study is dealing with two levels of data. The first level is individual and has been modeled as such. These individual level data occur in a social context; but age at death is not determined by individual factors alone; societal and environmental factors also impact age at death. In order to include a number of these societal and environmental data it is necessary to include state level data in this analysis. The individuals are nested in their respective states. The logic of multilevel modeling is that it allows for simultaneous examination of individual level and state level characteristics on age at death along with the interaction between the state characteristics and the effects of individual characteristics on their ages at death (Parks and Poston 2005).

Both model four and nine will include multi level equations but will not include the interaction effects.

$$\begin{aligned}
 Y_{ij} = & \gamma_{00} + \gamma_{01}(\text{POLLUTE})_j + \gamma_{02}(\text{HOSPITAL})_j + \gamma_{03}(\text{POVERTY})_j + \\
 & \gamma_{04}(\text{IMR})_j + \gamma_{10}(\text{CLERGY}_{ij}) + \gamma_{20}(\text{METRO}_{ij}) + \gamma_{30}(\text{SEX}_{ij}) + \\
 & \gamma_{40}(\text{MARITAL}_{ij}) + \gamma_{50}(\text{HISPANIC}_{ij}) + \gamma_{60}(\text{EDUCATION}_{ij}) + \\
 & \gamma_{70}(\text{BLACK}_{ij}) + \gamma_{80}(\text{OTHER}_{ij}) + u_0 + u_1(\text{CLERGY})_{ij} + u_2(\text{METRO})_{ij} +
 \end{aligned}$$

$$u_3 (\text{SEX})_{ij} + u_4 (\text{MARITAL})_{ij} + u_5 (\text{HISPANIC})_{ij} + u_6 (\text{EDUCATION})_{ij} + \\ u_7 (\text{BLACK})_{ij} + u_8 (\text{OTHER})_{ij} + r_{ij} \quad (\text{Models 4, 9})$$

HLM is utilized to run the last two models which include the state level characteristic. The first multi level model includes the Y variable, age at death, and the individual level variables and the state level variables pollution, poverty, hospitals and IMR. The final model includes the individual level, the state level and the interaction of the state level variables on the slope of clergy's age at death.

$$Y_{ij} = \gamma_{00} + \gamma_{01}(\text{POLLUTE})_j + \gamma_{02}(\text{HOSPITAL})_j + \gamma_{03}(\text{POVERTY})_j + \\ \gamma_{04}(\text{IMR})_j + \gamma_{10}(\text{CLERGY}_{ij}) + \gamma_{11}(\text{POLLUTE})_j (\text{CLERGY}_{ij}) + \\ \gamma_{12}(\text{HOSPITAL})_j (\text{CLERGY}_{ij}) + \gamma_{13}(\text{POVERTY})_j (\text{CLERGY}_{ij}) + \gamma_{14}(\text{IMR})_j \\ (\text{CLERGY}_{ij}) + \gamma_{20}(\text{METRO}_{ij}) + \gamma_{30}(\text{SEX}_{ij}) + \gamma_{40}(\text{MARITAL}_{ij}) + \gamma_{50} \\ (\text{HISPANIC}_{ij}) + \gamma_{60}(\text{EDUCATION}_{ij}) + \gamma_{70}(\text{BLACK}_{ij}) + \gamma_{80}(\text{OTHER}_{ij}) + \\ u_0 + u_1 (\text{CLERGY})_{ij} + u_2 (\text{METRO})_{ij} + u_3 (\text{SEX})_{ij} + u_4 (\text{MARITAL})_{ij} + \\ u_5 (\text{HISPANIC})_{ij} + u_6 (\text{EDUCATION})_{ij} + u_7 (\text{BLACK})_{ij} + u_8 (\text{OTHER})_{ij} + \\ r_{ij} \quad (\text{Models 5, 10})$$

### **Models 11-15**

An issue related to these data is their lack of individual detail. I have access to whether or not the professionals are clergy but no information as to the clerics' practiced denomination. The difference in

clerical denomination may be a significant factor in their age at death. Certain clergy are not allowed to marry. Marriage has been shown to have a significant impact on people's longevity. Married males especially have been shown to enjoy longevity benefits. Though it is not possible to determine the religious denomination of the clergy, by limiting these data to only clergy I can compare married clergy to non-married clergy. The inference would be that the unmarried clergy are more likely to belong to religious denominations that prohibit marriage for clerics (Roman Catholics). This is a reasonable assumption since it is likely that wives of clergy should outlive them and the single clergy should represent denominations that do not allow their clerics to marry.

