

Intergenerational Influences and Migration:  
Rurality and Adolescent Fertility in Lujan, Argentina

by

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Thesis submitted in partial fulfillment of  
the requirements for the degree of  
Master of Science in the Duke Global Health Institute  
in the Graduate School  
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ABSTRACT

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## **Abstract**

This cross sectional study explores migration, intergenerational influences and social isolation as determinants of early pregnancy in Lujan's rural communities, which are home to generations of migrants from neighboring nations and northern provinces. Results suggest that, even when controlling for socioeconomics, migrant families and individuals experience higher levels of social isolation than their native-born neighbors; that migrant females are more likely to have a pregnancy before the age of 17; and that although first-generation born females (daughter of at least one migrant parent) have a lower average of age at first pregnancy, first-generation born females show a stronger trend of delaying first pregnancy than native-born and migrant females, diverging from the fertility norms of their parents' place of origin, and adopting the fertility norms of Lujan.

Addressing both migrant health and adolescent health can be challenging in low-resource settings. However, as the results of this study show, addressing the determinants of social isolation, which is significantly associated with high levels of adolescent fertility and adverse health outcomes, may be as simple as extending opportunities to engage in extracurricular activities, and strengthening social networks.

A small cohort of 119 women and girls were surveyed, and a total of 26 different places of origin were represented, including many of Argentina's Northern provinces

and neighboring countries. This cross-sectional study was guided by the two following hypotheses:

- 1) First-generation born daughters and migrants have higher odds of having an early first pregnancy than their native-born counterparts.
- 2) First-generation born daughters will show a higher degree of divergence in age at first pregnancy from their mothers than native-born and migrant daughters, exhibiting successful fertility assimilation.

Hypothesis one, tested using multivariate logistic regression models, was partially supported by the results. Through mechanisms unique to migration, such as the distinct implications that rurality and social isolation have on migrant communities, migrants have higher odds of having an early first pregnancy than their native-born counterparts. Results for first-generation born (daughters of at least one migrant), although not statistically significant, do suggest that they as well have higher odds of having an early first pregnancy than their native-born counterparts.

Hypothesis two, tested using modified difference in differences models, was supported by the results of this study. Overall, first-generation born show a higher degree of divergence in age at first pregnancy from their mothers than native-born and migrants. First generation are having their first pregnancies at an average of 1.18 years later than their mothers, where native born and migrants overall divergence is negatively directed, and insignificant. The analyses show that intergenerational

divergence in age at first pregnancy is responsive to period conditions as well as migration and/or assimilation processes. Overall, across the time periods (age cohorts), *and* migration categories, divergence suggests a slow but positive direction, where girls are starting to delay their first pregnancies. Again, this trend has the strongest degree in first generation born, suggesting successful fertility assimilation. The versatility of the data collected in this study allows for exploration of inter-generational influences and migration as both separate and inter-related mechanisms by which reproductive health outcomes are affected.

## **Dedication**

This paper is dedicated to the Department of Health of Lujan, its social workers and health personnel, whose devotion and genuine concern for the well-being of Lujan's many communities never cease to inspire and humble. I also wish to dedicate this paper to the communities of Lujan, who are filled with warm hearted, honest, and sincere men and women. This study is for you and by you. Thank you for indulging me with your life stories and experiences!

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# 1. Introduction

Early pregnancy and childbearing have considerable socio-economic implications, especially in low-resource populations, creating great barriers to the attainment of social and economic prosperity. Impediment of completion of a secondary education, participation in the labor market, and receiving of professional or specified training are of primary concern, ultimately hindering a woman's ability to create opportunities and possible life-directions other than motherhood, reinforcing traditional gender roles.

Both international and internal migration, stimulated by economic necessity or aspired upward mobility, can further aggravate the circumstances in which a young mother lives, as women often move into situations of social and cultural marginalization that can negatively affect their assimilation process, and in turn, create additional barriers to benefiting from public services. In terms of international immigration, the legal status of the migrant and the receiving nation's policies on immigration can further obstruct access to essential resources.

In the context of both international immigration and internal migration, other barriers exist, such as linguistic, cultural, and ethnic differences. Although adolescent pregnancy and adolescent fertility timing trends have not been extensively studied in the context of international immigration and internal migration, studies carried out in



Central America, the United States, and Europe find that migration status and belonging to an ethnic minority are associated with high rates of adolescent pregnancy when compared to the local population (Smith 2011).

The effects of migration and intergenerational influences on early first pregnancy were explored using bivariate and multivariate logistic regressions and controlling for a number of other variables that have been thematically grouped as follows: socioeconomics, rurality and social isolation, and sexual and reproductive health.

Quantitative survey tools and in-depth, qualitative interviews were used for measuring these relationships among women and girls in respect to their places of origin. For the purpose of this study, the terms “foreign-born” and “migrant” are used to describe immigrants from other countries, mainly Argentina’s neighboring countries, *and* migrants born in Argentine provinces outside the province of Buenos Aires. Participants’ places of origin were also accounted for, although only 16.81 percent of participants were born outside of the province of Buenos Aires. A list and map of all places of origin represented in this study population are included in Appendix B.

This study was originally designed to identify variations in social contours of risk and allow for analysis of social network nodes, adolescent dyadic relationships, and inter-generational connections between the participants. However, the implementation of the study proved to be challenging in the collection of the data in the intended

extended social network nodes. The high degree of social isolation and privacy being highly valued and respected, pose two big limitations in exploring variations in social contours of risk and social-network influences.

## **1.1 Historical Perspective: Migration to & within Argentina**

The preamble of Argentina's constitution, written in 1853, proudly proclaims that the national goals and priorities of justice, peace, defense, welfare and liberty, apply to "all men in the world who wish to dwell on Argentine soil," lending to the eminent notion that Argentina is a nation built on a long and dynamic history of immigration (Carron, 1979). Sixteenth-century Spanish colonization commenced a long and withstanding immigrant flow from European countries, prominently from Italy, Spain, Germany, France, and Austria (Carron, 1979). Early governments embraced and governed by the ideal that "to rule is to populate " (Albarracin, 2003), an appropriate principle considering the vast amount of fertile, workable land and a considerably small population. However, this principal also reflects the thinking of Juan Bautista Alberdi, Argentine political theorist, and Domingo F. Sarmiento, Argentine activist and the seventh president of the nation, among others, who believed that the country needed a larger European population to improve the country or to replace the "barbarian," vagrant, racially mixed Argentines (Albarracin, 2003). Essentially, preliminary policies were originally designed to attract European agricultural workers, educators,

innovators, scientists, and entrepreneurs with the objective of creating a Euro-centric, “enlightened,” culturally and technologically advanced nation in the Americas (Osolvaldo, 2003).

Argentine immigration policies have almost always favored some version of an open-door policy, varying in conservative and liberal qualities of restrictions and intended target populations, and largely shaped by the waves of prosperity and deterioration of the nation’s economy (Albarracin 2003). Classic immigration policy trends predict that in times of economic hardship, social and ethnic tensions rise, national unity and nationalist ideals are threatened, and policies regarding immigration begin to take on more conservative qualities. While Argentina’s immigration *policies* have maintained a relatively liberal standpoint, the social implications of threatened national ideals do become notably problematic.

Today, the population of Argentine nationals is comprised of an estimated 86.4% percent of European descendants, 6.5% mestizo (of mixed Spanish and Amerindian ancestry), 3.4% Amerindian, 3.3% Arab, and 0.4% other. Argentina also has a significant South American international population, the majority of which is comprised of Bolivians, Peruvians, Paraguayans, and Uruguayans. Percentage estimates of the foreign born population residing in Argentina are estimated at 4.2% (Ceriani, FIDH 5).

Additionally, internal migration *within* Argentina is very significant, with a steady, strong, labor driven migratory flow from the Northern provinces to the Southern provinces, largely to the province of Buenos Aires. The province of Buenos Aires has a Human Development Index of 0.88 compared to an average of 0.79 among the Northeastern and Northwestern provinces, and is an important internal and external migration destination (Aportes Para el Desarrollo Humano en Argentina, 2011). Migrants come in search of higher quality of life and employment opportunities, and are more likely to be phenotypically mestizo or Amerindian descent

In 2003, President Nestor Kirchner's government reformed the nation's immigration policies once again, and lifted almost all restrictions on immigration from South American countries. In addition to guaranteeing access to all public services, the new policy reform encouraged and facilitated the documentation of all immigrants, a process that has historically been ridden with corruption, bureaucratic inefficiency, delays and arbitrariness, and discrimination (Albarracin, 2003). In 2006, the government launched its plan to register all undocumented immigrants, grant them formal residency, and integrate them into the nation's economic and social system. This plan aimed to encourage immigrants to pay taxes and, in return, receive legal protection and public services. This most recent policy reform is unique in that rather than being prompted by economic necessity or external pressures, an idealistic and politically

socialist motivation inspired its characteristics and implementation. Immigration as a human right, and the notion that freedom of movement is central to South American integration, were the driving ideals behind the reform (Nardi, 2011).

Today, immigration policies remain as such, upheld by President Cristina Kirchner, wife of the former president. However, while supported and upheld on a policy level, many immigrants, primarily from the neighboring countries of Bolivia, Peru, and Paraguay, face bureaucratic and societal hindrances as they try to integrate into mainstream society. Consistent with historical trends in the relationship between immigration and economic and social tensions, immigrants of the latest wave have been blamed for the struggling economy, accused of abusing social services, compromising employment opportunities for nationals, and not contributing to society or the economy (Nardi, 2011). While “the government of Argentina has taken significant formal steps toward the elimination of racial discrimination over the last decade” (Taran, 2010), social and racial tensions persist not only against immigrants but also against indigenous populations and other racial minorities.

## 2. Background & Study Setting

Young mothers and their babies face a higher risk of neglect and abuse, social isolation, physical illness, decreased social and monetary capital, and low social mobility. Appropriately, the Department of Health of Lujan, Argentina, and el Grupo de Practica de Medicina Familiar Cooperación Ltda., a family medicine cooperative, have expressed concern over the steadily rising numbers of adolescent pregnancy in the municipality of Lujan, Argentina. Lujan is located in the province of Buenos Aires with an approximate population 106,830; 10.7% to 13.4% of which is rural to semi-rural (Municipio de Lujan, 2009). Although data collection and management methods are problematic in Lujan and in Argentina in general, the adolescent birth rate of the municipality is estimated at almost double the rate found in the capital city, the Autonomous City of Buenos Aires, 34.9 compared to 18.4, respectively (Ministerio de Salud, 2008).

Lujan provides an extremely interesting context in which to explore several different determinants of adolescent pregnancy and fertility. This relatively small municipality, located only 65 km from the nation's capital, has huge variation in socioeconomics, demographics, and levels of urbanism and rurality. Most importantly, Lujan, because of its' long and prominent history in large agriculture and dairy production, is the destination of several migration and immigration flows. On a national

level, agriculture and agro-based industry account for 57 percent of all exports, 36 percent of employment, and 18 percent of GDP (Verner, 2005).

