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Educational attainment and adult mortality differentials in Argentina

Diferenciales por nivel educativo en mortalidad adulta en la Argentina

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Abstract

In Latin America, there is an important set of studies that show a significant inverse relationship between socioeconomic status and mortality rates, but we know very little about the specific relation between educational attainment and adult mortality. The objective of this paper is to describe the relationship of adult mortality to educational attainment in Argentina for 2010. The data used in this study come from the Argentinean Mortality File of 2010 and from the last Argentinean Census. Results show a clear gradient in the specific mortality rates according to educational groups, for both sexes and for all age groups. The existence and direction of this relationship were as expected; however, the magnitude of educational differences was much higher than what has been found in other countries. The data also exhibited a clear declining trend in mortality inequalities by education as age increased.

Key words: mortality, educational attainment, Argentina.

Resumen

En América Latina existe un importante grupo de estudios que muestran una relación inversa significativa entre estatus socioeconómico y tasas de mortalidad, pero poco sabemos aún sobre la relación específica entre nivel educativo y mortalidad adulta. El objetivo de este artículo es describir la relación entre mortalidad adulta y nivel educativo en la Argentina para el año 2010. Se utiliza información de la Base de Mortalidad Argentina de 2010 y del último Censo Nacional de Población de Argentina. Los resultados muestran un claro gradiente en las tasas específicas de mortalidad de acuerdo con los grupos educativos, para ambos sexos y para todos los grupos etarios. Si bien la existencia y la dirección de esta relación eran esperables, la magnitud de las diferencias educativas fue mucho más alta que lo encontrado en otros países. Los datos también exhiben un claro descenso en las inequidades en mortalidad a medida que la edad aumenta.

Palabras clave: mortalidad, nivel educativo, Argentina.

Introduction

The study of the relationship between socioeconomic characteristics and mortality patterns has been a traditional research area of demographic analysis, representing one of the seminal areas at the establishment of this discipline. The classic studies on socioeconomic differentials in mortality focused on how occupational status, income, wealth or educational attainment influenced mortality levels and causes of death for specific groups in the population. The analysis of these relationships has gained important scientific relevance in the social sciences in general and in demography in particular because it is directly linked with the crucial matter about how social stratification shapes different life opportunities for individuals (Hummer and Lariscy, 2011). Furthermore, the study of this relationship has relevant interest for the designing of public policies oriented to struggle with social inequalities.

In Latin America, there is an important set of studies that focus on social inequalities in mortality, in a context of overall mortality decline (Arriaga and Davis, 1969; Behm, 1980; Palloni, 1981; Chackiel, 1990; Rofman, 1994; Rosero-Bixby, 1994; Grushka, 1995; Cerqueira and Paes Antunes, 1998; Paes-Sousa, 2002; Paes Antunes, 2002; Diez Roux *et al*., 2007; Belon *et al*., 2008; Renteria and Turra, 2008). These studies all show a significant inverse relationship between socioeconomic status and mortality rates. However, mainly due to specific limitations in the available data, we know very little about the specific relation between educational attainment and adult mortality. In Argentina, in fact, there is very little research on differential mortality among adults.

The main objective of this paper is to describe the relationship of adult mortality to educational attainment in Argentina for the year 2010. More precisely, I focus the analysis on the relationship between educational attainment and specific levels of mortality among the working-aged adult population (25 to 64 years old) with data from the last Argentinean Census (2010).

The scientific literature from countries all over the world has shown a strong and inverse relationship between socioeconomic status and mortality rates. This inverse relationship between educational attainment and mortality rates provides just the tip of the iceberg for a large set of questions: Does the association between education and adult mortality vary by age group? Does this association vary by sex, or by geographical region?

The data used in this study come from the Mortality File for the year 2010 and from the National Census from Argentina for the year 2010. Considering significant limitations in the available data, it is used a Multiple Imputation procedure for predicting the missing cases in the variable education in the Mortality File. The Multiple Imputation is a technique for overcoming important data limitations. It complements and incorporates new insights to the frequently used ecological approach. However, it could not substitute high quality data. In this sense, results need to be considered cautiously, like an exploratory approximation to social phenomena and an incentive for the efforts for improving for socioeconomic data in death certificates.

The main measures used in this paper are Specific Mortality Rates by educational attainment, sex, age and region, and Mortality Ratios among educational groups.

Most Latin America countries have been identified as being among the most unequal societies in the world (Reimers, 1991; Frenk, Lozano and Bobadilla, 1994; Altimir, 1997). While Argentina is not the most unequal country in the region, economic inequality is a relevant characteristic when compared with other middle income countries. In this context, the study of how social inequality shapes different life opportunities for Argentinean individuals takes on remarkable relevance.

There also other reasons that make Argentina an interesting case study for analyzing the relationship between educational attainment and mortality. The mortality decline in Argentina began earlier than other Latin American countries, at the end of the 19th century. With Chile and Uruguay, Argentina was in an advanced stage of its demographic transition in the first half of the 20th century, when other Latin American countries were only beginning this transition. During the 1950s and 1960s, Argentina had the second highest life expectancy at birth in Latin America, only lower than the life expectancy of Uruguay. Now-a-days, Argentina has the sixth best position in the region, below Cuba, Costa Rica, Panama, Uruguay, and Chile. Thus, the pace of decline in the Argentinean mortality rate in the last four decades has slowed compared with other developing countries in the region.

This paper first resumes the demographic background, introduces some conceptual terms for studying socioeconomic differentials in adult mortality, and reviews previous research in adult mortality in Latin America. Second, it reports the main characteristics of the analyzed data and technical procedures in the Data, Measures and Methods section. Third, it presents an analysis of educational differentials in adult mortality in general. Then, it focuses on educational differentials in adult mortality by age, by sex and by geographical region. The last section closes with a summary of the findings.

Demographic background

During the second part of the 20th century, Latin America increased life expectancy at birth from 52 years to 70 years. This was the second fastest increase in life expectancy in the world, behind Asian countries (Chackiel, 2004). The studies that focused on the demographic and epidemiologic transition in Latin America agree with the idea that it is more accurate to talk about different or diverse transitions rather than talk about one transition (Palloni, 1981 and 1990; Chackiel, 1990 and 2004; Frenk, Lozano and Bobadilla, 1994; Guzmán *et al.*, 2006). Regarding the epidemiological transition, Frenk and colleagues proposed a typology of mortality profiles in Latin American countries, considering mortality patterns of change, the timing of the transition, and the pace and direction of these changes. In this typology, Argentina is part of the group of countries with an advanced mortality profile (together with Uruguay, Chile, Cuba, and Costa Rica). The other two groups in this typology are 'countries with a mixed mortality profile (e.g., Venezuela, Brazil, Colombia, Mexico, Dominican Republic, and Ecuador), and countries

with an incipient mortality profile (e.g., Peru and El Salvador) (Frenk, Lozano and Bobadilla, 1994).

Besides this heterogeneity in mortality profiles across Latin American countries, several authors have called attention to the heterogeneity of the demographic and epidemiologic transitions across socioeconomic groups (Zavala de Cosío, 1995; Schkolnik and Chackiel, 1998; Chackiel and Schkolnik, 2004). As explained by Frenk and colleagues (1994), Latin-America has the dubious merit of having the most unequal economic distribution in the world. This highly unequal economic distribution affects mortality patterns in such a way that some authors have emphasized that the differences between socioeconomic groups could not be reduced to "socioeconomic differentials" but to multiple and unequal simultaneous transitions (Paes-Sousa, 2002).

Life expectancy at birth in Argentina is currently estimated to be 76.13 years (INDEC, 2010), a relatively high number compared with the life expectancy in South America as a whole, that is 73 years (Population Reference Bureau, 2010). However, the pace of decline in the Argentinean mortality rate in the last four decades has slowed compared with other developing countries (Grushka, 1995).

The mortality decline in Argentina began at the end of the 19thcentury.[1] Intercensal estimations showed an increase in life expectancy at birth from 33 years for the period 1869-1895 to 40 years for the period 1895-1914. Life expectancy reached 61 years in 1947 and 66 years in 1960 (Somoza, 1971). In a different way compared to most Latin American countries, the most important increase in life expectancy in Argentina was registered at the end of the 19th century, in the 1895-1914 period. During the 1950s and 1960s, Argentina had the second highest life expectancy at birth in Latin America, only lower than the life expectancy of Uruguay. Now-a-days, Argentina has the sixth position in the region, below Cuba, Costa Rica, Panama, Uruguay and Chile. At the same time, the GDP per capita is one of the highest in Latin America (PRB, 2010). Thus, Argentina seems to have plenty of room for improvement with regard to life expectancy.