An ANOVA is estimated in order to determine whether multi-level modeling is statistically appropriate for this portion of the analysis.

At the individual level the variance is 100.2. At the state level the variance of the true state means around the grand mean is .5. These estimates show that much of the variation in age at death occurs within states at the individual level. The percentage of intra-state variance in age at death is the following:

level 1 variance/ (level 1+level 2 variance)\*100

$$.5/ (.5+100.2)*100=.5$$

There is a small amount of intra-state variance, but is statistically significant.

Models 11 through 13 will be typical micro-level analysis and can be interpreted much like ordinary least squares regression. The eleventh model will only include the variable marital.

$$Y_i = \beta_0 + \beta_1(\text{MARITAL})_i + r_i \quad (\text{Model 11})$$

The twelfth model will expand on the first and include the individual level ascribed factors sex, Hispanic, black and other (with white being the comparative group).

$$Y_i = \beta_0 + \beta_1(\text{MARITAL})_i + \beta_2(\text{SEX})_i + \beta_3(\text{HISPANIC})_i + \beta_4(\text{BLACK})_i + \beta_5(\text{OTHER})_i + r_i \quad (\text{Model 12})$$

The thirteenth model will add on to the twelfth and include the individual level achieved factors metro and education.

$$Y_i = \beta_0 + \beta_1(\text{MARITAL})_i + \beta_2(\text{SEX})_i + \beta_3(\text{HISPANIC})_i + \beta_4(\text{BLACK})_i + \beta_5(\text{OTHER})_i + \beta_6(\text{METRO})_i + \beta_7(\text{LVLEDU}) + r_i \quad (\text{Model 13})$$

The fourteenth model will include multi level equations but will not include the interaction effects.



1. Clergy are expected to have a significant longevity advantage over professionals and counseling professionals.
2. This positive longevity advantage will be sustained through the addition of ascribed variables.
3. This positive longevity advantage will also be sustained through the addition of ascribed and achieved variables.
4. This positive longevity advantage will also be sustained through the addition of ascribed, achieved and state-level variables.

The following hypothesis applies to models 11-14.

5. It is an assumption of this study that unmarried clergy belong to more behaviorally strict denominations and will have a significant life advantage over married clergy.
6. This positive longevity advantage will be sustained through the addition of ascribed variables.
7. This positive longevity advantage will also be sustained through the addition of ascribed and achieved variables.
8. This positive longevity advantage will also be sustained through the addition of ascribed, achieved and state-level variables.

## CHAPTER IV

### DESCRIPTION OF THE DATA

This thesis uses four separate data sets. These data are broken into three main sections; professionals, counseling professional and clergy. It is important to remember that these data represent a population that is already at a low risk of mortality. As such, I have manipulated the data to create homogeneous samples. These decedents have very similar occupational prestige, natural causes of death and all died between the ages of 55 and 99.

The last set of data, state data, is used in the same way with the first three data sets. It is necessary to examine the descriptive statistics about each data set before I begin reporting the multi-level results. These statistics are shown in the Tables 1-8.

**Table 1 Descriptive Statistics of Professional Sample**

Variable Name	N	Mean	SD	Min.	Max.
Age at Death	123,970	77.9	10.39	55	99
Sex	123,970	.43	.50	0	1.00
Hispanic	123,970	.01	.10	0	1.00
White	123,970	.93	.25	0	1.00
Black	123,970	.05	.21	0	1.00
Other	123,970	.02	.14	0	1.00
Metro	123,970	.73	.44	0	1.00
Marital	123,970	.50	.50	0	1.00
Clergy	123,970	.02	.15	0	1.00
Education	123,970	13.98	3.43	6.00	17.00

As indicated in Table 1 there are 123,970 professionals included in this first data set. Clergy make up 2% of this sample. Whites comprise 93% of the professionals. The majority of the sample is male, 57%. Seventy-three percent of the sample resided in an urban area. The sample has a mean education of 14 years. The average age at death is 77.9 years.