## **2.1 Migration and Rurality**

The most recent national census on immigration in Argentina was done in 2003. According to this data, an estimated 85% of immigrants from bordering countries immigrated to the province of Buenos Aires, of which only 15% migrated to and resided in the autonomous city of Buenos Aires. The remaining 65% migrated to and resided in the greater province of Buenos Aires and in the larger Pampeana Region (Global Commission on International Migration, 2005). While dispersed rural populations have been on a steady decline since 1990, grouped rural populations have remained steady and have grown in some regions. The Pampeana Region where the province of Buenos Aires is located, for example, increased by nearly 8 percent from 1990 to 2001 (Verner 2005). The aforementioned estimates on migrant flows to the province of Buenos Aires are often referenced as driving factors in grouped rural population percentage increases. However, research shows that this increase is more likely due to the significant decrease in dispersed rural populations. Essentially, data shows that dispersed rural populations are migrating to grouped rural populations. Both theories are plausible, and the extent of their contribution to the overall grouped rural population growth must be further investigated. Nonetheless, the well being of rural populations are of concern, as “rural

public service provision is scarce in areas such as education and health care, infrastructure, and transfer programs” (Verner 2005).

## **2.2 Migration and Fertility Rates**

In 2003, Argentina reformed its national immigration policy, extending residency and access to all public services to immigrants from countries belonging to MERCOSUR, the Common Market of South America, and those of other kin states, including: Brazil, Paraguay, Uruguay, Bolivia, Chile, Peru, Venezuela, Colombia and Ecuador. Operation “Patria Grande,” or “Grand Nation,” an operation whose main objective was to regulate migration and immigration from the aforementioned nations, commenced in 2006 (Cerruitti 2009).

While the current national immigration policy grants immigrants unrestricted and unconditional access to public services, only an estimated 30% of immigrants from Argentina’s neighboring countries were enrolled in the national health insurance scheme or La Obra Social, an employee based insurance program in 2009 (Gasparini, 2009.). Similarly, due to hindered or poor assimilation of migrant families, the educational attainment of school-aged children of immigrants is 17.8% lower, on average, than Argentine nationals (Conceição Chagas, 2009).

Fertility behavior and trends provide a platform by which to explore and measure the impact of low educational attainment and access to other public services,



two widely referenced indicators of poverty and low quality of life (Gasparini, 2009). In both immigrant and non-immigrant populations, fertility trends change within and across generations as a result of changes in socioeconomics, limited upward mobility, and perceived life prospects and opportunities (Gasparini, 2009). More specifically, limited upward mobility and lack of perceived life prospects essentially diminish the opportunity costs of childbearing by reducing incentives to invest in children (Gasparini, 2009). This theory holds true most commonly within generations of women who have been socioeconomically limited. As fertility rates are often used as an indicator for the socioeconomics or quality of life of a nation, particular region of a nation, or even specific communities, timing of fertility is also indicative of these conditions, with high rates of earlier pregnancies indicating poverty (Gasparini, 2009)

### **2.3 Fertility Trends in Argentina & Latin America**

The national adolescent birth rate (births per 1,000 women ages 15-19) of Argentina range, 55, is slightly higher than the world average of 52.7 per one thousand (World Bank 2011). This rate is considered uncharacteristically high for a middle-income country, especially considering their Human Development Index score of 0.88, rated on par with the United States and Australia, 0.937 and 0.938 respectively (HDR 2013). Although this birth rate is surprisingly high, it still hides stark disparities within regions and between provinces. For example, adolescent fertility rates reach an alarming 101.1

per one thousand in the Northern Province of Chaco and 100.4 in Misiones (Bonari, 2009). These numbers are not reflected in the national averages, as they are diminished in effect when averaged nationally, with the Autonomous City of Buenos Aires, at 18.2 per one thousand. The Autonomous City of Buenos Aires is included as a separate entity from the greater province of Buenos Aires, which falls at 42.7 (Gogna, 2008). These dramatic variations in averages between provinces speak both to the harsh inequalities found in the country and to the dramatic differences found in rural and urban populations.

### **2.3.1 Immigrant & Migrant Fertility Theory**

The following three migration fertility theories guided the objectives and hypotheses of this study: *Classic assimilation*, *racial stratification* (ethnic marginalization) and *segmented assimilation*. These three theories were developed for and have been generally applied to both intra and inter-generational immigrant fertility *rates* research in the United States (Choi 2012), and rarely have been applied to fertility *timing*. However, considering the parallel and correlation between fertility rates and timing, these selected theories provide a sound framework in which to explore their relevant principals.

There are fundamental differences in the assumptions and principals proposed by each theory (Choi 2012). *Classic assimilation* contends that immigrants and migrants

enter the province of Buenos Aires (the host country, province, or community), adopt the fertility norms and practices of the host society, and “adapt fertility practices that optimize their family’s chances for socioeconomic success in the host country” (Alba and Nee 1997; Carter 2000).

*Segmented assimilation* contends that the direction and extent of immigrant assimilation depends on: (1) the amount of resources immigrants bring from the country of origin; (2) the social, economic, and political conditions in the country of origin that motivate migration; and (3) the social, economic, and political conditions they face in the destination country (Portes and Zhou 1993). This assimilation theory argues that migrants and immigrants face and experience certain downward mobility because they migrate with limited economic and social capital and, upon arriving, encounter numerous barriers and limited opportunities for upward mobility.

*Racial stratification* contends that migrants, due to racial and ethnic discrimination and marginalization, are recurrently disadvantaged (Frank and Heuveline 2005). If applied to the central issues of this study, this theory predicts that high migrant adolescent and total fertility rates will maintain as such and may increase because negative or largely uncertain prospects for intra and inter-generational mobility suppresses the opportunity costs of childbearing. Limited prospects for their children’s

upward mobility diminish the costs of childrearing by reducing incentives to invest in children (Frank and Heuveline 2005).

## 2.4 Rural & Urban Lujan

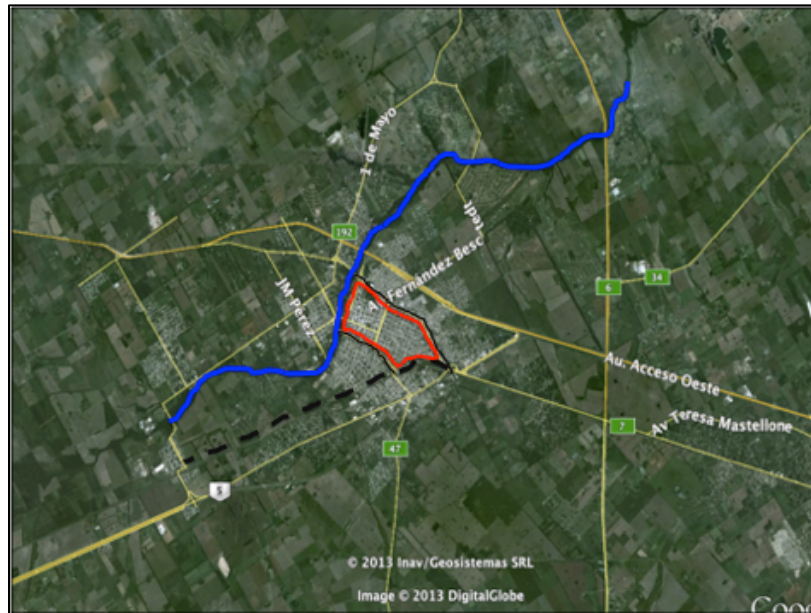
The municipality of Lujan is located in the province of Buenos Aires and is about one and a half to three hours westward by public transportation, depending on weather and traffic, from the nation's capital, the Autonomous City of Buenos Aires.

The entire municipality covers just under 800 km<sup>2</sup> and is located in the topographic region, Pampeana, or the central pampas. This climate, consisting mostly of low-lying grasslands, is generally temperate, ranging from subtropical to arid. Certain areas, including the province of Buenos Aires, are subject to severe annual flooding.



Figure 2.1 Lujan's location in the Province of Buenos Aires

The municipality's population is estimated at 106,830. Rural population estimates vary greatly, ranging from 10 to 14%. The small urban-city center where roughly 68,000 inhabitants live, constitutes only 15 km<sup>2</sup>, seven percent of the entire municipality (Municipio de Lujan, 2009). Lujan's urban center is uniquely situated and can be described as "boxed-in" by both man-made and natural boundaries (see figure 2.2).



**Figure 2.2 Lujan's "boxed-in" effect**

A large river runs down the valley and along one of the sides of the city center. Three highways and a railroad complete the city "limits." The greater municipality is comprised of six other semi-urban towns and 49 "barrios", rural to semi-rural neighborhoods, which range in levels of rurality (Municipio de Lujan, 2009).

Lujan's barrios, located outside of the "boxed-in" territory of the city-center, are characteristically very different in terms of socio-economics and demographics. Upon crossing any one of the aforementioned city boundaries, inhabitants are less likely to be phenotypically white and generally experience higher levels of poverty. However, great socio-economic variation *within* the barrios is also evident. Houses range from extremely well maintained ranches and country-homes, to makeshift shelters surrounded by unregulated landfills.

According to Verner's 2005 World Bank Report on *Rural Poverty and Labor Markets in Argentina*, 33% of the nation's rural populations experience extreme poverty, measured by unmet needs. Low connectivity to urban labor markets is identified as one of the main contributors to poverty in rural areas. For purposes of research and statistical analysis, Argentina has officially categorized rural populations as either grouped rural areas with under 2,000 inhabitants or dispersed rural areas in open countryside. Lujan's rurality is unique because of its proximity to both the city center of Lujan and its' relative close proximity to the nation's capital, one of the world's top twenty largest urban centers and the location of the nation's highest population density. Despite the perceived proximity to urbanism, Lujan's rural populations remain largely isolated and hindered in terms of their access to the labor markets and other economic and social opportunities offered by urbanism.

### **3. Methods**

Distinct geographic, socio-political, and historical and ethnic characteristics of Lujan create a unique context for research, especially as it relates to contemporary reproductive health and immigration policies.

This cross-sectional study explores migration, rurality, and intergenerational influences on timing of first pregnancy in four communities in Lujan, Argentina.

The researcher, in collaboration with *el Centro de Salud Familiar para la Obra Social* (a family medicine health center accessible to individuals and families who have employee based health insurance) and with the Secretary of Health of the Municipality of Lujan, employed a cross-sectional study with the intention of social network and inter-generational analysis to assess how adolescent dyadic relationships, peer relationships, family relationships and migratory history will influence the degree to which adolescents are exposed to pregnancy risk in terms of age at sexual debut, school attendance, history of physical, emotional/verbal, or sexual abuse or aggression, and source of reproductive health information.