Comparisons across countries hide the heterogeneity inside each country. In the case of Argentina, heterogeneity in the mortality levels among regions is notable. For example, in 2001, life expectancy at birth in Buenos Aires city was 75.91 (71.8 for men and 79.4 for women); meanwhile, life expectancy at birth in the province of Formosa was 70.8 (68.5 for men and 73.4 for women) (INDEC, 2007). As noted by Frenk and colleagues (1994), the definition of development includes the universality of benefits and progress. The

1 In contrast with the predictions from the demographic transition theory that fertility and mortality are high in traditional and low in modern societies, and that a demographic transition take place from one to other, in Argentina the decline of mortality and fertility has been practically simultaneous (Pantelides, 1983 and 2002). As marked by Pantelides, "The relationship between both curves does not follow the 'classical' form of transition as they keep parallel, with a natural increase rate of 13-20 per 1000. Both decline from the first years of the 20th century, but mortality stagnates between 1950 and 1970" (Pantelides, 1983: 512-513).

exceptional situation in Latin America is in the magnitude of these inequalities and the growing differences among extreme social groups (Frenk, Lozano and Bobadilla, 1994).

Socioeconomic differentials in adult mortality

An important body of knowledge has been constructed in demography and public health on the linkage between socioeconomic characteristics and mortality levels. The persistent and recurrent interest in this topic resides in that it expresses one of the most clearly evident manifestations of social inequality. As stated by Antonovsky in 1967, "Death is the final lot of all living beings. But, as the tragic experience of the Titanic passengers dramatically illustrates, the time at which one dies is related to one's class" (Antonovsky, 1967: 31).

Studies from countries all over the world have shown a strong and inverse relationship between socioeconomic status and mortality rates. That is, individuals with lower socioeconomic status have higher mortality and morbidity rates than individuals with higher socioeconomic status. In the case of the United States, the pioneering work of Kitagawa and Hauser (1973) provided extensive evidence of the existence of differential mortality by socioeconomic status over the period 1930-60. In the fourth chapter of their book, dedicated to analyze socioeconomic differentials in Chicago using data from The Chicago Area Study, the authors found that for both men and women the lowest socioeconomic class had a mortality rate that was approximately 60 percent higher than the rate of the highest class and that this inequality seemed to be stable over time in the analyzed period. Subsequent numerous studies showed this strong and inverse relationship whether measured by socioeconomic status as a whole, or by the different components of socioeconomic status: educational attainment, income or wealth, or occupation (Duleep, 1989; Feldman *et al*., 1989; Pappas *et al*., 1993; Preston and Taubman, 1994; Christenson and Johnson, 1995; Backlund, Sorlie and Johnson, 1996; Elo and Preston, 1996; Marmot *et al.,* 1997; Backlund, Sorlie and Johnson, 1996; Rogers, Hummer and Nam, 2000). Similar patterns of inequality have been found in other developed regions or countries like Israel (Jaffe *et al*., 2008), Canada (Mustard *et al*., 1997; Ross, Masters *et al.,* 2000), and Europe (Kunst and Mackenbach, 1994; Mackenbach *et al*., 1997; Sihvonen *et al*., 1998; Bopp and Minder, 2003; Huisman *et al*., 2004; Elo, Martikainen and Smith, 2006; Geyer *et al*., 2006; Clark and Royer, 2010; Madsen *et al*., 2010), where the unexpected increase in mortality levels in Russia in the last two decades has gained special attention (Chen, Wittgenstein and McKeon, 1996; Cockerham, 1997; Shkolnikov *et al*., 1998; Murphy *et al*., 2006; Shkolnikov *et al*., 2006).

The use of alternative socioeconomic status measures for analyzing socioeconomic differentials in adult mortality has been extensively debated (Kitagawa and Hauser, 1973; Christenson and Johnson, 1995; Backlund, Sorlie and Johnson, 1996; Elo and Preston, 1996; Hummer, Rogers and Eberstein, 1998; Smith *et al*., 1998; Duncan *et al*., 2002; Molla, Madans and Wagener, 2004; Hummer and Lariscy, 2011). As summarized by Hummer and colleagues (Hummer, Rogers and Eberstein, 1998: 560-561), there is a group of studies that suggest that income is the optimal measure because it is used to

purchase health care and preferred qualities of nutrition, transportation, exercise equipment, and housing (e.g., Adler *et al.,* 1994). On the other side, there is another group of studies that argue that education is the optimal measure because: it is most often completed relatively early in adult life and usually remains constant through adulthood; it is more relevant to study populations out of the work force (e.g., unemployed, retired, women in some regions); it generally has a higher response rate on surveys than income; it allows for easier international comparisons than using income (Valkonen, 1993); and it typically precedes occupational status, income, and the accumulation of wealth in a causal sense (Hummer and Lariscy, 2011: 4-5). Occupation is used as the main indicator of socioeconomic status for analyzing socioeconomic differentials in adult mortality in many seminal European mortality studies (Antonovsky, 1967); however, its use is limited for reaching groups such as the unemployed, service workers and homemakers. Alternative, occupation is useful when the analysis focuses of the mortality risk of different professions (Marmot and McDowall, 1986; Marmot *et al.,* 1991; Duncan *et al.,* 1995; Sorlie, Backlund and Keller, 1995) or when the availability of data is limited (Cordeiro and Silva, 2001).

In this research, educational attainment is used as indicator of socioeconomic status, agreeing with those studies that consider that it is the best socioeconomic measure for analyzing socioeconomic differentials in mortality, especially for adult mortality. Moreover, education is available in the Argentinean Mortality Files, while the variable income has much higher rates of missing data than educational attainment.

Previous research on adult mortality in Latin America

In Latin America, the study of adult mortality is scarce and even more scarce is the analysis of the relationship between educational attainment and adult mortality. However, there is some evidence from studies on socioeconomic differentials, which include the variable education in a broader set of socioeconomic variables, and which is used to consider regional and ecological based socioeconomic differentials. In general, these studies show a significant inverse relationship between socioeconomic status and mortality rates (Rofman, 1994; Rosero-Bixby, 1994; Grushka, 1996; Paes-Sousa, 2002; Belon *et al*., 2008; Renteria and Turra, 2008), and that there are significant differences in the relationship depending on the specific causes of death (Rosero-Bixby, 1994; Grushka, 1995; Paes Antunes, 2002; Diez Roux *et al*., 2007).

The limitations in the available data and the almost exclusive focus on infant and child mortality are the main reasons for the lack of research on adult mortality in Latin America (Chackiel, 1990; Rofman, 1994; Paz *et al*., 2004). The restricted information reported on death records has constrained the analysis of socioeconomic differentials in mortality using direct methods. Unfortunately, the application of specific surveys for overcoming these limitations, such as the mortality follow-up studies used in developed

countries, is not common.[2] Moreover, the traditional sources of information, such as Vital Statistics, have presented some problems in data quality such as missing information on key variables, coverage problems, etc.[3] In addition to the data limitations, research on mortality in Latin America has focused almost exclusively on infant mortality, mostly because of its use in international comparisons as a crude indicator of the status of the population and for its intrinsic importance for measuring human development. An important body of knowledge on infant mortality has been developed in the region, often using specific surveys which complement traditional sources such as Vital Statistics (Breilh, 1983; Bronfman and Tuiran, 1984; Saad, 1985; Bronfman, 1992; Bähr and Wehrhahn, 1993; Bronfman, 2000; Sastry, 2004). These studies showed that socioeconomic factors are responsible for most of the observed differences in infant mortality. Several authors have suggested that this differential effect can be extended to the adult population (Paz *et al.*, 2004), and a great portion of what we know today about socioeconomic differentials in adult mortality comes from these studies on infant mortality. However, as noted by Rofman (1994: 77), this assumption lacks robust empirical support.