**Table 2 Descriptive Statistics of Counseling Professional Sample**

Variable Name	N	Mean	SD	Min.	Max.
Age at Death	5,037	76.5	10.6	55	99
Sex	5,037	.32	.47	0	1.00
Hispanic	5,037	.01	.12	0	1.00
White	5,037	.83	.38	0	1.00
Black	5,037	.15	.36	0	1.00
Other	5,037	.02	.14	0	1.00
Metro	5,037	.71	.45	0	1.00
Marital	5,037	.51	.50	0	1.00
Clergy	5,037	.58	.49	0	1.00
Education	5,037	12.89	3.59	6.00	17.00

There are 5,037 counseling professionals included in this second data set as shown in Table 2. Clergy make up 58% of this sample. The majority of the sample is male, 68%. Whites comprise 83% of the counseling professionals. Seventy-one percent of the sample resides in an urban area. The sample has a mean education of 13 years.

**Table 3 Descriptive Statistics of Clergy Sample**

<b>Variable Name</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Min.</b>	<b>Max.</b>
Age at Death	2,958	78.00	10.03	55	99
Marital	2,958	.61	.49	0	1.00
Sex	2,958	.09	.29	0	1.00
Hispanic	2,958	.01	.10	0	1.00
White	2,958	.84	.37	0	1.00
Black	2,958	.14	.35	0	1.00
Other	2,958	.02	.13	0	1.00
Metro	2,958	.67	.50	0	1.00
Education	2,958	14.19	2.99	6.00	17.00

As indicated in Table 3 there are 2,958 clerics included in this third data set. The majority of the sample is male, 91%. Whites comprise 84% of the clerics. Sixty-seven percent of the sample resides in an urban area. The sample has a mean education of 14 years.

**Table 4 Descriptive Statistics of State Sample**

<b>Variable Name</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Min.</b>	<b>Max.</b>
Pollution	19	156.11	132.40	8.65	563.19
Hospitals	19	.03	.01	.02	.06
Poverty	19	25.03	6.42	15.02	37.32
IMR	19	7.14	1.26	4.80	9.80

The state data set includes 19 states. These states have a mean of 156.11 dry pounds of pollution, as indicated by Table 4, for the years spanning 1988-1997. There is an average of .03 hospitals per 1,000 state residents. On average 25.03 people per 1,000 state residents were in poverty in 1997. The states have a mean IMR of 7.14 for 1997 through 1999.

I would like to show that these data are suitable for regression modeling. Though the data are very homogeneous there is no issue of collinearity between the variables. I utilize zero-order correlation to demonstrate that all variables meet the assumption of independence.

**Table 5 Correlation Matrix of Professional Variables**

	Age at Death	Sex	Hispanic	Black	Other	Metro	Marital	Clergy
Sex	.18							
Hispanic	-.03	-.01						
Black	-.08	.08	-.02					
Other	-.04	-.03	.01	-.03				
Metro	-.04	-.05	.01	.05	.01			
Marital	-.33	-.44	.01	-.05	.03	.01		
Clergy	.00	-.11	.00	.07	.00	-.02	.04	
Edu.	-.02	.04	-.04	-.01	.03	.03	.02	.01

Table 5 shows that the majority of the variables display little relationship with other variables. Marital seems to have a strong relationship with Sex and Black. In order to establish whether or not these relationships would be problematic in later analysis I calculated a tolerance value of .8. Therefore Marital is not a problematic variable.