#### **3.1 Objectives & Hypotheses**

##### **3.1.1 Objectives**

The objective of this study is to explore intergenerational influences of migration on timing of first pregnancy. The following themes are central in the context by which

this objective was defined: 1) Socio-economics, 2) Social isolation and rurality, and 3) intergenerational influences and reproductive health.

### **3.1.2 Hypotheses**

1. First-generation born daughters and migrants have higher odds of having an early first pregnancy than their native-born counterparts.
2. First-generation born daughters will show more divergence in age at first pregnancy from their mothers than native-born daughters<sup>1</sup>.

## **3.2 Study Design**

This cross-sectional study design utilized both quantitative and qualitative methods to obtain the desired information. The qualitative data will only be used as anecdotal input on specific relevant topics within the discussion of results.

### **3.2.1 Quantitative Survey Tools**

Four distinct survey tools were used: Survey tool AC was designed for young women that were currently pregnant at the time of the study or had had a pregnancy in their adolescence. Survey AA was designed for young women that may or may not have had a pregnancy in their adolescence or at all. Survey MAC was specifically designed

---

<sup>1</sup> Divergence, for the purposes of this study, is defined as the difference in age at first pregnancy of mother and daughter, in years and months.



for the mothers of AC participants, and asked a few qualitative questions specific to their daughters' pregnancy. These qualitative questions were Survey MA was designed for the mothers or aunts of AA participants, or for women out of the age group at risk, generally 30 years of age and older.

### 3.2.2 Survey Tool Design & Measures

The quantitative survey tool was designed to measure various risk factors of early pregnancy. The measures are themed as such: 1) *Socio-economics, assimilation and family influences* 2) *Social isolation and rurality*, and 3) *Reproductive Health Behavior*.

**Socioeconomics, assimilation, and family influences.** Measuring *socioeconomics* in this study context was challenging. In the development of the socioeconomic measure, collaborating social workers expressed concern in trying gauge monetary income. In their experiences, questions regarding income were strongly correlated with non-response and misreporting. In regard to the particular communities in question, high levels of non-response and misreporting are attributed to fluctuations in the labor market, unstable and/or informal employment and erratic compensation. The socioeconomic measure was developed in collaboration with the Department of Health of Lujan and the collaborating social workers, and is comprised of the following elements: 1) Running hot water, 2) Food security/insecurity, 3) Overcrowding, and 4) Years of education attained.

**Social isolation and rurality.** *Social Isolation and Rurality* are crucial components of this study, as the unique circumstances of Lujan's rural and semi-rural populations elicit a non-traditional relationship between the two. Social isolation is not inherent to rurality. However, the initial crude analyses for this study show significant associations and trends. Accordingly, they have been themed and measured together using Principal Components Analysis.

*Rurality* is a convoluted term, as there is no consensus in the literature about how to define or measure it. Rurality, when based on ill-defined distinctions between rural and urban, is poorly and inaccurately measured. This can be dangerous and have serious policy implications. There are several approaches to define rurality and urbanism, such as the Rural-Urban Density Typology. This typology offers an alternative classification system to the Rural-Urban Continuum Code, which has been criticized for its crude and arbitrary definitions and the blatant lack of continuousness implied in its' name. The Rural-Urban Density Typology utilizes thresholds for four variables; total number of urban residents, population density, and population of the country's largest urban area. While this typology is useful in identifying the extremes that are largely lost, masked or unquestioned using the Rural-Urban Continuum Code, it fails to identify or classify mixed communities (Waldorf, 2006).

Waldorf offers a typology, the *Index of Relative Rurality* that provides a multidimensional approach to identifying degrees of rurality and urbanism. The rurality index is made up of four dimensions of rurality: population size, population density, extent of urban area and remoteness (Waldorf, 2006). While this index is recognized as the most versatile and precise measure of rurality, it was designed for rurality in the United States. Dependence on agriculture, unpaved roads, electricity, running water and plumbing are other dimensions of rurality not included in the index, as these dimensions are no longer of concern in rural America. In the United States, dependence on agriculture accounts for a very small share of economic activities in rural areas and overall, and is therefore no longer considered a key dimension of rurality. However, dependence on agriculture, specifically in rural communities in Argentina, is common, as are unpaved roads, limited formal trash collection, limited electricity and running water, particularly running hot water (Verner 2005). Therefore, similar weighted methods were used to create a rurality index that incorporates the Argentina-specific characteristics of rural communities. The data allows for data collection on running hot water, condition of primary roads in area of residence, roads, proximity to Lujan's urban center, and municipal trash collection services.

*Social Isolation*, while not always the case, is a documented product of rural culture and conditions in Lujan. Unemployment, low levels of social engagement, not

completing secondary education and limited time spent with non-family members are indicative of high levels of social isolation (Verner 2005). The survey tool for this study allows measurement of social isolation by the following variables: Currently employed (outside of the home) and participation in social and extracurricular activities.

### **3.3 Qualitative Interview Tool**

A general interview guide was used to obtain qualitative, in-depth information in order to gain a deeper understanding of the issues at hand. The in-depth interview was completed by a total of fifteen participants, just short of 8% of the total study population. The original desired sample size was a minimum of 220, in which case roughly thirty in-depth interviews would have been conducted. However, due to severe flooding and the other limitations listed in below, the study sample achieved just over half. Accordingly, we did not feel it was necessary to interview more than twelve participants in order to gain the insight desired. The interviews were completed by women ranging from 19 to 65 years of age. Some of the interviews were recorded with a hand-held voice recorder, and others were recorded by hand into a notebook.

### **3.4 Piloting & Translation**

#### **3.4.1 Piloting**

The final drafts of all the four types of survey tools were first distributed to the community health clinics to be reviewed by the attending social workers and in some

cases, the attending nurses and/or community health workers. After minor but necessary changes, the surveys were piloted in two groups of women, each in a different community. A total of fifteen women piloted the surveys. Upon completion, each participant was asked individually if any part of the survey was unclear, confusing, or worded in a way that made the participant uncomfortable. One concern was expressed about the terminology used in the question on abortion and miscarriages. The question was rewritten and included in the final versions.

Although the surveys were created with much deliberation, collaboration and time, there were several imperfections, which in turn, limited certain analyses of the final results.

### **3.4.2 Translation**

Surveys and all accompanying documents were initially translated into Argentine Spanish by the PI, and were later revised by several collaborators who are familiar with the colloquial norms of Lujan's barrio communities. Translations were not direct in consideration of communication and colloquial norms, and varying literacy levels.

### **3.5 Coding System**

Both the surveys and interviews were coded with a coding system that maintained anonymity while still allowing the researcher to map the family or social

connections between participants. The coding system employed is described in detail in Appendix C.

### **3.6 Subject Selection**

The researcher employed a snowball sampling technique that has several stages and possible directions.

#### **3.6.1 Population, Sample, & Research Team**

Enrollment took place in four different barrios, or neighborhoods, all positioned outside of Lujan's city center, in the "boxed-out" territory described in the introduction. Since the regional migration trends of interest are largely rural to rural, the study population was intentionally sampled from four randomly selected barrios, each ranging in both rurality and proximity to the city center.

This enrollment process had several possible states and possible directions. Due to the variability between the different neighborhoods and within the groups, enrollment strategy was designed to be flexible. However, their names will remain unspecified to maintain confidentiality. The social worker of each barrio was consulted for the best enrollment strategy based on the general characteristics and tendencies of the population.

### 3.6.2 Enrollment of Participants for Survey

The enrollment process began with one adolescent female. First contact was usually be made by the social worker or attending nurse assigned to the said barrio. Each of the selected barrios has a community health center with a nurse, psychologist, social worker, community health promoter and sometimes a doctor. The social worker or nurse contacted the desired participant by phone or in person, either at the individuals' home or in the community health center. The social worker explained the process of the study, the objectives of the study and the importance of her participation. She was explained verbally her rights as a participant. It was made clear that her participation was desired and would be very helpful but that it was completely voluntary and that no negative consequences existed if she did not want to participate. The participant, as the starting point of the enrollment process, was asked to solicit her mother, her closest friends, female cousins and any other females that she spends a lot of time with. The mothers of all these women were also invited. A time and date was set for either the group of women to come to the health center, for the social worker and the researcher to go to the home, or for all to meet in another location.

In some cases, the researcher collaborated with the personnel at the health center to organize "events" at the health center, where the groups of women would be invited to come participate in a study. It was advertised that snacks and beverages would be provided and that young children were welcome to join.

Initially concerned about reluctance, attrition and lack of interest, no randomization method was used in the selection of participants. However, the researcher thoroughly explained to the social workers and nurses that a varied sample size was desired, and that potential participants should only be chosen based on age and based on the criteria that they be living in the said barrio.

As expected, in most barrios, enrollment was slow going, and was carried out throughout the entire timeline of the study. Each group of women made up a node. A *minimum* of five nodes per neighborhood was desired. Enrollment had no upper limit.

### **3.6.3 Enrollment of Participants for Interview**

Participants of the in-depth interview process were selected randomly upon completion of the survey. Desired participants were approached and informed of the interview process. For those who desired to participate, a meeting time and place was arranged. No minors (under the age of 18) were approached for participation in the interview process. The reasons for this decision are explained in the ethics section of this paper (section 3.8). At least one participant from each barrio was selected.

The research team was initially concerned that women might be reluctant to be interviewed and/or surveyed, based on the generalized perception that rural Argentine women do not feel comfortable talking about sex and their personal lives. On the



contrary, the women seemed glad to be interviewed, and many expressed a sense of relief in being able to voice their concerns in confidentiality.

### **3.7 Ethics**

The researcher's priority in the development and execution of this study was the over-all well being of the participants and their communities. The study design ensures confidentiality at all stages, and the intentions of the study were communicated directly to each and every participant.

#### **3.7.1 IRB Approval**

Approval from the Internal Review Boards of both Duke University and the Family Medicine Cooperative of the province of Buenos Aires was received before any stage of implementation commenced.

#### **3.7.2 Consent**

##### **3.7.2.1 Consent for Participation in Surveys**

All participants were verbally informed of their rights before starting the survey. Each survey took an average of 15 minutes to complete. If the participant had any difficulty in reading or writing, the PI or the social worker administered the survey in a separate area to allow for privacy. It was clearly explained that any participating minor (under the age of 18) must be accompanied by her mother or a legal guardian. A written parental consent form was signed for all participants under the age of 18.

### **3.7.2.2 Consent for Participation in Interviews**

Participants were informed that their participation was not obligatory, that the interview did not have to be recorded electronically if there was any discomfort, and that the interview process could be stopped at any time. The women who requested to have their interviews recorded by hand expressed fear that someone would be able to recognize their voices and identify them later.