The majority of the studies in the region dealing with the relationship between educational attainment and adult mortality are subsumed in a wider set of investigations studying socioeconomic differentials in adult mortality levels. In these studies, the variable education is included in a broader set of socioeconomic variables, and their focus is on the relationship between adult mortality and economic development (Curto de Casas, 1993; Orihuela-Egoavil, 1993; Rosero-Bixby, 1994; Grushka, 1995; Cerqueira and Paes Antunes, 1998; Duarte *et al.,* 2002; Messias, 2003; Ishitani *et al.*, 2006; Diez Roux *et al.*, 2007; Belon *et al.*, 2008). With few exceptions, these studies are based on indirect approaches, where deaths are compiled at a specific ecological level (states, municipalities or census tracts of residence of the deceased person), and then deaths and the population for each geographical area are allocated as a unit to one of several educational groups, on the basis of an educational index for this geographical area.

Studies that analyzed the relation between mortality levels and socioeconomic factors in Latin America using these methods show that there is a strong and inverse association between socioeconomic factors (e.g., income, GDP per capita, urbanization, illiteracy rates, percentile of homes with inadequate sanitary draining, etc.) and adult mortality rates. For example, a research study aiming to measure the impact of illiteracy rates on the relationship between income disparities and life expectancy in Brazil (Messias, 2003) found that income disparities (using the Gini Coefficient) and illiteracy rates were negatively associated with life expectancy in Brazil. A simple linear regression between life expectancy and the illiteracy rate, measured from this ecological approach,

2 Promising research designs have being implemented in the last years. See, for example, Rosero-Bixby and Antich, 2010.

3 The evaluation of the quality of the available data and methods for overcoming its problems has been an important issue in the research on adult mortality in the region (Grushka, 1996; Paes Antunes, 2007; Piscoya-Díaz and Queiroz, 2010).

showed a 2.2 year decrease in life expectancy for a 10-unit increase in the illiteracy rate. A multiple linear regression, including GDP per capita, illiteracy rate and the Gini coefficient, showed that the inclusion of illiteracy rates in the regression model removed the effect of income disparities (Messias, 2003: 1294). A similar finding was presented by Belon and colleagues (2008) for the population of Campinas, Brazil, for the year 2005. The authors found that the difference in life expectancy between extreme socioeconomic groups was about 4 years (76.9 for those individual in the highest socioeconomic status *vs*. 72.5 for those individual in the lowest socioeconomic status), with the largest difference among men (Belon *et al*., 2008: 9).

Concerning Argentina, an analysis of trends in adult mortality for the period 1980-1990 showed that adult mortality rates decreased approximately 14%, with a similar relative decline for men and women, and for each five-year age group from 15 to 65 years old (Grushka, 1995). As stated by the author of this research, the analysis of mortality rates at the national level hides important differences between subpopulations. The analysis of mortality rates at the province level allow us to observe differences between subpopulations with very diverse ecological socioeconomic indicators (such as illiteracy rate, GDP per capita or urbanization rate). For example, for the year 1980, adult mortality levels across provinces oscillated between 2.5 and 4.7 by one thousand inhabitants among women, and 4.5 to 7.4 among men. For the year 1990, the differences between adult mortality levels across provinces were considerably reduced, oscillating between 2.1 and 3.7 among women, and 4.5 to 6.5 among men (Grushka, 1995: 88).

However, even when the association between socioeconomic factors and adult mortality seems straightforward in the region, the association between the pace of decline in adult mortality and changes in economic development are not so direct. In a seminal research study on adult mortality in Costa Rica, stagnation in the adult mortality decline was observed in a period of important growth in economic development and health spending (1960-1970); moreover, an increase in the pace of adult mortality decline was observed in a period of stagnation in economic development (1980-1990) (Rosero-Bixby, 1994). In his research, Grushka showed that the 14 percent decline in adult mortality rates during the 1980-1990 period in Argentina occurred during a period of economic decline, calling attention to the apparent lack of association between economic crisis and adult mortality (Grushka, 1995: 111).

Studies that analyzed the relationship between causes of death in adult mortality and socioeconomic factors in Latin America show that there are significant differences in the relationship depending on the specific cause of death and that the effect of this relationship varies considerably by age and sex (Rosero-Bixby, 1994; Grushka, 1995; Paes-Sousa, 2002; Paes Antunes, 2002; Ishitani *et al*., 2006; Di Cesare, 2007; Diez Roux *et al*., 2007; Pessoa Cesse, 2007; Wilson, Regidor and Otero, 2007; Nogueira, Ribeiro and Cruz, 2009). For example, the association between neoplasm mortality and socioeconomic factors tends to be positive, whereas the association between transmittable disease mortality and socioeconomic factors tends to be negative. These patterns should be understood in light of the transformations in the Latin American mortality profile throughout its

epidemiological transition, which have shown a growing tendency for neoplasms as a cause of death compared to infectious and parasitic diseases. As proposed by the epidemiologic transition, improvement in the social conditions of the population reduces the incidence of diseases related to underdevelopment affecting mainly the younger population and increases the incidence of chronic-degenerative diseases affecting mainly the older population (Frenk, Lozano and Bobadilla, 1994). In this sense, these studies find higher neoplasm mortality in geographic areas with better education levels. Furthermore, some of these studies show important variability in the effect of the relationship by age and sex. For instance, through a multiple regression analysis with Brazilian Mortality Files and from the 1980 and 1991 Brazilian Censuses, Paes Antunes (2002) finds a significant positive association between education, measured as the illiteracy rate among the 15 year-old population, and neoplasm mortality and external cause mortality. That is, there is a higher death risk for these causes in states with better education. Similarly, Rosero-Bixby (1994) finds that the positive correlation between adult mortality in Costa Rican counties and their socioeconomic and health status was especially substantial for cardiovascular diseases and diabetes. In Argentina, Grushka (1995) found that the association between mortality levels and socioeconomic factors is significant for women but not for men. Through a decomposition of this relation by cause of death, the author shows that the negative correlation between neoplasm mortality and urbanization (used as an indicator of economic development) is the reason for this unexpected difference between men and women in the significance of the association (Grushka, 1995: 139). Besides specific differences, these studies in Latin America call attention to the relevance of socioeconomic differentials for analyzing each group of causes of death separately.

The limitations in the available data do not prevent some researchers from analyzing socioeconomic differentials in adult mortality at the individual level. Following the research tradition of studies developed mainly in Europe (Antonovsky, 1967), some researchers explore socioeconomic differentials using the occupation registered on death certificates. For example, Duncan and colleagues (1995) analyze occupational differentials in mortality for men aged 15-64 years old in the State of São Paulo, Brazil, by linking data from Mortality Files and Censuses. In this study, they found that mortality rates were 3.8 times greater for men in the lower occupational category compared to the men in the higher occupational category. In a similar study, but applying a methodological design which included a longitudinal analysis on a probabilistic sample, Cordeiro and Silva (2001) found that in the region of Botucatu, São Paulo, Brazil, the death risk increases consistently for people with lower specialized occupations; they lose up to 12 years in life expectancy compared to intellectual workers with higher specialized occupations. Even when these studies provide evidence on the strength of the association between socioeconomic factors and adult mortality, they do not provide us with information about the relationship with other socioeconomic factors and have the limitations related to the use of the variable occupation as the exclusive variable for measuring socioeconomic status. For example, they have the restriction of analyzing only the part of the population that is economically active, making it difficult for the analysis of female populations in some specific regions and periods.

There is also a group of studies that try to overcome these data limitations using alternative sources of information and/or methodological designs that are of special relevance for this research (Rofman, 1994; Renteria and Turra, 2008). Rofman (1994) estimates socioeconomic differentials in adult mortality in Argentina using data from the National Social Security System (Administración Nacional de Seguridad Social), finding an important inverse correlation between mortality risk and income. Even though this study does not advance the analysis of the role of education attainment for mortality risk and used only the information of the population aged 65 or older, it is the first study in Argentina using individual data for estimating socioeconomic differentials in adult mortality. The author found that the differences by income are 11.5 years in life expectancy at 20 years old, and 4.4 years at 65 years. Thus, life expectancy among individuals with high socioeconomic status is 20 to 25 percent higher than among individuals with lower socioeconomic status (Rofman, 1994: 88).