**Table 6 Correlation Matrix of Counseling Variables**

	Age at Death	Sex	Hispanic	Black	Other	Metro	Marital	Clergy
Sex	-.02							
Hispanic	-.04	.03						
Black	-.11	.07	-.04					
Other	-.06	.01	-.01	-.06				
Metro	-.02	.05	.04	.14	.00			
Marital	-.19	-.34	-.02	-.02	.02	-.07		
Clergy	.17	-.59	-.04	-.02	-.03	-.10	.22	
Edu.	-.04	-.02	-.06	-.17	-.05	.09	-.01	-.13

Many of the Counseling variables display only slight relationship with other variables as shown in Table 6. Clergy seems to have a strong relationship with Sex. A

tolerance value of .63 leads to the conclusion that Clergy will not be a problem in later analysis.

**Table 7 Correlation Matrix of Clergy Variables**

	Age at Death	Marital	Sex	Hispanic	Black	Other	Metro
Marital	-.23						
Sex	-.04	-.20					
Hispanic	-.03	.00	.00				
Black	-.06	.00	.12	-.03			
Other	-.07	.00	.03	-.01	-.06		
Metro	-.01	-.06	.00	.02	.14	-.02	
Edu.	-.03	.00	-.15	-.08	-.20	-.07	.08

Table 7 shows that none of the variables in the Clergy data set display a strong relationship with other variables.

**Table 8 Correlation Matrix of State Variables**

	Pollution	Hospitals	Poverty	IMR
Hospitals	.28			
Poverty	-.04	.04		
IMR	.03	-.12	.47	

Many of the State variables display a very weak relationship with the other variables with the exception of IMR as indicated in Table 8. IMR seems to show a strong relationship with poverty. But IMR has a strong tolerance value of .75, so I conclude that IMR is suitable for use in the regression modeling.

It is appropriate to use all four data sets in the regression modeling.

The next chapter of this thesis contains the analysis. I estimate 15 models in order to test my hypothesis. This chapter provides evidence for whether or not my hypotheses were supported.

## CHAPTER V

### ANALYSIS OF THE HLM MODELS

This chapter of my thesis provides the results for models 1-15. These models give evidence about whether or not my hypotheses were supported.

#### **Results**

In this first analysis models one through three are direct effect models. Model one includes the dependent variable, age at death, and the main individual level variable, clergy. Clergy is a dummy variable with non-clergy professionals scored zero and clergy scored one. Clergy do not experience a significant longevity advantage over professionals in this model (see Table 9).

Model two includes a number of ascribed demographic variables as well as the main independent variable of clergy. The clergy experience a significant longevity advantage over professionals of 1.89 years (see Table 9).

Model three adds achieved demographic independent variables to the previous model. The positive association between longevity and clergy is maintained. Clergy experience a significant longevity advantage over professionals of 1.42 years (see Table 9).

**Table 9 HLM Regression Results Predicting Professional Age at Death**

	Model 1	Model 2	Model 3	Model 4	Model 5					
<b>Direct Effects</b>										
	Effect	SE	Effect	SE	Effect	SE	Effect	SE	Effect	SE
Clergy +	.11	.19	1.89***	.19	1.65***	.18	1.42***	.27	1.32***	.25
Sex +			3.91***	.06	1.12***	.06	1.22***	.16	1.21***	.16
Hispanic -			3.025** *	.30	3.21***	2.8	2.46***	.62	2.51***	.61
Black -			4.33***	.14	4.53***	.13	-4.6***	.40	4.64***	.41
Other -			3.04***	.26	2.39***	.25	4.62***	.50	4.57***	.50
Metro -					-.39***	.07	-.23	.17	-.24	.17
Marital +					6.31***	.06	6.09***	.22	6.11***	.23
Education +					-.06***	.01	-.04	.40	-.04	.03
Pollution -							.00	.00	.00	.00
Hospitals +							40.12** *	11.26	41.50** *	11.11
Poverty -							.09***	.02	.08***	.02
IMR -							-.53***	.10	-.44***	.10
<b>Interaction Effects</b>										
Pollution on Clergy slope									.002	.003
Hospitals on Clergy slope									22.62	25.65
Poverty on Clergy slope									-.05	.04
IMR on Clergy slope									.75***	.21
Intercept	77.90** *	.29	77.9***	.29	77.87** *	.30	77.93** *	.22	77.93** *	.21

\*\*\* indicates p<.001

Model four adds state level variables onto the previous model and is a multi-level model. The inclusion of state-level variables does not eliminate the significant longevity advantage experienced by the clergy. The clergy have 1.42 years of life advantage over professionals in this model (see Table 9).