At the cost of unique and valuable insight from youth within the risk period (aged 17 or younger), participants under the age of 18 were not considered eligible for participation in the in-depth interview process. This decision was made in collaboration with the PI's in-country research advisor, Dr. Fernando Copolillo, in consideration of national laws 26.061, 24417 and 26485, regarding mandatory reporting of any incidence of abuse. Even though the participant's name would not have been recorded, the nature of the interview process is intrinsically not anonymous. While the well-being of each and every participant is the main priority of the researcher and research team, it was collaboratively decided that for the researcher, as a foreigner and temporary visitor, to report incidences of violence would be inappropriate. Furthermore, the process by which reports of child and domestic abuse is addressed, is famously slow, surly out-dating the completion of the study and the departure of the PI. The delays in the process are also known to exacerbate existing tensions in the homes of the victims, as the abuser is informed of the charges against him. Until due process, no interventions or removals

of vulnerable individuals is attempted. Lastly, the attending social workers in each community are highly involved in their communities and felt confident that any existing child abuse was already documented and being addressed. Although there is no way to confirm those claims, the final decision to exclude minors was deemed the most appropriate.

### **3.7.3 Compensation**

Upon completion of the survey, the cell phone number of each participant was recorded, with no corresponding name. Within the next two to three days, a credit of \$20.00 Argentine pesos, the equivalent of \$5.00 USD, was charged to their phones. This was done in convenience stores or grocery stores, where this service is provided. The list of numbers was properly disposed of shortly thereafter. This served as a small compensation for their time.

### **3.7.4 Post-survey & Post-interview**

All participants were given a card with the contact information of the PI and encouraged to call or write with any questions or doubts that may arise. Participants were encouraged to pass on the PI's contact information to any female adolescent from the said barrio. Additionally, each participant was given a pamphlet of comprehensive information about intimate partner violence and the contact information for several local resources.

## **3.8 Statistical Analyses**

Quantitative data collected through survey was analyzed using Stata 12.1.

### **3.8.1 Hypothesis 1**

Possible confounders, predictors and effect modifiers of the relationship in question for Hypothesis 1 were identified using directed acyclic graph (Appendix D). DAGs were used to determine the minimally sufficient adjustment set. All relationships were analyzed using correlations and logistic regression where the outcome, early pregnancy, was dichotomized. Each logistic model included an age restriction, excluding all participants younger than 17 and older than 41 years of age. Those younger than 17 were excluded because they had not yet finished the risk period for the outcome (pregnancy at age 17 or younger). Those older than 41 years of age were considered outliers and therefore excluded. All results are expressed in odds ratios, OR.

#### **3.8.1.1 Outcome: Early Pregnancy**

The dependent variable, early pregnancy, was dichotomized into age at first pregnancy 17 years or younger, and 18 years or older. Those who had never had a pregnancy were included in the latter category.

After extensive exploration of the independent variables in relation to age at first pregnancy, dichotomization of the outcome proved most suitable for identifying trends. It should be noted here that the determinants of early pregnancy at age 14 or younger

might be very different. However, the small total sample size of 119 limits the significance in the variation between the two groups within early pregnancy (age 14 or younger and 15 to 17).

### **3.8.1.2 Primary Exposure: Migration**

Two dummy variables were created for the primary exposure, Migration. The two dummy variables are defined as follows: 1) The participant is foreign-born or not; 2) The participant has one or both foreign-born parents.

### **3.8.1.3 Additional exposures of interest**

**Rurality and Social Isolation.** In addition to the primary exposure of migration to the province of Buenos Aires, the effects of rurality and social isolation were analyzed. The variable for rurality and social isolation is continuous and was created using a Principal Components Analysis for the following variables: distance from home to the city center (km), paved or unpaved roadways of neighborhoods (specifically the roadway where the local health clinic is located), primary source of reproductive health education, participation in extra-curricular activity, inclusion in municipal trash collection service route, and current employment outside of the home.

As explained in the section titled, *Survey Tools and Measures* (3.2.2), these variables were chosen based on rurality index theory (Waldorf, 2006) and in conjunction with defining qualities of rurality specific to Argentina. The Principal Components

Analysis yielded two components with acceptable Eigenvalues ( $\geq 1$ ). The first component, with an eigenvalue of 1.88 and a proportion of variation of 0.3761, expressed appropriately directed relationships to the dependent variable. Next, scree plots were run on the eigenvalues to observe proportions of variation while maintaining trends. Finally, the first two components were tested to verify that their correlation was zero.

**Mother's age at first pregnancy.** This variable was dichotomized as age at first pregnancy 17 years or younger, and age at first pregnancy 18 years or older.

**Socioeconomics<sup>2</sup>** (continuous). Again, a Principal Components Analysis was used to create an index. The analysis the following variables: running hot water in the home (binary), food security (binary), overcrowding (continuous, total living in house divided by bedrooms), and approximate educational attainment in years (continuous).

### 3.8.2 Hypothesis 2

The analysis for hypothesis 2 is a multi-step process, where each step employs one or more difference in differences models. Extreme outliers were adjusted for. ANOVA analyses were run before and after adjusting for outliers to determine significance in variation between and within groups.

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<sup>2</sup> The measures used for a socioeconomics proxy were confirmed in theory and in region-specific literature. This proxy is potentially limiting in that it clearly measures the *current* socioeconomics of the participant, and not pre-pregnancy, or pre-migration.

**Step 1.** First, intergenerational divergence in age at first pregnancy was estimated by calculating the average difference between participant's age at first pregnancy and her mother's age at first pregnancy. Participants were categorized by migrant category (native born, first generation, and migrant.) The averages were then used to calculate the difference in differences using a difference in differences model. The population breakdown is as follows:

**Step 2.** Second, in consideration of the large age span of the study population (17 to 40), participants were broken up into two age cohorts: 1) 17 to 26, & 2) 27 to 40. The average difference between participant's age at first pregnancy and her mother's age at first pregnancy was calculated with this categorization, without consideration of migration category, only to be able to explore differences in time periods. The averages were then used to calculate the difference in differences using a difference in differences model.

**Step 3.** Significant variation was found between the groups in both the categorizations of *step 1* and *step 2*. Therefore, a further stratified difference in differences model was employed, where participants were categorized by both migrant category *and* age cohort.

**Step 4.** Using the two-way categories listed above, several intergenerational trends can be measured. The two age cohorts allow for calculation of intergenerational

divergence in two time periods, or age cohorts, in each migrant category and across migrant categories. Difference in differences models were employed to measure the following:

- 1) Degree and direction of change (in years) in average age at first pregnancy of *daughter* (participant) from later earlier time period (older age cohort, cohort 2) to later time period (younger age cohort, cohort 1), in each migrant category: native born, first generation and migrant.
- 2) Degree and direction of change (in years) in average divergence from mother's age at first pregnancy to daughter's age at first pregnancy from later earlier time period (older age cohort, cohort 2) to later time period (younger age cohort, cohort 1), in each migrant category: native born, first generation and migrant.



## 4. Results

### 4.1 Quantitative Results

#### 4.1.1 Description of Sample Population

For the purpose of demographic summary, participants from the sample population were categorized in several different ways, allowing for exploration within complex relationships. Description of participants is limited to only those included in final analyses. The different categorizations are as follows:

1) Early Pregnancy:

- *Early Pregnancy*: Those who had a pregnancy at age 17 or younger (n=49, 55.68%);
- *No Early Pregnancy*: Those who did not have a pregnancy at age 17 or younger (n=39, 44.32%).

2) Native-born, first generation-born and migrant:

- *Native-born*: Participant and parents BA born (n=24, 27.27%),
- *First-generation-1*: Participant born in Buenos Aires (BsAs) and at least one migrant parent (n=47, 53.41%),
- *Migrant*: participant and both parents are migrants (n=17, 19.32%).

The total study population (n=119) included women aged 13 to 67 years old (mean age= 26.26). A total of 88 participants met the age restrictions, aged 17 to 40 (mean

age=24.25). Overall, 55.68% (49) of the population a pregnancy at age 17 or younger (*Early Pregnancy*), compared to 44.32% (39) who did not have a pregnancy at 17 years of age or younger (*No Early Pregnancy*). The total mean of age at first pregnancy was 17.85 (SD= 3.06). The mean age at first pregnancy in those who had early pregnancies was 15.84 (SD=1.18), significantly lower than those who did not have early pregnancies, with a mean age at first pregnancy of 20.38 (SD=2.82).

Of all those who had an early pregnancy, 62.50% (n=40) had at least one migrant parent, compared to 37.50% (n=9), with no migrant parents. Of all participants with early pregnancies, 28.57% (n=14) are migrants. Of those who did not have early pregnancies, 62.50% (15) have no migrant parents. The mean age at first pregnancy for native-born participants (27.27%) is 19. (SD=3.84), verses first-generation (53.41%), at 17.89 (SD=2.66). Migrant participants (19.32%), mean is 16.12 (SD=2.12).

**Table 1 Population Description**

	Age at 1 <sup>st</sup> Pregnancy		No Early Pregnancy		Early Pregnancy		RSIS	SES	
	n	%	n	n	%	n	%	mean	mean
<b>Native-born</b>	24	27.27	19	15	62.50	9	37.50	-0.58	-0.55
<b>First-Generation born</b>	47	53.41	17.89	21	44.68	26	55.32	-0.05	-0.01
<b>1mig parent</b>	26	29.55	18	11	42.31	15	57.69	-0.40	-0.16
<b>2mig parent</b>	21	23.86	17.76	10	47.62	11	52.38	0.38	0.17
<b>Migrant</b>	17	19.32	16.12	3	17.65	14	82.35	0.64	0.36
<b>Total</b>	88	100%	17.85	39	44.32	49	55.68	-0.06	-0.09

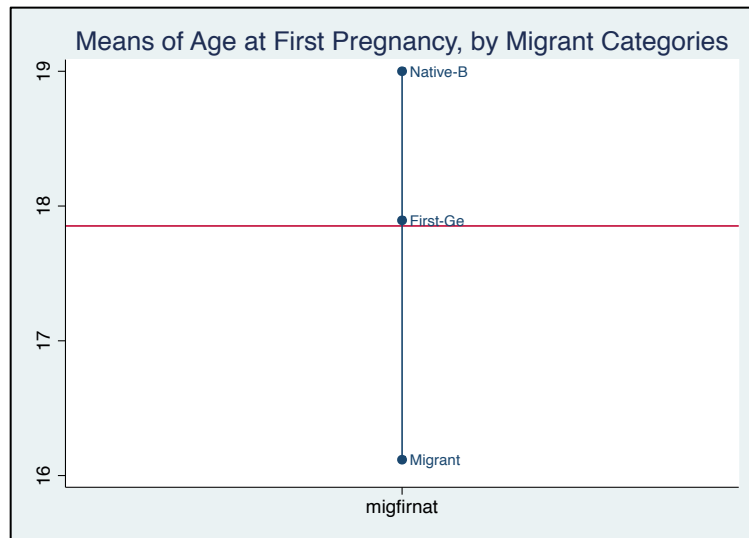


Figure 4.1 Means of Age at first pregnancy, by Migrant/First-generation/Native-born

#### 4.1.2 Rurality & Social Isolation

A one-way ANOVA t-test confirms that there is significant variation in the mean Rurality Social Isolation Score (RSIS) between women who had early pregnancies (Early Pregnancy) and women who did not have early pregnancies (No Early Pregnancy). The mean RSIS for women who did not have early pregnancies is -0.55 (SD=1.5), compared to those who did have an early pregnancy, at 0.33 (SD=1.17). The one-way ANOVA test yielded an F score of 3.74 and a Bartlett's test Chi2 (1) score of 5.8266, which rejects the null (>0.01) that there is equal variance between the two groups. Thus, we begin to see significant association between high levels of rurality and early age at first pregnancy. On a spectrum of rurality and urbanism, ranging from -4 to 2, the lower and negative

numbers are toward the “urban” side of the spectrum, where, as the rise in RSIS scores indicates higher levels of rurality and social isolation.