The study of Renteria and Turra (2008) in Brazil is another of these studies trying to overcome data limitations, and it is of special relevance to my research as well because it is, to my knowledge, the only article in Latin America which analyzed specifically the relation between adult mortality and education attainment. This research study combines information about the mother's survival and education of respondents from a nationally representative household survey collected in Brazil in 1996 (Pesquisa de Padrões de Vida), to examine how mortality among adult women varied by level of education during the last few decades. Based on the traditional orphanhood method for adult mortality, the authors apply a methodological approach that allow them to estimate female mortality rates by level of education at the individual level and analyze how these differentials vary by age and education simultaneously. The authors find that

> [..] mortality is about three to four times higher among the lowest educational group compared to the highest one. The differences reduce slightly at higher ages, suggesting that protection or selection effects may also operate also among Brazilian women (Renteria and Turra, 2008: 12).

Thus, this study from Brazil is consistent with the findings of studies in other regions showing the strong inverse association between adult mortality and education attainment (e.g., Hummer and Lariscy, 2011).

In sum, the literature shows that, in Latin America, research on adult mortality has been largely neglected. The scarcity of studies analyzing socioeconomic differentials and the incipient group of studies trying to overcome data limitations with new data sources show that a strong inverse association exists between adult mortality and socioeconomic factors. The literature also shows that the association between socioeconomic factors and mortality risk could assume different directions and intensity depending on the cause of death, age and sex group, and time period analyzed. To our knowledge, no study in Latin America has tried to analyze how the relation between education attainment and adult mortality unfolds with changes occurring in education levels. Neither have we found a research study in the region that used the information about education attainment on death certificates for analyzing educational differentials in adult mortality.

Data, Measures and Methods

The main objective of this paper is to describe the relationship of adult mortality to educational attainment in Argentina for the year 2010. The data used in this study come from the Mortality Files for the year 2010 and from the National Census from Argentina for the year 2010.

Argentina's Mortality Files include data on all deaths occurring within Argentina for each year. Data are obtained from certificates filed for deaths taking place in each Province, including one record for each death occurring during the data year. Mortality Files are part of the National Vital Statistics System and are one of the most well utilized data sets for studying mortality patterns, especially because of their universal coverage and standardization. Mortality Files include information on basic socio-demographic factors of the deaths, generally reported by next of kin, and some characteristics of the situation of the death (such as place of death, manner of death, cause of death). This information is collected by the Department of Statistics of the Ministry of Health.

Even when various studies have examined the quality of vital statistics on death and ranked the coverage and the quality of the data in Argentina as one of the best in the region (Chackiel, 1987; Jaspers-Faijer and Orellana 1994 y 1996), the variable educational attainment presents a higher rate of missing cases. For the year 2010, the percentage of missing cases in the variable education for the population aged 25-64 years hovered around 40 percent.

Considering this limitation of the available data, it is used the technique of Multiple Imputation (Rubin, 1996; Schafer and Graham, 2002; Enders, 2006; Graham, 2009; Stata, 2009). Multiple Imputation is a statistical technique for handling missing data which basically consists of the creation of multiples sets of plausible values through a series of multiple regression equations on the variable with missing cases, using the other variables in the file as predictors. In order to create imputed datasets with different estimates of the missing values, random perturbations are added (e.g., using a different number of predictors). In this phase, a pre-determined number of copies (e.g., 10 or 20) of the data are generated, each of which is imputed with different estimates of the missing values. In a second phase, the average of the estimated values is used as the predicted score of the missing value. The multiple set of imputations used to create the missing value also allows the calculation of the standard error related with each predicted value (Enders, 2006: 430). The final product is a completed data set which could be analyzed with standard statistical software. This technique is currently considered to be one of the best procedures available when working with missing data (Enders, 2006: 434).

The main variables are mortality and educational attainment.

Mortality in this study is measured by age, sex, region, and educational attainment. Argentinean death certificates for 2010 for country residents who were age 25 to 64 at the time of their death provide the numerators of these death rates. The denominators are estimated from the 2010 Census.

The use of data from the Mortality Files for the numerator and data from the Census for the denominator is a method that has a long history in the study of socioeconomic differentials in mortality levels and has been productively used in many countries (e.g., Kitagawa and Hauser, 1973; Valkonen, 1993; Christenson and Johnson, 1995). This method has a number of potential problems due to possible numerator or denominator biases, but also due to the combination of different sources in which classification of educational level may differ between Census and Mortality Files (Vallin, 1980; Shkolnikov *et al*., 1998). In the census the information comes from a declaration which is usually made by the individual; in the death certificate the declaration is always made by a third party. Additionally, in the specific case of educational attainment, several studies showed that third parties tend to overestimate the educational attainment of the deceased when completing the death certificate. This bias tends to be most severe when estimating mortality for educational groups at the extremes of the distribution (Shkolnikov *et al*., 1998). A conservative strategy adopted for some authors for dealing with this problem was to use aggregate educational categories (e.g., 3 categories) rather than an extensive category system of education or years of education (Marmot and McDowall, 1986; Shkolnikov *et al*., 1998). In this research we do not have other alternative that using aggregate educational categories because this is the way that the data is registered in the Argentina's Mortality Files.

Years of education is categorized in three groupings: a) less than eight years of education (low level of education, up to Completed Primary School); b) eight to twelve years of education (intermediate level of education, up to Completed Secondary School); and c) thirteen years of education or more (high level of education, Completed or Uncompleted Superior Studies). The decedent data is answered by next of kin, and in some cases these relatives do not have complete information on some dimensions. For instance, knowing the highest education level attained for the decedent is difficult for some groups, especially when the decedent is very old.

Sex is measured as male and female.

The variable age is categorized using five-year age groups.

The variable region is categorized in five groups: 1) Buenos Aires Region, including the Province of Buenos Aires and Buenos Aires City; 2) Center Region, including the provinces of Córdoba, Entre Ríos and Santa Fe; 3) Cuyo Region, including the provinces of La Rioja, Mendoza, San Juan and San Luis; 4) North Region, including the provinces Chaco, Corrientes, Formosa, Misiones, Catamarca, Jujuy; and 5) Patagonia Region, including the provinces of Santa Cruz, Chubut, Río Negro, La Pampa, Tierra del Fuego and Neuquén.

Besides the use of specific mortality rates, the use of mortality ratios among educational groups offers a more eloquent view of the differences. The mortality ratios clarify the relative mortality differences between educational attainment groups for each age and sex group. In this case, the reference category for the ratios is the highest level of education.

Hypothesis

Based on the results of previous studies in other countries, this paper expects to find that educational attainment has an inverse and strong relationship with overall adult mortality levels in Argentina. Overall, it is expected to find that people with higher levels of education will exhibit lower levels of adult mortality as many international studies have shown. As mentioned before, this inverse relationship between educational attainment and mortality rates is just the beginning of a larger set of questions. Another working hypothesis of this paper is that the relationship between educational attainment and overall adult mortality will vary by gender, region and age group, as has been found in other countries.

Specifically, it is expected to find evidence of this relationship between educational differences in adult mortality among both sexes, with a stronger relationship for males. Grushka (1995) found that the association between mortality levels and socioeconomic factors is significant for women but not for men in Argentina, but he did not have specific information on educational attainment and mortality levels –existing international literature on the topic does not offer a consistent answer (Koskinen and Martelin, 1994; Zajacova, 2006; Zajacova and Hummer, 2009). Moreover, it is expected that relative educational differences in mortality rates will be smaller than among younger adults. This age pattern has been found in some research in the United States from the 1960s but is different from us findings in more recent periods (Hummer and Lariscy, 2011; Molla, Madans and Wagener, 2004).

Educational differentials in mortality among adults in Argentina

How do overall adult mortality patterns in Argentina interrelate with educational attainment? The traditional way to approaching this question is to analyze the specific mortality levels (e.g., using death rates and/or life expectancy at particular ages) for each educational group. Support for the first hypothesis arises if I find lower mortality rates among more highly educated Argentinean adults.