Model 5 further expands on the multi-level model and includes interaction effects between the state-level variables and the clergy slope. A significant positive longevity advantage for clergy, of 1.32 years, is maintained in this model (see Table 9). A single interaction effect had a significant impact on the clergy slope. A state's IMR has a significant impact on clergy's slope. This effect serves to increase the clergy's longevity advantage of 1.32 years by .75 years bringing the longevity advantage to 2.07 years (see Table 9). This is to say that a cleric living in a state with a high IMR will have 2.07 years of life advantage over professionals in that state.

The second analysis begins with direct effects only in models six through eight. Model six includes the dependent variable, age at death, and the main individual level variable, clergy. In this analysis clergy did experience a

significant longevity advantage of 3.62 years over counseling professionals (see Table 10).

Ascribed demographic variables were added to the model. It is shown that the clergy experience a significant years of life advantage over counseling professionals of over half a decade (see Table 10).

The eighth model includes achieved demographic independent variables in addition to the ascribed and clergy variables. The positive relationship is maintained and clergy experience a significant longevity advantage over counseling professionals of 5 years (see Table 10).

The contextual effects on mortality, or state-level variables were then added to the previous model in model nine and create a multi-level model. Putting state-level variables into the model fails to do away with the significant longevity advantage experienced by the clergy, indeed the relationship strengthens. The clergy have 5.1 years of life advantage over professionals in this model (see Table 10).

**Table 10 HLM Regression Results Predicting Counseling Age at Death**

	Model 6		Model 7		Model 8		Model 9		Model 10	
<b>Direct Effects</b>										
	Effect	SE								
<b>Clergy +</b>	<b>3.62***</b>	<b>.25</b>	<b>5.14***</b>	<b>.37</b>	<b>5.00***</b>	<b>.37</b>	<b>5.10***</b>	<b>.40</b>	<b>5.12***</b>	<b>.41</b>
Sex +			2.77***	.38	.87*	.39	1.16*	.50	1.22*	.51
Hispanic -			-3.84**	1.25	-4.31***	2.8	-4.02**	1.35	-4.05**	1.36
Black -			-3.29***	.42	-3.50***	.42	-3.24***	.78	-3.20***	.82
Other -			-5.67***	1.25	-5.25***	1.23	-6.68***	1.62	-6.50***	1.60
Metro -					.13	.33	.17	.42	.17	.42
Marital +					-4.98***	.30	-4.74***	.49	-4.77***	.49
Education +					-.13**	.04	-.10*	.05	-.10*	.05
Pollution -							.00	.00	.00	.00
Hospitals +							57.68*	25.80	62.36*	26.00
Poverty -							.00	.04	.00	.04
IMR -							.09	.22	.11	.22
<b>Interaction Effects</b>										
Pollution on Clergy slope									.006**	.004
Hospitals on Clergy slope									11.38	24.00
Poverty on Clergy slope									.03	.05
IMR on Clergy slope									.11	.22
Intercept	76.37***	.28	76.36***	.29	76.36***	.29	76.34***	.27	76.34***	.27

\*\*\*indicates p<.001 \*\*indicates p<.01 \*indicates p<.05

Model ten builds on the multi-level model and includes interaction effects between state-level variables and the clergy slope. This model shows a longevity advantage of 5.12 years for clergy (see Table 10). A single interaction effect had a significant impact on the clergy slope. A state's pollution level has a significant impact on clergy's slope. This effect is very small; .006 years of life advantage (see Table 10). This is to say that a cleric living in a state with a high pollution exposure will have 5.126 years of life advantage over counseling professionals in that state.