The four locations in which the study sample enrollment took place, vary in proximity to the city-center, quality of roadways (paved and unpaved), levels of social engagement, and access to municipal services, such as formal trash collection.

Figure 4.5 shows the density distribution of RSIS in each barrio (neighborhood). Again, a one-way ANOVA t-test was run to confirm that the variation of mean RSIS between barrios is significant. The analysis yielded an F score of 50.59 (Prob >F 0.000), and a Bartlett’s Chi2 (1) score of 11.7444m rejecting the null and confirming significant variation in rurality and social isolation between barrios. The RSIS means are as follows: -1.648 (SD=0.819), .858 (SD=0.9711), .774 (SD=0.593), & -1.027 (SD=1.073), for barrios 1 through 4, respectively (see figure 4.6).

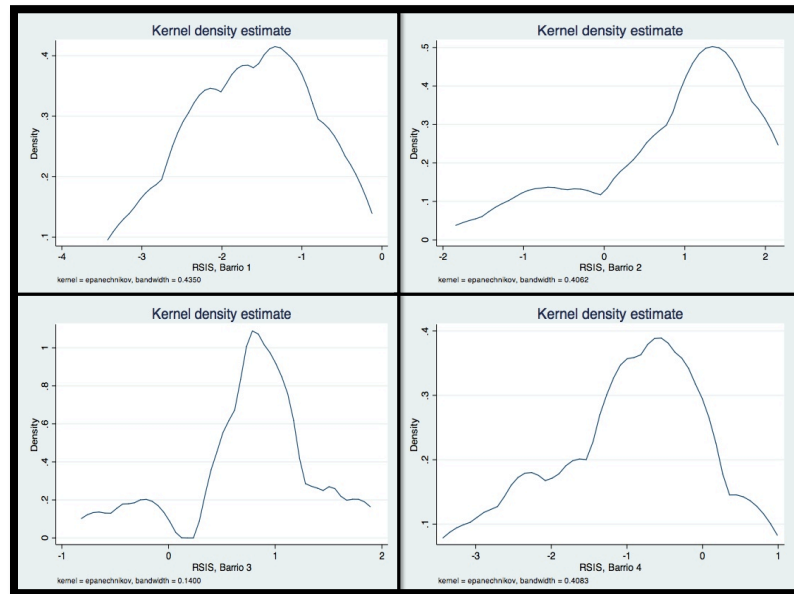


Figure 4.2 RSIS, by Barrio, 1, 2, 3 ,4

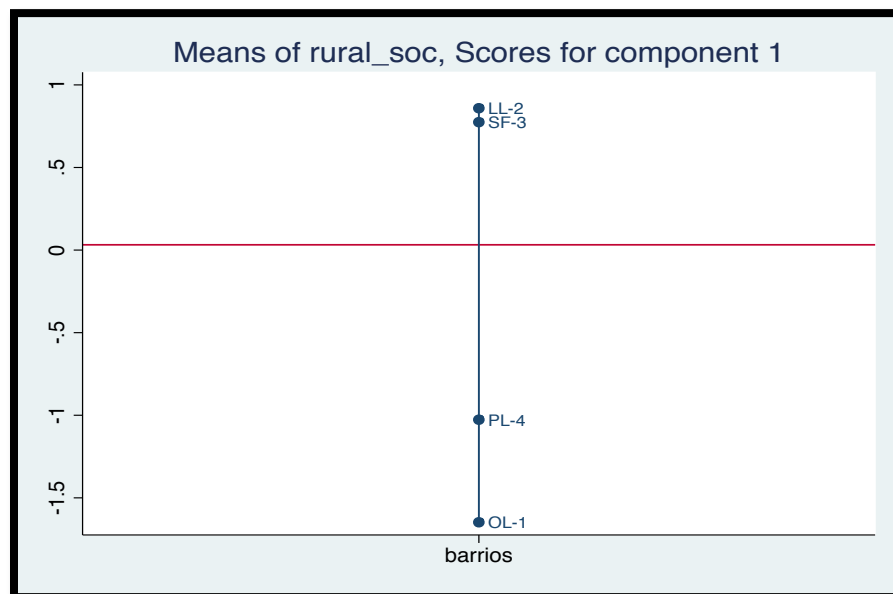
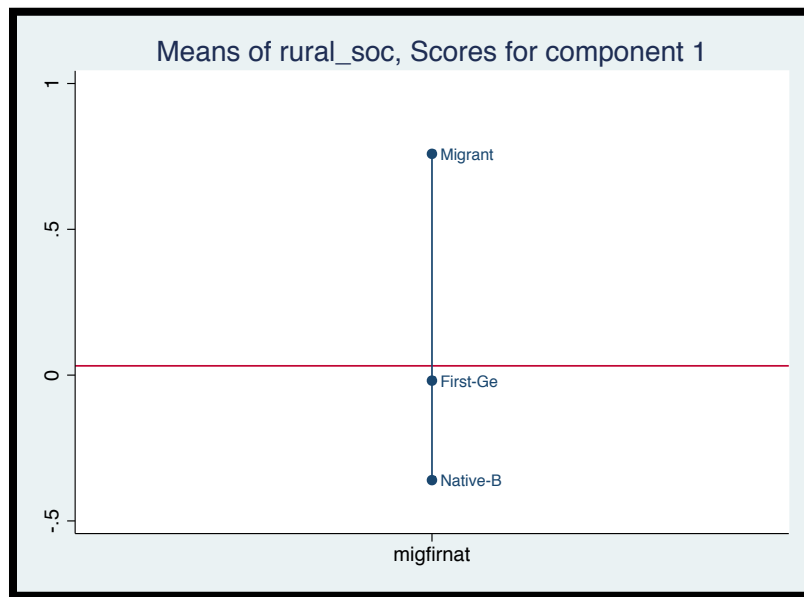


Figure 4.3 SES by barrio

Lastly, RSIS density was measured within the three categories of migrant-family (Native-born, first-generation and migrant). Again, the high F value of 3.74 shows the

variation in mean RSIS between categories to be notable. The Bartlett Chi2 Test result of 2.0237 rejects the null and confirms that variation is statistically significant. The RSIS means for native-born, first-generation born and migrants are as follows, respectively: - 0.3603 (SD=1.404), -0.190 (SD=1.321), and 0.7587 (SD=1.034) (see figure 4.7).



**Figure 4.4 Rurality and Social Isolation Score, by Migrant Category**

Further exploration shows that when stratifying the first-generation born participants by having one versus two migrant parents, the RSIS scores vary. The RSIS score for first-generation born with only one migrant parent is -0.2535 (SD=1.32), versus those who have two parents, 0.2316 (SD=1.302) (see figure 4.8). In short, the more migrant family members in each group, the higher their RSIS scores, implying that

migrants are migrating to and residing in locations with higher rurality and social isolation.

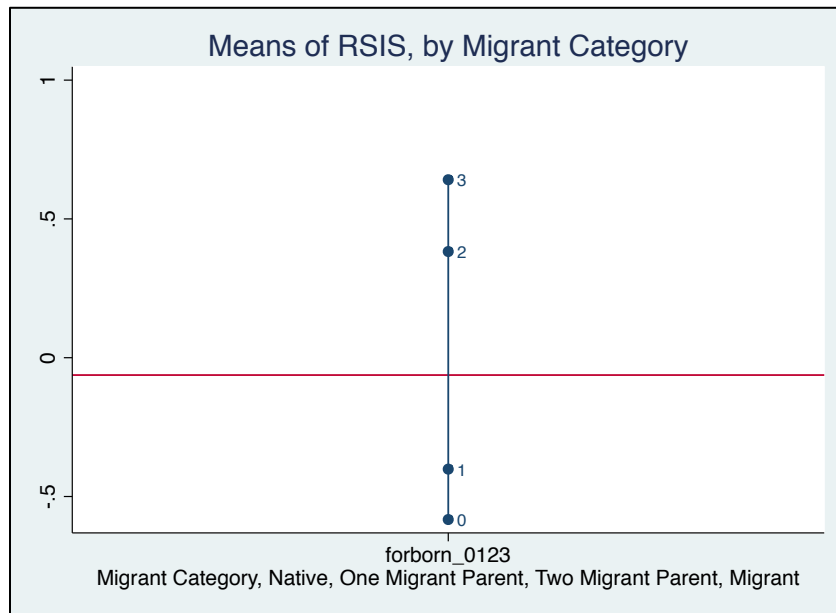


Figure 4.5 Mean of SES Score, by Migrant Category

### 4.1.3 Socioeconomics

#### 4.1.3.1 Socioeconomic Profiles

The mean socioeconomic score (SES) for the entire population is 0.00535 (SD=1.171, min -2.6044 – 3.7305) where higher numbers indicate lower socioeconomic levels. The mean SES for AFP 0 is -.43203 (SD=0.889), compared to .3941 (SD=1.26). A one-way ANOVA t-test confirms variance (F=16.73) as significant, with a Bartlett's Chi2 test score of 6.725.



SES by migrant categories (Native-born, first-generation and migrant) are as follows: -0.4214 (SD=1.04), 0.085 (SD=1.07), and 0.435 (SD=1.40).

When stratifying SES means by 4-migrant categories (0,1,2,3) to examine the difference between having one versus two migrant parents, the SES scores are as follows: -0.4214 (SD=1.04), -.1511 (SD=0.9734), .3383 (SD=1.400), & .4351 (SD=1.400), respectively. The variance is significant (F=3.68) with a Bartlett's Chi2 test of 3.4515, suggesting an upward (lower SES) linear trend with the number of migrant parents and place of birth of participant.

Mean SES by barrios 1,2,3 & 4 are as follows: -0.3756 (SD=1.088), -0.1623 (SD=0.7450), 0.0245 (SD=1.503), & 0.34988 (SD=1.165). Again, variation (F=1.71) is significant between barrios, with a Bartlett's Chi2 test score of 16.321.