Following the documentation strategy of Molla, Madans and Wagener (2004), Table 1 displays death rates (per 1,000 persons) for each age group by years of completed school. The variable age is categorized using five-year age groups. Years of education is categorized in three groupings: a) less than eight years of education (low level of education, up to Completed Primary School); b) eight to twelve years of education (intermediate level of education, up to Completed Secondary School); and c) thirteen years of education or more (high level of education, Completed or Uncompleted Superior Studies). Moreover, the use of mortality ratios among educational groups offers a more eloquent view of the differences. This information is presented in the last three columns of Table 1, similar to Molla, Madans and Wagener (2004). The mortality ratios clarify the relative mortality

differences between educational attainment groups for each age and sex group. In this case, the reference category for the ratios is the highest level of education.[4]

The findings show a clear gradient in the age-specific mortality rates according to educational attainment. For both sexes and for all age groups, the lower the educational level, the higher the mortality rate. In concordance with the first working hypothesis of this paper, then, there is a strong and inverse relationship between educational attainment and adult mortality rates in Argentina.

The central panel of Table 1 shows that deaths rates are much higher for the population with low education levels than for the rest. For example, for the oldest male group (60-64), the death rate among men with thirteen years or more of education is 8.3 per 1,000, while the death rate among men in the same age group but with low education (less than eight years) is 23.0 per 1,000. This pattern is consistent throughout Table 1, accompanied by the expected rise of death rates at higher ages and by lower deaths rates for women compared with men.

We can gain a clearer perspective of these mortality differences using the rate ratios that appear in the right panel of Table 1. Men aged 25 to 29 years old with low education have seven times the rate of dying than men in the same age group but with higher education (13 years or more). Similarly, women in the same 25-29 age group with low education have a mortality rate that is 7.5 times higher than highly educated women in that age group. Even though this pattern was expected between our key variables, the magnitude of these ratios is higher than what has been found in similar studies in other countries, such as the United States.

Table 1 also shows also other interesting patterns. First, the differences between educational groups tend to be similar for both men and women for the first three age groups, but more pronounced among men than women in the older age groups. Second, relative educational differences in mortality rates tend to smaller among older adults.

Educational differentials in mortality by age

Several studies have found that relative educational differences in mortality rates tend to be smaller among older adults than younger adults. This age pattern is found in different countries. In the case of the United States, this pattern was first demonstrated in the 1960s but is very strong in more recent periods (Hummer and Lariscy, 2011; Molla, Madans and Wagener, 2004).

As mentioned before, there are no studies in Argentina about this specific topic, and the research on adult mortality in Latin America is scarce. Considering this lack of local

4 Specifying the ratio as the low educated group to the high educated group does not take into account inequalities in other portions of the educational distribution (e.g., the relation of the low educated group to the group with an intermediate level of education). However, the analysis of the data showed the complete distributions of these rate ratios tend to be graded with few exceptions.

Table 1
Death Rates (per 1,000 population) and Mortality Ratios by educational attainment, age groups and sex. Argentina. 2010

Sex and Age	Population	Deaths	Total	Years of school completed					
				Deaths per 1,000 population			Mortality Ratio		
				Less than 8 years	8 to 12 years of education	13 years of education or more	Less than 8 years	8 to 12 years of education	13 years of education or more
Male	9,154,273	46,872	5.1	8.2	3.5	1.7	4.8	2.1	1.0
25-29	1,542,414	2,432	1.6	3.4	1.2	0.5	7.6	2.6	1.0
30-34	1,523,234	2,413	1.6	2.4	1.3	0.6	4.2	2.3	1.0
35-39	1,297,569	2,582	2.0	3.1	1.5	0.7	4.5	2.2	1.0
40-44	1,180,645	3,191	2.7	3.9	2.3	0.9	4.4	2.6	1.0
45-49	1,005,734	4,554	4.5	6.8	3.4	1.6	4.3	2.2	1.0
50-54	1,013,357	7,057	7.0	8.9	6.1	2.7	3.4	2.3	1.0
55-59	863,230	10,624	12.3	16.3	9.7	4.8	3.4	2.0	1.0
60-64	728,090	14,019	19.3	23.0	16.4	8.3	2.8	2.0	1.0
Female	9,683,510	26,805	2.8	4.6	2.1	1.0	4.7	2.2	1.0
25-29	1,570,933	995	0.6	1.6	0.5	0.2	7.5	2.3	1.0
30-34	1,582,914	1,273	0.8	1.3	0.7	0.3	4.1	2.3	1.0
35-39	1,348,409	1,507	1.1	1.7	1.0	0.5	3.6	2.1	1.0
40-44	1,246,204	1,965	1.6	2.3	1.5	0.6	3.7	2.4	1.0
45-49	1,061,582	2,958	2.8	4.2	2.5	1.1	3.7	2.2	1.0
50-54	1,095,770	4,205	3.8	5.0	3.4	1.8	2.8	1.9	1.0
55-59	933,434	5,968	6.4	8.8	5.1	2.8	3.2	1.9	1.0
60-64	844,264	7,934	9.4	11.3	7.6	4.7	2.4	1.6	1.0

Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

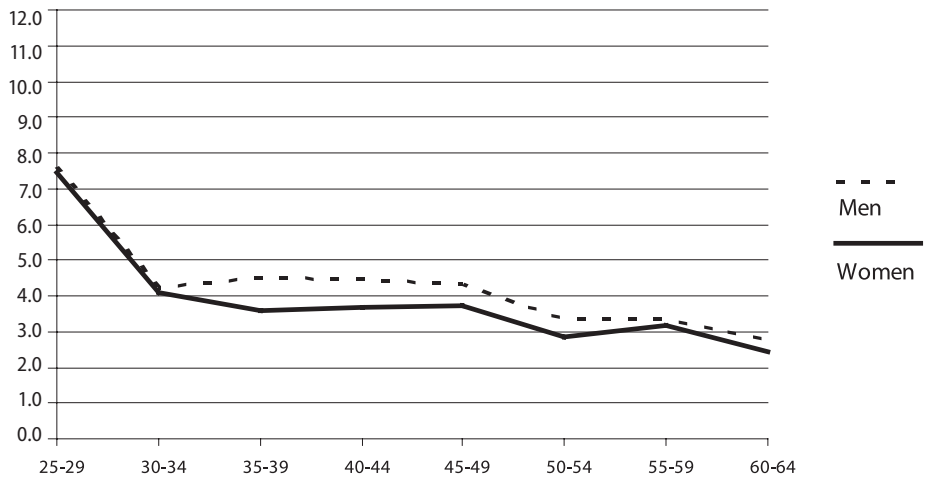
information, the working hypothesis about an age-based pattern is formulated founded on the findings of previous research in other countries. This hypothesis suggests that mortality inequalities by education will be smaller among older adults than among younger adults.

Graph 1 displays mortality ratios comparing the groups with less than 8 years of education to the groups with 13 years or more of education, based on data from Argentina for the year 2010. This indicator expresses the ratio of the mortality rate for the low educated group divided by the death rate of the high educated group; it can be interpreted as a proxy of educational inequality in death. Age groups are presented on the *x*-axis and the mortality ratios between the lowest and highest educational groups are presented on

the *y*-axis. The solid line represents the mortality ratios for women while the dotted line represents the mortality ratios for men.

Graph 1 shows a generally declining pattern of mortality inequalities by education as age ascends. The younger group has much higher mortality ratios than the other age groups. This is true for both sexes. The mortality ratio between the women with lowest education and the women with highest education is more than 7 for the youngest age group. This mortality ratio is reduced to approximately 2 for the older adults.[5] Similarly, the younger adult men with low education have 7.6 times the rate of dying than their peers with high education. For the older men, this mortality ratio is reduced to about three.

Graph 1
Mortality Ratios by educational attainment among adult population, by age group and sex. Argentina. 2010



Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

In addition to the generally smaller mortality ratios among older adults, there are some peculiarities in the age-based patterns. For example, the educational inequalities exhibit a decline for women up to the 35-39 age group; at that point, the mortality ratio between the less educated and the more educated women is equal to 4.5. The dotted line for men also shows a declining ratio up to the 30-34 age group, after which the ratio remains stable for the 35-39, 40-44, and 45-49 groups at about 4.5. At age group 50-54, there are important declines in educational inequalities in death for both men and women. Seemingly, it is in this age group where the force of mortality begins to have an

5 As mentioned by other authors, because the mortality rates are high in older adults, "even small mortality differences by educational attainment in older adulthood are meaningful because of the heavy of concentration of deaths in older ages" (Hummer and Hernández, 2013: 5).

important impact: less educated men and women have 2.5 times the chance of dying than their more educated pairs. In the older age groups analyzed, we find the smallest educational inequalities, in concordance with the first corollary hypothesis. Nonetheless, less educated men and women in the oldest age groups still exhibit between 2 and 3 times the rate of death compared to their high educated peers; thus, there are very wide educational inequalities in every age group between 25 and 64.