The same pattern for analysis is repeated and in this last analysis models 11-13 are direct effect only. This last analysis is different than the above; the main independent variable changes from clergy to marital status. Model 11 includes the dependent variable, age at death, and the main individual level variable, marital. Marital is a dummy variable with clergy scored zero if unmarried at time of death and scored one if married at time of death. Unmarried clergy experience a significant longevity advantage over married clergy of 4.89 years in this model (see Table 11).

Model 12 adds a number of ascribed demographic variables as well as the main independent variable marital. Unmarried clergy experience a significant longevity advantage over married clergy of 4.74 years (see Table 11).

Model 13 includes achieved demographic independent variables as well as those in the previous model. There is a positive association between longevity and unmarried clergy. Unmarried clergy experience a significant longevity advantage over married clergy of 4.68 years (see Table 11).

The fourteenth model adds on state level variables which creates a multi-level model. The inclusion of state-level variables does not eliminate the significant longevity advantage experienced by the unmarried clergy. The unmarried clergy have 4.69 years of life advantage over married clergy in this model (see Table 11).

**Table 11 HLM Regression Results Predicting Clergy Age at Death**

	Model 11	Model 12	Model 13	Model 14	Model 15					
<b>Direct Effects</b>										
	Effect	SE								
<b>Marital</b>	<b>-4.89***</b>	<b>.57</b>	<b>-4.74***</b>	<b>.63</b>	<b>-4.68***</b>	<b>.64</b>	<b>-4.69***</b>	<b>.36</b>	<b>-4.56***</b>	<b>.51</b>
Sex +			-.81	.63	-.72	.73	.68	.73	-.77	.73
Hispanic -			-3.43*	1.81	-3.72**	2.07	-3.74	1.97	-4.16*	2.00
Black -			-1.88***	.53	-2.65***	.61	-2.60***	.61	-2.57***	.63
Other -			-7.00***	1.78	-	2.68	-10.04***	2.50	-9.14***	2.30
Metro -					-.05	.53	.00	.53	.13	.52
Education +					-.16**	.05	-.16**	.05	-.16*	.05
Pollution -							.00	.00	.00*	.00
Hospitals +							31.91	26.37	45.25	25.87
Poverty -							-.03	.04	-.06	.04
IMR -							-.02	.22	.05	.21
<b>Interaction Effects</b>										
Pollution on Marital slope									-.02*	.51
Hospitals on Marital slope									-40.31	57.36
Poverty on Marital slope									.06	.09
IMR on Marital slope									-.73	.46
Intercept	77.90***	.29	77.92***	.30	76.36***	.29	78.04***	.26	78.11***	.24

\*\*\*indicates p<.001 \*\*indicates p<.01 \*indicates p<.05

Model 15 includes interaction effects between state-level variables and the marital slope. The significant positive longevity advantage is maintained. Unmarried clergy have a longevity advantage of 4.56 years (see Table 11). Only one interaction effect has a significant impact on the marital slope, a state's pollution. This effect serves to decrease the married clergy's longevity by .02 years. The married clergy were already at a 4.56 years of life disadvantage but the pollution interaction on the marital slope serves to increase this disadvantage for married clergy to 4.58 years (see Table 11) when compared to unmarried clergy.

### **Testing the Hypotheses**

Now it is pertinent to address whether or not my hypotheses were supported by the results of the regressions.

1. Clergy did experience a longevity advantage over both professionals and counseling professionals alone. The relationship was only significant in the counseling professional's model.
2. This positive longevity advantage was sustained with the addition of ascribed variables. The addition of ascribed variables served to increase the longevity advantage of clergy over professionals and this

- relationship was significant. The relationship was also increased in the counseling professionals only model
3. The years of life advantage was further sustained through the addition of ascribed and achieved variables. Both the professional and counseling professional models showed significant clergy years of life advantage.
  4. The addition of state-level variables on mortality did not eliminate the positive longevity advantage. Professional and counseling professional multi-level models showed significant longevity gain. In the counseling professional multi-level model the inclusion of state-level variables served to increase the clergy's longevity advantage. There was at least one interaction effect in the counseling professionals and the professional model; it shows how the clergy longevity advantage over professionals or counseling professionals varied among the state.
  5. The unmarried clergy, who are assumed to belong to more behaviorally strict denominations, experienced a significant longevity advantage over married clergy.
  6. As with the professional and counseling professional models this positive longevity advantage was sustained