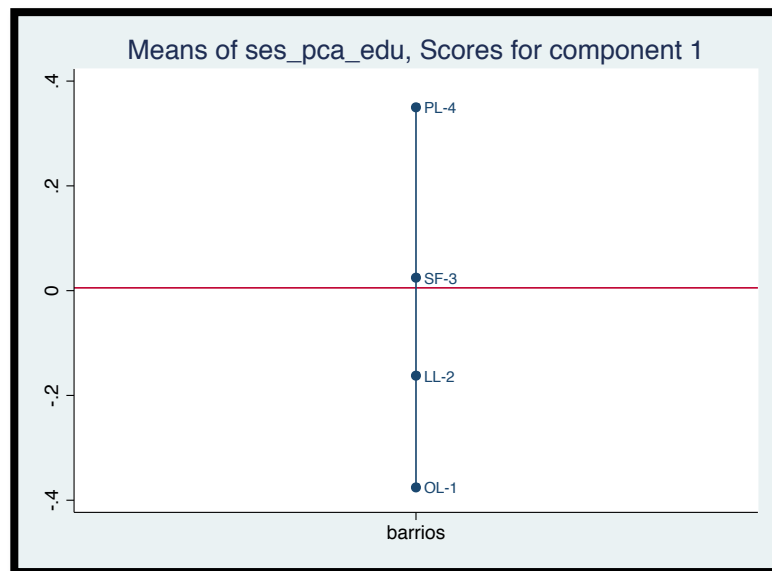


Figure 4.6 Mean SES Score, by Barrios

#### 4.1.3.2 Correlations Table of All Variables Included in Model

A correlations test was run to determine significant associations between variables.  $P < 0.05$  were used for inclusion in logistic regression models. Significant relationships were confirmed between all variables *except* for the following:

- Rurality & social isolation with socioeconomics, and mother's age at first pregnancy
- Mother's first pregnancy with rurality and social isolation

**Table 2 Correlations Table, Dependent Variable with all Independent Variables, (\*) when NOT significant chi2 value**

**Correlations Table, (\*)=NOT significant**

	Early Pregnancy	Migration	SES	Rurality & Soc. Isolation	Mother's age @ 1st pregnancy
<b>Early Pregnancy</b>	1				
<b>Chi2</b>					
<b>Migration</b>	0.3002	1			
<b>Chi2</b>	0.0045				
<b>SES</b>	0.3229	0.2525	1		
<b>Chi2</b>	0.0022	0.0176			
<b>Rurality&amp;Soc.Isolation</b>	0.2566	0.2636	0.153	1	
<b>Chi2</b>	0.0025	0.0048	0.155*		
<b>Mother's age @ 1st pregnancy</b>	-0.3601	-0.2863	-0.3445	- 0.111	1
<b>Chi2</b>	0.0006	0.0068	0.0010	0.3018*	

## 4.2 Final Models: Hypothesis 1

### 4.2.1 Early Pregnancy and Migration

All models were tested for goodness-of-fit. All had high p-values, indicating goodness-of-fit for the data. Due to the small sample size of this population (n=88), p-values of 0.1 and smaller are considered significant, with 95% confidence intervals.

#### 4.2.1.1 Crude Model

First, a univariate logistic regression is used calculate the odds ratios (OR) of having an early first pregnancy and having one or both migrant parents. The model is significant (p=0.036), and expresses a 2.78 increase in the odds of having an early

pregnancy if one or both parents are migrants (born in one of the Northern Argentine provinces or in one of Argentina's neighboring countries) ( $p=0.039$ , 95% C.I.= 1.05 – 7.32). The relatively large confidence interval can most likely be attributed to the small sample size.

#### **4.2.1.2 Model 2**

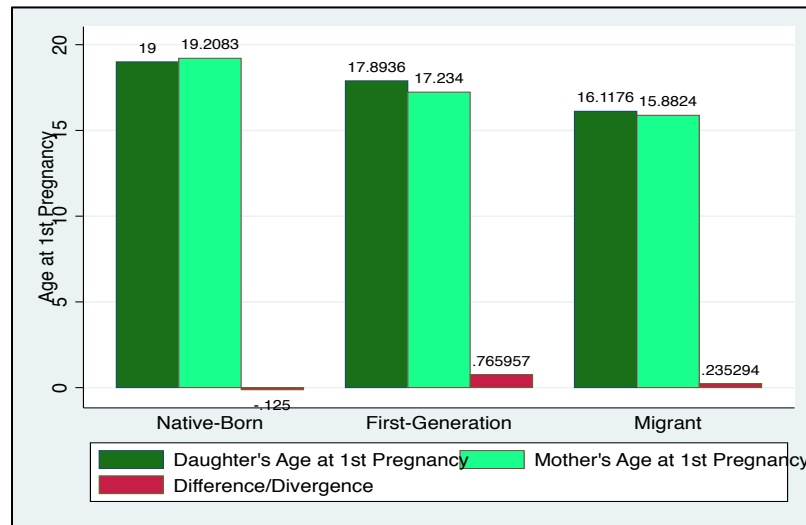
Next, the participant's place of birth, foreign born or not, was included in the model. The model was significant ( $p=0.088$ ). The odds ratio for being foreign-born is 4.2 higher than being native-born, and is significant ( $p=0.040$ ). The odds ratio for having one or more migrant parents decreases to 1.98 and trends toward insignificant ( $p=0.184$ ).

#### **4.2.1.3 Model 3**

The final model includes participants' and parents' migrant status, as in the model 2, with Rurality and Social Isolation, Socioeconomics, and mother's age at first pregnancy. The model is significant ( $p=0.000$ ). Having one or more migrant parents shows an odds ratio of 1.04, but is insignificant ( $p=0.945$ ). Being a migrant has an increased odds ratio of 4.68 and is significant ( $p=0.06$ , 95% C.I. 0.93-23.42). *RSIS* is significant with an OR of 1.47 ( $p=0.049$ , 95% C.I.=1.00-2.15). *SES*, with an OR of 1.62, is also significant ( $p=0.059$ , 95% C.I. 0.982-2.67). An odds ratio of 3.59 ( $p=0.015$ , 95% C.I. 1.28-10.08) is shown if mother's first pregnancy was at the age of 17 years or younger.

### 4.3 Difference in Differences: Hypothesis 2

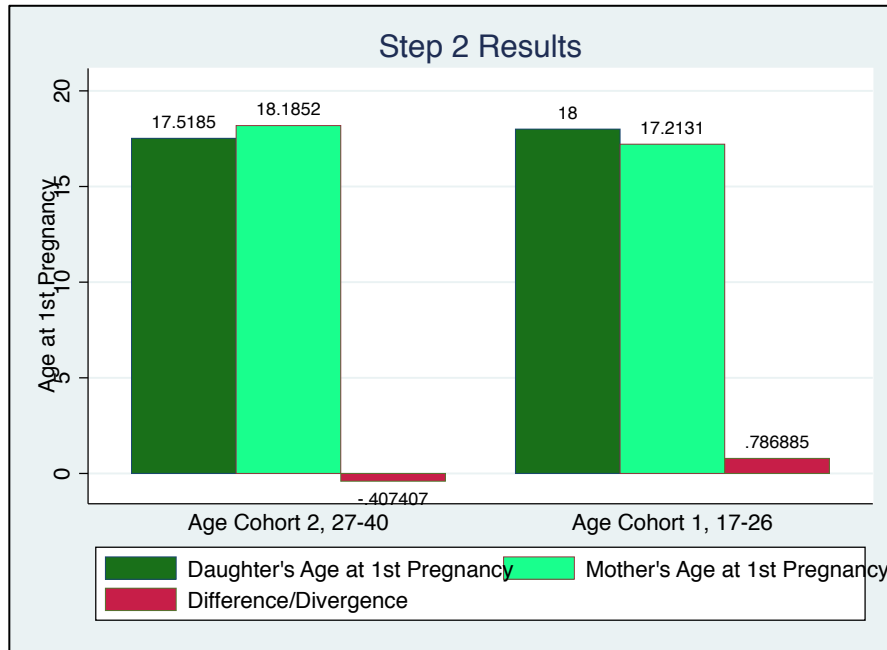
**Step 1.** When stratified only by migrant category, native-born age at first pregnancy (mean=19, SD= 3.84) diverges *negatively* (decreasing in age) from mother’s age at first pregnancy (mean=19.21, SD=4.7) by -0.125 years. First-born generation age at first pregnancy (mean=17.90, SD=2.66) diverges *positively* (increases in age) from mother’s age at first pregnancy (mean=17.23, SD=3.9) by 0.77; and migrants’ age at first pregnancy (mean=16.12, SD=2.12) diverges *positively* from mother’s age at first pregnancy (mean=15.88, SD=2.47) by 0.24.



**Figure 4.7 Step 1 Results, Expressed in Means**

**Step 2.** When stratified only by age cohort, or time period, age cohort 1 (17-26) shows a *positive* divergence of 0.787, of daughter’s age at first pregnancy (mean=18, SD=2.8) from mother’s age at first pregnancy (mean=17.21, SD=17.21). Age cohort 2 (27-

40) showed a *negative* divergence of -0.410, of daughter's age at first pregnancy (mean=17.5, SD=3.7) from mother's age at first pregnancy (mean=18.19, SD=5.11).



**Figure 4.8 Step 2 Results, Expressed in Means**

**Step 3** stratifies by age cohort and migrant category. In age cohort 1 (17-26), native-born diverge positively by 0.93, in daughter's age at first pregnancy (mean=19.5, SD=3.28), from mother's age at first pregnancy (mean 18.57, SD=3.82). First generation born positively diverge by 0.722, in daughter's age at first pregnancy (mean=17.97, SD=2.60), to mother's age at first pregnancy (mean=17.25, SD=3.46). Migrants positively diverge by 0.818, in daughter's age at first pregnancy (mean=16.18, SD=1.54 from mother's age at first pregnancy (mean=15.36).

In age cohort 2, native born negatively diverge by -1.6, in daughter's age at first pregnancy (mean=18.3, SD=4.62), from mother's age at first pregnancy (mean=20.1, SD=5.78). First generation positively diverges by 0.91 in daughter's age at first pregnancy (mean=17.64, SD=2.94), from mother's age at first pregnancy (mean 17.18, SD=5.23). Migrants negatively diverge by -.8333, in daughter's age at first pregnancy (mean=16, SD=3.09), from mother's age at first pregnancy (mean=16.8333, SD= 3.06).