Educational differentials in mortality by sex

The data from Table 1 also shows that educational inequalities in death are larger for men than for women. This pattern is in agreement with what was expected and differs with what has been found by Grushka (1995),[6] who found a significant association between mortality and socioeconomic factors in Argentina but only for women and not for men.

At almost every age group, men are characterized by larger educational inequalities in death than women. Among younger adults, where the educational inequalities in death are the highest, the differences between genders are very small. It is at the 35-39 age group where these differences increase in a significant way: the mortality ratio for men is 4.5, while the mortality ratio for women is 3.6. The smaller educational inequalities in death in the oldest age groups are accompanied by a decline in the gender differences in educational inequalities as well. Overall, though, it is clear that low educated men in Argentina are characterized by the highest death rates during adulthood –rates that are generally 3 to 5 times higher than highly educated men-. Low educated Argentinean women are also characterized by very high mortality relative to high educated women, with the ratios generally in the 2 to 5 range.

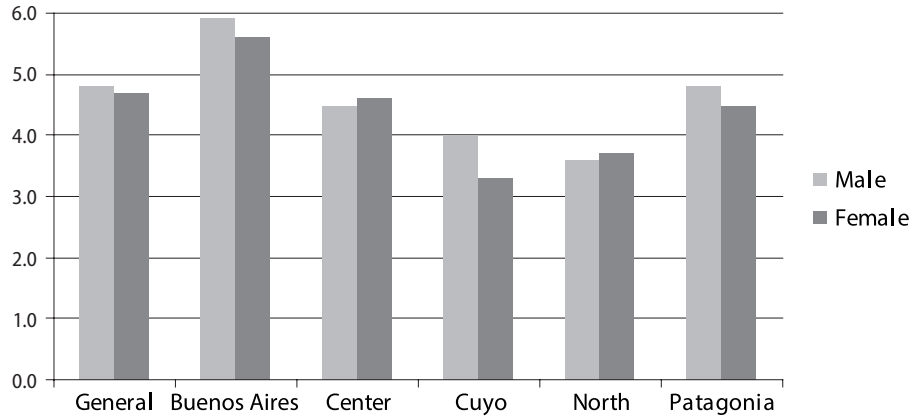
Educational differentials in mortality by region

Graph 2 presents the adult mortality rate ratios for educational attainment by sex for each region. These ratios are based on data for all adult ages 25-64.

First, it is important to note that every region is characterized by wide educational differences in adult mortality; the ratios comparing the lowest educated individuals with

6 It has to be considered that Grushka used extended indicators of socioeconomic status, not focusing exclusively on educational attainment, and with data from 1980 to 1991. Furthermore, there are also two main points that limits the reach of this apparent contradictory finding. First, a history analysis showed that there is an inversion in the patterns in the year 2001. Up to this year, the educational inequalities in death were larger for women than for women (Manzelli, 2014). Second, using exclusively educational attainment as the key variable differs theoretically to using a set of socioeconomic indicators. In this sense, the theory of resource substation, which sustains that education benefits health most among people with fewer alternative resources (Mirowsky and Ross, 2003; Ross, Masters *et al*., 2012). When applied to gender, "the resource substitution and human capital perspectives imply that education may be more important to women's health than to men's for the very reason that women have fewer socioeconomic resources of other kinds, such as power, authority, earnings, household income, and wealth" (Ross, Masters *et al.,* 2012: 1160). In this sense, the generally increasing educational levels in Argentina across time could have a higher beneficial impact among women, who were in a more disadvantaged situation.

Graph 2
Mortality Ratios by educational attainment among the adult population, by sex and region. Argentina. 2010



Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

the highest educated individuals are in the 3 to 6 range. Second, it can also be observed that the Buenos Aires, Center and Patagonia regions display the higher educational inequalities in death. In the case of the Buenos Aires Region, the adult male population with low education level has almost six times the rate of death than the adult male population with a high education level. For the female population of this region, the mortality ratios are slightly lower than the male population, but higher than the male and female populations in the other regions.

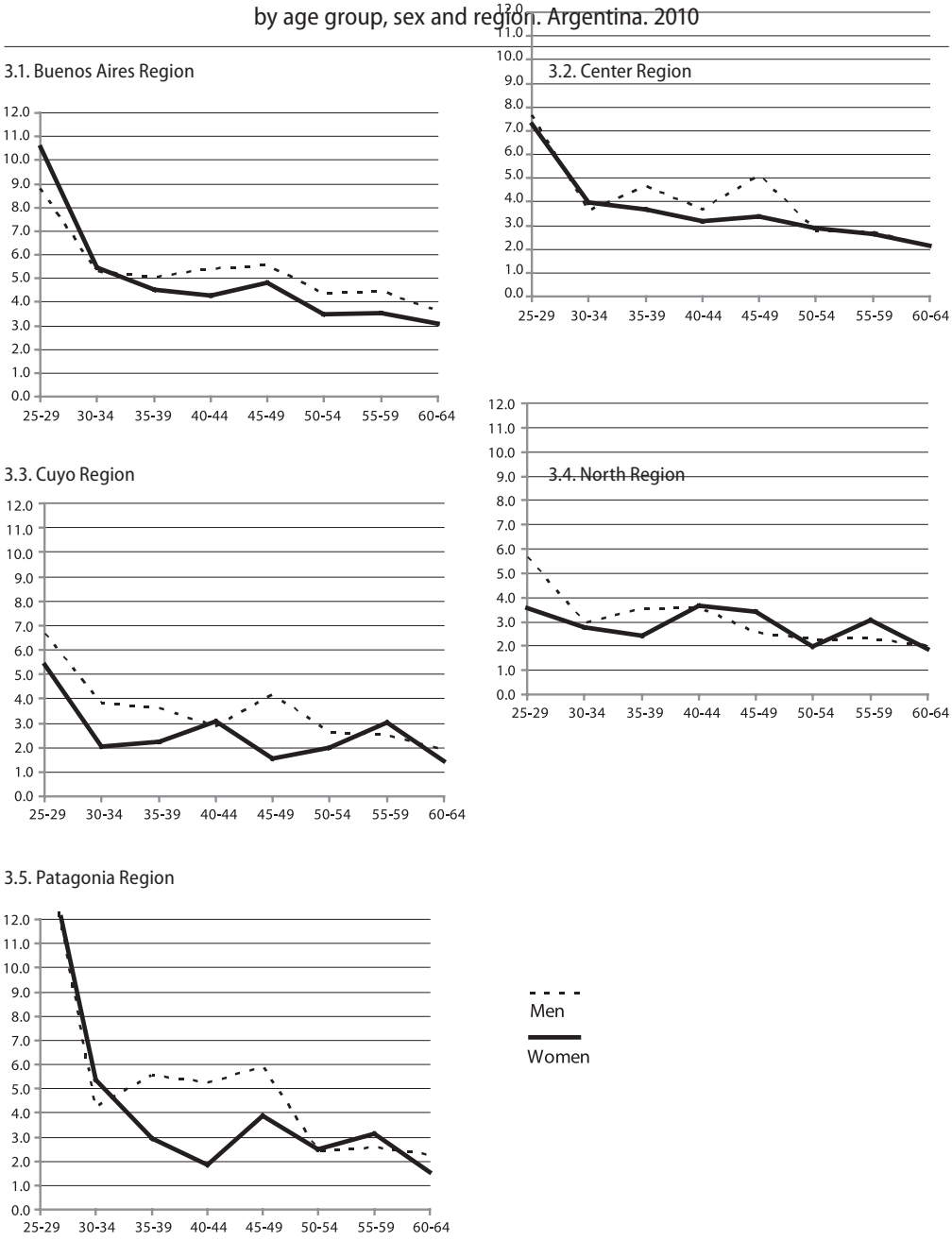
Beyond the Buenos Aires Region, the next largest ratios are in the Patagonia and Center regions, each with a mortality ratio by educational attainment that is higher than 4 for both sexes. The North and Cuyo regions present smaller mortality ratios by educational attainment, each of which is lower than 4.0. Nonetheless, these are still very wide mortality differences by educational attainment.