- through the addition of ascribed variables. Unmarried clergy enjoy a significant years of life advantage over married clergy with the addition of ascribed variables.
7. Again this decreased risk of mortality was not eradicated by the addition of ascribed and achieved variables. Unmarried clergy continued to show a significant longevity advantage over married clergy with the addition of ascribed and achieved variables.
  8. The addition of ascribed, achieved and state-level variables did not eliminate the positive years of life advantage. The multi-level models showed unmarried clergy benefited from significant longevity advantage when compared with the married clergy. The pollution interaction with marital effect served to further increase the unmarried clergy's longevity advantage over married clergy.

All but one my hypotheses have been supported. This research provides evidence that in low-risk populations clergy experience significant longevity advantages over professionals and counseling professionals. Further, clergy who belong to more behaviorally strict denominations that do not allow clerics to marry also, experience

significant longevity advantage over those clergy belonging to less strict denominations.

In the last chapter of this thesis the implication of my research are presented and discussed. Also, further research in the area of religion and mortality will be discussed.

## CHAPTER VI

### DISCUSSION AND CONCLUSIONS

This final chapter summarizes my findings. I offer some directions for future research on the topic of religion and mortality. Some of the possible implications of this research are also presented.

My hypotheses were supported in all but one of the fifteen models that were estimated. The clergy showed a significant life advantage over professionals and counseling professionals in almost all instances.

The use of a multi-level model was theoretically and statistically appropriate in the study. The clergy's advantage was supported in all multi-level models. Even though many of the interaction effects did not work in these models the significant effects served to increase the clergy's and unmarried clergy's years of life advantage.

In the professional population the clergy's life advantage was not apparent at the beginning of the analysis. The inclusion of demographic variables affected the model, and the clergy then showed a significant longevity advantage over professionals. This relationship was maintained with the addition of achieved and state level variables. There is something about the clergy that is missing in the professional population that protects

them from death, even though their demographic and contextual characteristics are very similar to those of the professional population.

The positive and significant relationship between longevity and clergy was obvious from the beginning of the model of clergy and counseling professionals. The clergy experienced years of life advantage in all instances that they were compared to counseling professional clergy.

Earlier in this thesis I stated that it would be beneficial to further isolate the impact of religion on mortality by comparing clergy to professionals with similar jobs but not religion jobs. Counseling professionals are usually involved with their clients over a long period of time and have similar counseling relationships that are also evident in the work of clergy. The difference is the absence of religion from the counseling professionals' work. Isolating religion in this way showed a very large (five years) mortality disadvantage when religion is absent. The relationship between occupation and religion, with mortality, point to the importance of religion as a determining factor of mortality.

Religion has proven to be an important variable where mortality is concerned. The differences between religions also provide additional mortality protection. Clergy who

are not married (an indicator of a more behaviorally strict religion) are shown to have an almost five year life advantage over clerics who are married. This relationship is obvious from the most basic to the most elaborate models.

I would be overstretching the data were I to conclude that more denominationally strict religions provide a larger mortality buffer for their clerics than less strict religions. But death certificate data have no information regarding religion. I am fairly confident about the pattern of mortality; women usually outlive men and if a cleric in this data set is single at time of death it is more likely that he was not married than his being a widower.

Religion seems to provide a buffer against mortality. By focusing in on homogenous populations it becomes evident that even among these low-risk populations religion provides a huge longevity advantage. In order to understand this phenomenon more analysis concerning religion and mortality is needed.

A major disadvantage of these data is that they are cross sectional. Of course the decedent will only die once but a longitudinal data set would allow us to discern other factors that may impact mortality or help explain the

religious buffer. For instance, person's behaviors concerning religious participation and quality of said participation would be invaluable in attributing religion as a mortality buffer. Most data may be problematic where quality of religious experience is concerned

I was able to show that religion provides a buffer against mortality. The addition of ascribed, achieved and state-level variables along with interactions does not seem to eliminate this advantage. However, I was not able to identify what it is about religion that provides this buffer, or why it appears that more behaviorally strict religions provide a larger buffer than the less strict religions.