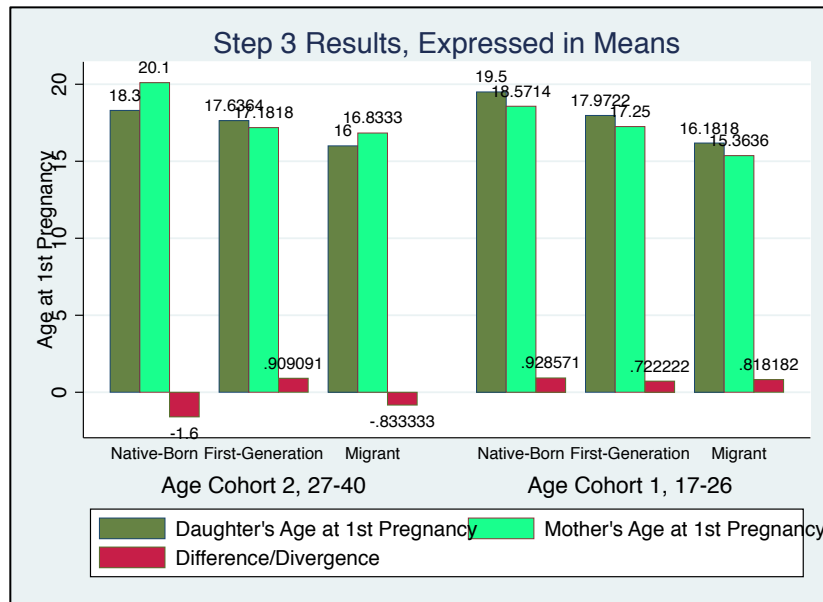


Figure 4.9 Step 3 Results, Expressed in Means

**Step 4.** 1) A positive change in age at first pregnancy in native born of 1.2 was observed from age cohort 2 to age cohort 1. A change positive change in age at first pregnancy in first generation of 0.34 was observed from age cohort 2 to age cohort 1. A

change positive change in age at first pregnancy in migrants of 0.18 was observed from age cohort 2 to age cohort 1.

2) Average change across and within generations, native-born show a slight and negative divergence in age at first pregnancy from their mothers (-0.336). First generation show a positive and notable divergence of 1.18 in age at first pregnancy from their mothers, and migrants show almost parallel age at first pregnancy of daughter from mother (-0.0076).



## 5. Discussion

The primary objectives of this study were to 1) explore and measure the effects of the mechanisms of migration on timing of first pregnancy, and 2) explore inter-generational influences on timing of first pregnancy in the context of migration, rurality and social isolation. The outcome of interest, early pregnancy, was used as a measurable reference to gauge these effects. The direction and degree to which an individual or family assimilates depends on several factors, circumstances and experiences, and may consequently affect fertility rates, timing and patterns intra and inter-generationally. Migrant fertility theorists provide mixed accounts on how and why fertility in migrants changes. The three following theories provided the framework to achieve the objectives of this paper: *Classical assimilation*, by which a migrant female will adopt the fertility norms of the receiving society; *segmented assimilation*, by which the direction and degree of assimilation is contingent on pre-migration circumstances and circumstances of receiving society; and *racial stratification*, by which the fertility rates of a migrant female will remain the same or increase due to racial or ethnic marginalization and consequently a diminished prospect of upward mobility.

## 5.1 Exploring Hypothesis 1

The primary hypothesis by which this study was guided, states that first-generation and migrant females have increased odds of having a first pregnancy in adolescence. This hypothesis was partially supported by the findings of this study.

### 5.1.1 Migration & Timing of First Pregnancy

52.94% of the total study population had a pregnancy at age 17 or younger. 28.57% of all participants who had early pregnancies were migrants, and 57.58% had *at least one migrant parent*. Initial crude logistic analyses found the relationship between having one or more migrant parent and the outcome of interest, early pregnancy, to be statistically significant, where those with at least one migrant parent have 2.78 higher odds of having an early pregnancy than those who do not have any migrant parents.

This crude relationship clearly supports one part of the primary hypothesis, and predicts a significant increase in the odds of having a pregnancy in adolescence if one or more parents are migrants is a migrant. When adjusting for the participant's migrant status, however, significance in the increased odds related to migration shifts to *being a migrant* (having migrated to the province of Buenos Aires *after* birth), where migrants have 4.2 higher odds of having an early pregnancy than their non-migrant counterparts, regardless of having at least one migrant parent or not. The odds of having an early pregnancy of those who have at least one migrant parent compared to those who do not

drops to 1.98, and although the p-value for this odds ratio trends towards insignificant, it is still suggestive of a trend in intergenerational influences of parent's place of birth, or parents having migrated, on daughter's timing of first pregnancy.

Regardless, these crude relationships evidence *intergenerational, segmented assimilation*, where migrants and their daughters have higher odds of having an early pregnancy than their non-migrant counterparts, indicating hindered or poor assimilation in terms of fertility norms.

#### **5.1.1.1 Rurality & Social Isolation, Socioeconomics and Mother's Age at First Pregnancy**

According to the results of the multivariate analysis, the odds of having an early pregnancy explained by participant's migration are 4.7, when adjusted for rurality and social isolation, socioeconomics and mother's age at first pregnancy. The odds of having an early pregnancy explained by having at least one migrant parent is 1.04, and is significant. The odds of having an early pregnancy increase by 1.5 for every one-unit positive change on the rurality and social isolation scale. The Rurality and Social Isolation (RSIS) index was scaled such that characteristics of rurality and social isolation become more prominent as the score increases in value. This significant relationship suggests that living conditions and lifestyles with qualities of rurality and social isolation significantly increase the odds of a female having an early pregnancy.

Adolescent and total fertility rates in rural communities are often significantly higher than those of the closest urban center. These high fertility rates are often attributed to low levels of educational attainment and poverty. This assumption is frequently made about migrant populations in rural *and* urban communities, as higher fertility rates in those populations are often observed. However, once controlling for socioeconomics, the relationship between rurality and social isolation with early pregnancy remains significant. Socioeconomics are also significantly associated to the outcome, where an increase of 1.62 in odds for every one-unit positive change on the socioeconomic index (measured by unmet needs and educational attainment) of having an early pregnancy. Increasing number of unmet needs in combination with lower educational attainment increases the odds of having an early pregnancy.

While socioeconomics does explain some of the indicated association between rurality, social isolation and early pregnancy, the findings indicate that rurality and social isolation is an independent predictor of early pregnancy. Alternative explanations to high fertility rates in rural communities include, 1) restricted access to fertility control methods and resources due to geographic and/or elemental or discrimination-related impediments, 2) dependence on agriculture, leading to intentional increase of fertility with the prospect that sons and daughters will eventually contribute to productivity and

relieve some of the burden of labor, and lastly, 3) social isolation and/or poor social support systems, which can potentially have many effects on fertility.

Three potential ways social isolation can affect fertility are as follows: 1) Women seek to increase their family size to compensate for loneliness or lack of social support; 2) Women can experience a diminished sense of autonomy, and consequently have less sovereignty in reproductive health and family planning decision-making; and 3) Women can have less social, emotional and logistical resources to manage, prevent and/or counteract physical, sexual, emotional and/or verbal violence. Incidence and frequency of domestic violence are strongly associated with unwanted pregnancies, early pregnancies, especially when occurring at 15 years of age or younger, and high fertility rates.

Lastly, the odds of having an early pregnancy in those whose mothers had their first pregnancies at age 17 or younger are 3.59, compared to those whose mothers did not have a pregnancy at or before the age of 17.

In conclusion, hypothesis one is partially supported by the results of these analyses, which can be summarized as follows: Even though poor socioeconomics and higher levels of rurality and social isolation explain some of the perceived difference in the prevalence of early pregnancy between migrants and daughters of migrants, the results of this study find that being foreign-born, having migrated or having one or

more migrant parent is an independent predictor of early pregnancy in Lujan. In other words, migrants and daughters of migrants have higher odds of having an early pregnancy, but not due to their overall lower socioeconomic levels. The elevated odds associated with early pregnancy can partly be attributed to living in rural, socially isolated areas and to intergenerational influences, such as direction and degree of assimilation and mother's age at first pregnancy. While rurality and social isolation are associated with socioeconomics, the results of these analyses suggest that migrants and daughters of migrants experience rural living and social isolation in different ways than their native-born neighbors.

## **5.2 Exploring Hypothesis 2**

The degree and direction of a migrant's or daughter of migrant's assimilation can be measured by her fertility outcomes in comparison with 1) her mother's fertility outcomes and subsequently the fertility norms her mother's place of origin, and 2) the fertility norms of the receiving society.

Hypothesis 2 states that first generation daughters will have higher deviation in age at first pregnancy from their mothers' than their native-born counterparts. This hypothesis predicts that daughters of migrants from Argentina's neighboring countries and Northern provinces follow the rapid intergenerational fertility convergence toward native levels, and therefore, a greater difference in age at first pregnancy of mother and

daughter will be observed, compared to daughters of native born parents. This hypothesis was framed on the principal of classic fertility assimilation, which contends that migration essentially disrupts the expected intergenerational patterns of timing at first pregnancy, prompting greater change or divergence from the norm. The premise of this hypothesis is that having a parent or two parents that have migrated disrupts the normal intergenerational transmission patterns of age at first pregnancy, as daughters of migrants having been born and raised in the host society, subscribe to and are naturally influenced by it's fertility timing norms, where as native-born participants would not diverge significantly from the expected intergenerational trends in timing at first pregnancy, as not having migrated suggests a stagnant environment that would only reflect changes or shifts in their greater society.

The results of this study support this hypothesis and the predicted trend was observed. We find that intergenerational transmission of age at first pregnancy is responsive to both assimilation processes and time periods. This is evidenced in the beginning steps of the analysis for hypothesis 2, in just averaging the ages at first pregnancy, by migrant category and age category, first independently and then combined.

**Migration.** On average, migrants are having their first pregnancy at the age of 16.12, 2.88 years younger than their native-born counter parts, who have their first

pregnancies at age 19. While we can not identify the true reason for this notable difference in age at first pregnancy between migrants and native born, due to the limitations in the data of knowing when the migrant had migrated (before or after first pregnancy, etc.), we can assume that each average is each indicative of the fertility norms of each society, the sending (neighboring country or Northern province) and host (Lujan). This assumption is further confirmed by similar differences in age of first pregnancy of mothers, where the mothers of migrants had their first pregnancy at age 15.88, compared to mothers of native born, who, on average, had theirs at the age of 19.21. First-generation born fall in between the other two cohorts, having been born in the host society but also having one or more migrant parent; therefore exposed to assimilation and the intergenerational transmission of certain fertility behaviors.

When stratifying only by age cohort and not migration, we can see they both diverge and age at first pregnancy is responsive to time period. Interestingly, only a half year (.5) overall change in the age of first pregnancy for across age cohorts was observed an average of 17.84, first-generation born are having their pregnancies at 1.37 years younger than native born, and 1.72 years older than migrants.

**Time Period.** When stratified *only* by age and *not* migration categories, the younger cohort, cohort 1, has a mean age at first pregnancy of 18 (SD=2.79), 0.48 years later than age cohort 2, whose mean of age at first pregnancy is 17.52. Age cohort 2 (17-



26) shows a positive divergence of 0.79 years in age at first pregnancy of daughter (mean=18, SD 2.79) from age at first pregnancy of mother (mean=17.21, SD=2.79).

However, age cohort 1 (27-40) shows a negative divergence of -0.407 years in age at first pregnancy of daughter (mean 17.52, SD=3.65), from mother's age at first pregnancy (mean=18.18, SD 5.11).