Graph 2 also shows that the Cuyo Region is characterized by larger gender differences in educational inequalities in mortality, and that the Center and North regions show a particularity: the female population has similar educational inequalities in death than the male population. However, this last finding requires a deeper analysis that considers the specificities by age.

Graph 3 presents the mortality ratios for educational attainment, by sex and age, for the five regions. All of the regions exhibit higher educational differences in mortality at the youngest ages, a decline in these mortality ratios as age increases, and generally stronger educational inequalities in death for men than for women. However, there are two unique patterns across regions. First, the patterns in the Buenos Aires Region and Center Region exhibit great inequality at the young ages and, considering their population weights in the country, they largely determine the national shape presented in Graph 1.

The Patagonia Region also presents extreme mortality differentials by education among young adults.

Graph 3
Mortality Ratios by educational attainment among adult population, by age group, sex and region. Argentina. 2010



Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

There are other particularities in this group of regions that merit special attention. Contrary to what was found in the other regions, in Buenos Aires the female population at 25-29 years presents higher mortality ratios than the male population (10.7 and 9.6, respectively). This relation quickly reverses in the next age group (30-34), taking the traditional form where educational inequalities in death are stronger in the male population than in the female population. The Center Region also does not show a gender difference in educational inequalities in death in the first age group but, similar to Buenos Aires, larger gender differences are found in the intermediate age groups (35-39, 40-44, 45-49).

Patagonia presents very high mortality ratios for the first age group for both men and women, even though we have to approach this finding with caution because it could be a data artifact given the small population and small number of deaths for specific age groups in this region (see Table 6 in the Annex). There are other strange patterns in this region: the cross-over in the 30-34 age group, the contrasting pattern of ascending differences for men and descending differences for women in the 35-39 and 40-44 age groups, and the cross-over in the 55-59 age group. The limitations of the available data do not allow us to go deeper in these issues. Again, though, this region has only a small number of deaths in some age groups.

The Cuyo Region and North Region show a different pattern characterized by lower educational inequalities in death across all age groups. Although the youngest age groups are characterized by the largest mortality ratios (roughly 6.0 in both regions), the declining pattern with age is not as pronounced as it is in the other three regions.

Conclusions

This paper addressed two basic questions on the study of inequality and mortality: How are overall adult mortality patterns in Argentina differentiated by education level?; Does the association between education and adult mortality vary by age group, gender and region as has been found in other countries?

In the first part of this paper we described the specific demographic background in a context of high socioeconomic inequalities that make Latin America countries and Argentina, in particular, interesting settings for studying inequalities in mortality. The literature review on adult mortality in Latin America showed that this specific issue has been largely neglected. However, the scarcity of studies analyzing socioeconomic differentials and the incipient group of studies trying to overcome data limitations with new data sources show that a strong inverse association exists between adult mortality and socioeconomic factors. Hypotheses based on previous research, largely from other countries, were developed to guide the analysis.

The first hypothesis focused on the inverse relationship between educational attainment and overall adult mortality. The analysis for this hypothesis was based on death rates and mortality ratios by educational attainment. We found a clear gradient in the specific mortality rates according to educational group, for both sexes and for all age groups. The existence and direction of this relationship was as expected; however, the

magnitude of educational differences was much higher than what has been found in other countries. It is clear, then, that educational attainment very strongly differentiates mortality rates among Argentinean adults.

Several corollary hypotheses were formed around the second general hypothesis of this dissertation. These corollary hypotheses guided the analysis of educational differences in mortality specific to gender, age group, and region among adults in Argentina. Again, we used age-specific mortality rates and rate ratios by educational attainment to examine these patterns.

The first corollary hypothesis regarding age differences was confirmed; the data exhibited a clear declining trend in mortality inequalities by education as age increased. In particular, the younger age groups had much higher mortality ratios than the older age groups.

We had also found evidence consistent with our second corollary hypothesis. Educational inequalities in death are stronger for men than for women. However, there were some exceptions to this overall pattern in some age groups. In general, though, gender differences in educational gradients in mortality were larger at younger ages when educational inequalities are the highest and smaller at older ages when educational inequalities are smaller. Clearly, young low educated men appear to exhibit the highest relative mortality disadvantages in Argentina.

Our third corollary hypothesis expected to find larger educational inequalities in mortality in regions with lower educational levels (North and Cuyo) than in regions with higher educational levels (Buenos Aires, Center and Patagonia). However, the data indicated exactly the opposite. Instead, North Region and Cuyo Region exhibited the smallest educational inequalities in death. On the other hand, the Buenos Aires, Center and Patagonia regions presented very high mortality ratios between the lowest and highest educational groups.

This paper answered relevant key unanswered questions in Argentina; however, the research was also hampered by data limitations. I used Multiple Imputation as an advanced technique for overcoming important data limitations, such as the 30% of death certificates that did not contain any information on educational attainment. However, Multiple Imputation cannot substitute for high quality data. Another important data limitation is the lack of available variables to explain why there are such large educational differences in mortality in Argentina. Focusing on the mortality files, besides the problems with the education variable, there is a lack of information on other socioeconomic variables such as employment status, occupation or nationality. Moreover, the analysis of underlying cause of death while also taking in account the other contributing causes of death is not possible in Argentina because public data on mortality files do not include this information.

Besides its scientific value, this analysis should also serve as an incentive toward improving socioeconomic data on death certificates, both in Argentina as well as across

Latin America. An improvement of information on death certificates is required not only for testing classic hypotheses regarding social inequalities in mortality, but also to formulate new hypotheses and to answer more in-depth research questions on this issue.

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Annex

Table 2
Death Rates (per 1,000 population) and Mortality Ratios by educational attainment, age groups and sex. Buenos Aires Region. Argentina. 2010

Sex and age	Population	Deaths	Total	Years of school completed					
				Deaths per 1,000 population			Mortality Ratio		
				Less than 8 years	8 to 12 years of education	13 years of education or more	Less than 8 years	8 to 12 years of education	13 years of education or more
Male	4,337,024	22,073	5.1	8.9	3.3	1.5	5.9	2.2	1.0
25-29	713,317	1,070	1.5	4.0	1.0	0.4	8.8	2.3	1.0
30-34	719,397	1,111	1.5	2.5	1.2	0.5	5.3	2.6	1.0
35-39	612,819	1,258	2.1	3.5	1.5	0.7	5.1	2.1	1.0
40-44	561,610	1,579	2.8	4.4	2.2	0.8	5.4	2.7	1.0
45-49	478,409	2,046	4.3	7.0	3.1	1.3	5.6	2.4	1.0
50-54	482,073	3,302	6.8	9.7	5.6	2.2	4.4	2.5	1.0
55-59	410,654	4,982	12.1	18.0	8.7	4.0	4.5	2.2	1.0
60-64	358,745	6,725	18.7	24.7	14.1	6.9	3.6	2.1	1.0
Female	4,637,784	12,965	2.8	5.1	2.0	0.9	5.6	2.2	1.0
25-29	724,959	458	0.6	2.1	0.5	0.2	10.5	2.4	1.0
30-34	746,939	582	0.8	1.4	0.7	0.3	5.5	2.8	1.0
35-39	636,281	738	1.2	2.0	1.0	0.5	4.5	2.2	1.0
40-44	598,423	944	1.6	2.5	1.4	0.6	4.3	2.3	1.0
45-49	509,768	1,403	2.8	4.5	2.3	0.9	4.8	2.5	1.0
50-54	535,377	2,042	3.8	5.6	2.9	1.6	3.5	1.8	1.0
55-59	456,061	2,855	6.3	9.4	4.6	2.7	3.5	1.7	1.0
60-64	429,976	3,943	9.2	11.9	6.8	3.9	3.1	1.8	1.0

Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

Table 3
Death Rates (per 1,000 population) and Mortality Ratios by educational attainment, age groups and sex. Central Region, Argentina. 2010