It has been shown that the clergy live longer than persons in low risk populations. The next step in isolating the effect of religion is to study the different types of religions and mortality rates of their clerics. By isolating the differences between religions and religious practices it would be possible to further isolate what it is about religion that is impacting mortality. The "clergy only" model lends support to the hypothesis that stricter denomination clerics are more likely to live longer. Does this advantage extend to the parishioners or is it because of celibacy? A longitudinal study that

followed denominationally strict parishes and less strict parishes could give evidence as to whether or not religiously mandated celibacy provides longevity advantage. Only focusing on the clergy would be problematic in gauging the impact of religion. The church members would be the crucial link in determining the effect of religion on longevity and how much of one affects the other. Any new research in this area must be thoughtful and approached with caution; even the hypothetical study just mentioned may miss the mark.

It is obvious that clergy experience a years of life advantage in a population that is not at a high risk of mortality. This could be due to various reasons. One reason for the clergy's life advantage may be the support network available to them in their professional roles. The clergy may develop large social networks in the process of performing their jobs. They are committed to serving a particular group of people and have frequent contact with them. They may develop a dense social ties network with people who share similar values and interests that may enhance the quality of the social relationships (Ellison and George 1994, Kelley 1979). These relationships may provide support networks for the clergy that are not there for other professionals.

The clergy usually have the benefit of extensive international professional networks that provide support and justification for their endeavors for their particular religion and sect. There is a similar support system for most professionals though it is not on a comparable scale with the religious professions. Most religions predate modern professional associations. The combined legitimacy of century long traditions and international support from a community with similar values may provide a sense of purpose that would have an adverse effect on mortality that is not present in other professions. This sense of purpose has been represented by the decreased likelihood of mortality for the religious elderly in the proximity of major life events and religious celebrations (Idler and Kasl 1991). This association may be even more pronounced when an individual is employed in a religious vocation.

These increased social networks may be indicative of less stress in clergy's life. Stress has an important impact on mortality. Those who are under economic, mental or physical stress are at higher risks of mortality when compared to the rest of the population (Rogers et al 2000). The professional population may not have the benefit of dense social networks with like valued people to reduce their stress levels.

Further the impact of stress on clergy could be a large part of the discrepancy between their longevity and that of the counseling professions. There is a great amount of stress associated with caring for others in an occupational setting (Wilhelm et al 2004). The counseling professionals' day is usually made up of caring for others, while clergy are involved in a myriad of tasks besides counseling. These data are not appropriate to show the effect of stress on the professional population.

There may be other unmeasured factors dealing with the impact of religion that is absent from these data. Indeed religious attendance can only be inferred for the clergy. Religion may provide material as well as emotional satisfaction that may work to alleviate stressful events and increase the self-esteem of its members (Rogers et al 2000). Prayer may endow individuals with the belief that a divinity is on their side. This perception of divinity in a person's life may provide them with a sense of peace and buffer them from stress.

The research reported in this thesis shows that clergy have a clear longevity advantage over other professionals. In order to understand why this advantage is present one would need data reflecting the amount of stress in professionals' lives along with the impact of religion on

their lives. The data would need to answer questions dealing with prayer, self-esteem, meditation and the perceived influence of divinity or calling on a person's life. A longitudinal study that followed a group of professionals and clergy, until their deaths, would be an appropriate way to discern what it is about clergy that gives them such an obvious life advantage.

When I began this thesis, my reasoning was that it would be important to study low-risk populations because of their obvious life advantages over most of the population. By continuing this research it may be possible to better isolate the advantage and enable researchers to distribute knowledge of that advantage to the total population. This would provide knowledge over factors that influence our time of death. It would be a step towards decreasing the inequality within society.

Previous research has shown the benefit of religiosity on longevity. I have shown the benefit of religion as an occupation. This puts us on the path to determining what it is about religion that we can recommend for increased longevity advantage.

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