Sex and age	Population	Deaths	Total	Years of school completed					
				Deaths per 1,000 population			Mortality Ratio		
				Less than 8 years	8 to 12 years of education	13 years of education or more	Less than 8 years	8 to 12 years of education	13 years of education or more
Male	1,785,269	9,287	5.2	8.1	3.9	1.8	4.5	2.1	1.0
25-29	302,254	419	1.4	3.0	1.1	0.4	7.6	2.8	1.0
30-34	290,860	435	1.5	2.2	1.3	0.6	3.6	2.2	1.0
35-39	247,770	450	1.8	2.9	1.5	0.6	4.7	2.5	1.0
40-44	228,783	568	2.5	3.4	2.3	0.9	3.7	2.5	1.0
45-49	194,890	908	4.7	6.8	4.0	1.3	5.1	3.1	1.0
50-54	200,425	1,378	6.9	8.6	6.0	3.1	2.8	1.9	1.0
55-59	170,733	2,122	12.4	15.9	10.2	5.8	2.7	1.8	1.0
60-64	149,554	3,007	20.1	22.6	18.8	10.7	2.1	1.8	1.0
Female	1,879,747	4,906	2.6	4.3	2.2	0.9	4.6	2.3	1.0
25-29	304,597	158	0.5	1.3	0.5	0.2	7.3	3.1	1.0
30-34	299,922	192	0.6	1.1	0.6	0.3	4.0	2.3	1.0
35-39	255,490	229	0.9	1.4	0.9	0.4	3.7	2.3	1.0
40-44	240,048	333	1.4	1.9	1.4	0.6	3.2	2.4	1.0
45-49	204,486	571	2.8	4.1	2.6	1.2	3.4	2.2	1.0
50-54	216,046	768	3.6	4.3	3.9	1.5	2.9	2.7	1.0
55-59	184,039	1,142	6.2	8.3	5.1	3.2	2.6	1.6	1.0
60-64	175,119	1,513	8.6	10.0	7.7	4.7	2.1	1.7	1.0

Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

Table 4
Death Rates (per 1,000 population) and Mortality Ratios by educational attainment, age groups and sex. Cuyo Region, Argentina. 2010

Sex and age	Population	Deaths	Total	Years of school completed					
				Deaths per 1,000 population			Mortality Ratio		
				Less than 8 years	8 to 12 years of education	13 years of education or more	Less than 8 years	8 to 12 years of education	13 years of education or more
Male	707,848	3,224	4.6	7.0	3.2	1.8	4.0	1.8	1.0
25-29	121,219	171	1.4	2.9	1.1	0.4	6.6	2.4	1.0
30-34	118,960	175	1.5	2.4	1.0	0.6	3.8	1.7	1.0
35-39	101,336	166	1.6	2.5	1.3	0.7	3.6	1.9	1.0
40-44	89,253	165	1.8	2.5	1.6	0.9	2.9	1.8	1.0
45-49	76,031	286	3.8	5.9	2.5	1.4	4.2	1.8	1.0
50-54	77,621	470	6.1	7.1	6.0	2.7	2.6	2.2	1.0
55-59	66,122	781	11.8	14.8	9.6	5.9	2.5	1.6	1.0
60-64	57,306	1,010	17.6	19.8	15.6	10.3	1.9	1.5	1.0
Female	749,647	2,001	2.7	4.1	2.1	1.2	3.3	1.7	1.0
25-29	122,417	67	0.5	1.3	0.4	0.2	5.4	1.8	1.0
30-34	123,686	92	0.7	1.1	0.6	0.5	2.1	1.2	1.0
35-39	105,362	110	1.0	1.4	1.0	0.6	2.2	1.6	1.0
40-44	94,876	131	1.4	1.8	1.6	0.6	3.1	2.7	1.0
45-49	80,821	213	2.6	3.1	2.6	2.0	1.6	1.3	1.0
50-54	84,682	306	3.6	4.3	3.4	2.2	2.0	1.5	1.0
55-59	72,137	460	6.4	8.4	5.3	2.8	3.0	1.9	1.0
60-64	65,666	622	9.5	10.4	8.1	7.3	1.4	1.1	1.0

Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

Table 5
Death Rates (per 1,000 population) and Mortality Ratios by educational attainment, age groups and sex. North Region, Argentina. 2010

Sex and age	Population	Deaths	Total	Years of school completed					
				Deaths per 1,000 population			Mortality Ratio		
				Less than 8 years	8 to 12 years of education	13 years of education or more	Less than 8 years	8 to 12 years of education	13 years of education or more
Male	1,740,233	9,278	5.3	7.2	4.1	2.0	3.6	2.1	1.0
25-29	306,015	571	1.9	2.9	1.7	0.5	5.7	3.3	1.0
30-34	293,279	518	1.8	2.2	1.6	0.7	3.0	2.2	1.0
35-39	249,830	516	2.1	2.7	1.9	0.8	3.5	2.5	1.0
40-44	223,741	642	2.9	3.6	2.7	1.0	3.6	2.7	1.0
45-49	190,594	968	5.1	6.5	4.0	2.5	2.6	1.6	1.0
50-54	191,102	1,438	7.5	8.2	7.8	3.6	2.3	2.2	1.0
55-59	162,790	2,129	13.1	14.8	11.8	6.4	2.3	1.8	1.0
60-64	122,882	2,496	20.3	21.4	21.0	10.6	2.0	2.0	1.0
Female	1,831,026	5,459	3.0	4.1	2.5	1.1	3.7	2.2	1.0
25-29	321,091	250	0.8	1.3	0.7	0.4	3.6	1.8	1.0
30-34	311,385	318	1.0	1.3	1.0	0.5	2.8	2.0	1.0
35-39	265,254	327	1.2	1.6	1.1	0.7	2.4	1.7	1.0
40-44	234,670	436	1.9	2.4	2.0	0.6	3.7	3.1	1.0
45-49	199,904	615	3.1	4.1	2.8	1.2	3.5	2.4	1.0
50-54	197,906	849	4.3	4.8	4.4	2.4	2.0	1.8	1.0
55-59	168,586	1,202	7.1	8.4	7.2	2.7	3.1	2.6	1.0
60-64	132,230	1,462	11.1	11.9	11.0	6.4	1.9	1.7	1.0

Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.

Table 6
Death Rates (per 1,000 population) and Mortality Ratios by educational attainment, age groups and sex. Patagonia Region, Argentina. 2010

Sex and age	Population	Deaths	Total	Years of school completed					
				Deaths per 1,000 population			Mortality Ratio		
				Less than 8 years	8 to 12 years of education	13 years of education or more	Less than 8 years	8 to 12 years of education	13 years of education or more
Male	583,899	2,578	4.4	7.1	3.1	1.5	4.8	2.1	1.0
25-29	99,609	158	1.6	3.9	1.1	0.2	16.4	4.5	1.0
30-34	100,738	138	1.4	2.3	1.0	0.5	4.3	1.9	1.0
35-39	85,814	152	1.8	3.2	1.2	0.6	5.6	2.1	1.0
40-44	77,257	188	2.4	3.8	1.7	0.7	5.3	2.4	1.0
45-49	65,811	274	4.2	6.4	3.0	1.1	5.9	2.7	1.0
50-54	62,136	410	6.6	7.9	6.0	3.2	2.4	1.9	1.0
55-59	52,931	548	10.4	12.2	10.0	4.8	2.6	2.1	1.0
60-64	39,603	710	17.9	19.3	18.9	8.5	2.3	2.2	1.0
Female	585,306	1,370	2.3	3.9	1.8	0.9	4.5	2.1	1.0
25-29	97,869	54	0.6	2.0	0.4	0.1	16.2	3.1	1.0
30-34	100,982	80	0.8	1.4	0.7	0.3	5.3	2.5	1.0
35-39	86,022	95	1.1	1.4	1.3	0.5	2.9	2.8	1.0
40-44	78,187	110	1.4	1.6	1.6	0.9	1.9	1.8	1.0
45-49	66,603	146	2.2	3.1	2.2	0.8	3.9	2.8	1.0
50-54	61,760	227	3.7	4.2	4.1	1.7	2.5	2.4	1.0
55-59	52,610	286	5.4	7.1	4.7	2.3	3.1	2.1	1.0
60-64	41,273	372	9.0	10.5	6.1	6.7	1.6	0.9	1.0

Sources: Elaborated by the author based upon Argentine National Census 2010 and Argentine Mortality Files-Vital Statistic 2010.