Overall, when stratifying only by time period, we can see a slow but significant trend toward delaying first pregnancies. As this variation lies between two time periods in a time span of 23 years, a deeper look into what socio-political, economical or ideological changes might have taken place that can be attributed to the slight but positive trend toward delaying pregnancy. Policies on compulsory education for example, may be influential, for example; policies on and investment in reproductive health resources may also be of significant influence, just as shifts in the national or local economy. Unfortunately, the data is limited in determining which, if any, of these are significant factors. The same call for research applies when addressing the difference in the degree and direction of intergenerational divergence from mother's age at first pregnancy. What factors or influences are unique to each time period that would affect the degree and direction of intergenerational transmission of age at first pregnancy?

**Migration and time period.** Only when we stratify by both migration and time period can we really see the significant variation between groups, speaking to the

responsiveness to assimilation processes, intergenerational influences, and perhaps social influences, or lack thereof.

**Age cohort 1** (27-40), as reported above, (27-40), has a mean age at first pregnancy of 17.52 (SD=3.65). However, significant variation within this time period strata exists when factoring in migration. Migrants, for example, have a mean age of first pregnancy of only 16 (SD=3.09), 0.64 years earlier than first-generation at 17.64 (SD=2.92), and 2.3 years earlier than native-born, at 18.3 (SD=4.62). Mother's age at first pregnancy also shows significant variation within these strata, where mothers of migrants (mean=16.83, SD=3.06) had their babies at an average of 3.27 years earlier than their native-born counterparts, but only 0.35 years earlier than mothers of first generation born. Intergenerational divergence in age at first pregnancy shows an interesting trend for this age cohort. Both migrants and native born show negative divergence (-0.833 and -1.6 years earlier, respectively). First generation, however, show a positive divergence of 0.91 years. These results evidence successful assimilation among first generation, showing that first generation are positively shifting away from their mother's fertility norms, which in this case, would be timing of early pregnancy. The degree to which they are diverging however, is only slightly higher than migrants, and lower than natives.

**Age cohort 2** (17-26), as reported above, has a mean age of first pregnancy of 18 (SD=2.8). Again, significant variation lies within these strata, found across the migration categories. In these time-period strata, migrants had their babies on average 3.32 years earlier than their native-born counter parts (means= 16.18 and 19.5, respectively), and 1.79 years earlier than first generation born. Already, without even yet exploring the intergenerational divergence of age at first pregnancy in each stratum, significant influences of assimilation are evidenced.

Again, significant variation in mother's ages at first pregnancy is found in this age cohort, where mothers of migrants have a mean age at first pregnancy of 15.36 (SD=2.06), 3.21 years earlier than their native born counter parts (18.57), and 1.89 years earlier than mothers of first generation born (mean=17.25, SD=3.46). Further analyses are needed in order to explore the reasons why there is variation between these strata, specifically between migrant mothers and mothers of first generation born, many of whom are also migrants. Mothers of first generation born may have higher average of age at first pregnancy because 38.89% (n=14) are native born.

In this age strata, all migrant categories show positive intergenerational divergence in age at first pregnancy. Native-born show the greatest degree of divergence among the three strata, although only 0.11 years higher migrants. In fact, here, first-generation born show the lowest degree of divergence, rejecting hypothesis 2. These

results suggest that either assimilation may not be as successful in first generation as it is evidenced to be in age cohort 1, or that time period factors may be playing a more influential role.

Only when we average the degrees of divergence of each age cohort with the three migrant categories can we conclude final divergence trends. When averaged accordingly, native born show an overall slight and negative divergence of -0.336; first generation show an overall notable and positive divergence of 1.18; and migrants, like native born, show an overall slight and negative divergence of -0.0076.

In measuring the overall degree and direction of divergence within migrant categories and across age cohorts, the overall trends can be identified and explored. These results support hypothesis 2, stating that first generation born will show a higher level of divergence in age at first pregnancy from their mothers than their native born and migrant counterparts. The support for this hypothesis evidences successful assimilation, where daughters of migrants are adopting the fertility norms of the host society rather than those of her parent's places of origin, and ultimately bettering their reproductive health outcomes.

## 6. Limitations

While the results of this study suggest several relationships and trends in reproductive health, migration and rurality, the small study sample size of 119 greatly limits generalizability. The original desired sample size was set at a minimum of 220 women. However, due to several limitations, achieving more than 119 in the given time was impossible.

During the study implementation duration of five months, Lujan experienced heavy rains and severe flooding. While the city is positioned in a low-lying valley and at the conjunction of two rivers, the municipality had not experienced floods so severe since 1985. Hundreds of people lost their homes and took refuge in disaster relief shelters set up by the municipal Department of Health. Three of the neighborhoods included in this study were of the several severely affected areas. Research came to a halt for one period of six weeks and a second period of three weeks.

Rain, even when not causing severe flooding, was a significant limitation in data collection. As thoroughly discussed in this paper, many of the study locations are rural with dirt roads. Heavy or even moderate rain makes the roads impassable. Poor weather conditions, even when mild, were a common source of attrition.

Low levels of social desirability and privacy being highly valued were also causes for low enrollment. A general sense of lack of interest in interacting with the PI or participating was sense.

The most important limitations of this study are some imperfections in the survey tool. Although this study examines determinants of early pregnancy, contraception was not discussed. This is due to an imperfection in the survey question. Although all efforts were made to ensure the validity and effectiveness of the survey tool, unforeseen miss-interpretations of certain questions were fairly common, making their inclusion in the final study impossible.

Furthermore, the study enrollment strategy relied on a snowballing technique. In relation to the low levels of social desirability, it was very difficult to create multi-family and generational nodes. The quantitative data collection methods employed four different types of surveys, each varying in question inclusion in certain areas. For example, survey tool AA, while effective in collecting some data on the participant's parents, does not ask for the educational attainment level of either of her parents, nor does it ask for the number of children her mother had. It was expected that the mother would also be enrolled and the desired information would be collected by her own responses. However, it was found increasingly difficult to involve and enroll mothers

and daughters together. A total 22.6% (n=27) of the entire population also had their mothers enrolled.

Also related to the enrollment process and study design, the internal validity of this study is compromised by clustering, which is extrinsic in social network designs. The implications of the cluster effect on the internal validity are unclear, and perhaps unimportant, considering that the clustering was intentional and necessary for the purposes of this study. Nevertheless, it does reiterate the fact that these results are not generalizable, and are only useful in identifying trends and possible relationships for future migration fertility research.

Last but not least, at the cost of unique and valuable insight from female youth *within* the risk period (aged 17 or younger), participants under the age of 18 were not considered eligible for participation in the in-depth interview process. This decision was made in collaboration with the PI's in-country research advisor, Dr. Fernando Copolillo, in consideration of national laws 26.061, 24417 and 26485, regarding mandatory reporting of any incidence of abuse. Even though the participant's name would not have been recorded, the nature of the interview process is intrinsically not anonymous. While the well-being of each and every participant is the main priority of the researcher and research team, it was collaboratively decided that for the researcher,

as a foreigner and temporary visitor, to report incidences of violence would be inappropriate.



## 7. Conclusion

This study aimed to address the implications that the experiences and mechanisms unique to migration may have on migrant fertility trends. The primary objective was to measure the *intergenerational influences* of migration on timing at first pregnancy. The primary hypothesis of this study, in consideration of the historical characteristics of migration trends to the province of Buenos Aires from the places of origin represented in this study sample, and the ethnic and racial complexities within Argentina, states that *migrant women and girls, and first-generation females, have higher odds of having a first pregnancy before the age of 18, compared to their non-migrant counterparts.* This hypothesis was guided by the *segmented assimilation theory*, and suggests controlling for the usual culprits of the unfavorable reproductive health outcomes commonly observed in migration populations (poverty and educational attainment), *other* mechanisms and characteristics of migration can be identified and measured.

Logistic regression models were used to measure the primary exposure, migration (being a migrant, first-generation born or native-born), on the primary outcome of interest, adolescent pregnancy. Ultimately, crude analyses show a significant increase in odds of having an early pregnancy when at least one parent is a migrant parent or the individual herself is a migrant.

After controlling for socioeconomics, rurality and social isolation, and mother's age at first pregnancy, results indicate that *being a migrant* significantly raises a female's odds of having an early pregnancy, and having at least one migrant parent may not significantly increase the odds of having an early pregnancy. This conclusion is further supported by the results that support hypothesis 2, where first generation, the daughters of one or more migrants, show a higher level of intergenerational divergence in age at first pregnancy, and in a positive direction. So, while first generation born have an average lower age at first pregnancy, they do show a shift towards delaying first pregnancies, evidencing successful fertility assimilation.

Overall, migrants and first-generation born participants have significantly lower socioeconomics, experience higher levels of social isolation and rurality, and have poorer reproductive health scores than their native-born counterparts. However, results found no significant relationship between socioeconomics and rurality and social isolation, suggesting that migrants and first generation born experience higher levels of rurality and social isolation regardless of their socioeconomics. Ultimately, these results evidence the need for further research on other possibly significant influences and factors leading to marginalization, such as racism or discrimination, and/or language or cultural barriers.

These results ultimately challenge common perceptions of immigrant- related poverty and its impact on rurality, social isolation and reproductive health outcomes. These analyses further suggest that barrios (neighborhoods) and their characteristics are principal determinants in level of rurality and social isolation. Essentially, the implications and impact of an individual's socioeconomics are largely contingent on the individual's migration category *and* on which barrio she resides in.

Significant variation in rurality and social isolation within each migration category and across barrios deduces that the *degree and direction* of assimilation processes are highly influenced by place of residency. Although the exact number of years a participant and her family have been residing in the province of Buenos Aires, we can conclude that first-generation born participants and their parents have resided in the province for a longer period of time, and therefore have had more time to adapt and assimilate, implying a positive and protective affect of assimilation, eventually leading to decreased levels of social isolation and living circumstances that have lower degrees of rurality. Again, these results and conclusions are further evidenced by the strong and positive intergenerational divergence of age at first pregnancy among first generation born.

The implications of these finding are endless. Migrants experience and are impacted by the consequences of rurality in significantly different ways than their

native-born neighbors, and on average, experience much higher levels of social isolation. Rurality and social isolation significantly increase a female's odds of experiencing poor determinants of reproductive health, lower socioeconomic levels and limited upward mobility. Yet, first generation show successful assimilation and adoption of host society's fertility norms.

Social isolation is not inherent in rural communities, and the extent of its prevalence largely depends on social mobility, strong social networks and opportunity to engage with non-family members outside of the home and workplace. By extending opportunities for social engagement, such as expansion of extracurricular activities, and consequently expanding and strengthening social networks, many of the hindrances of attaining social and economic success that migrants experience in their receiving societies, may be relieved. Similarly, these initiatives may relieve the disadvantageous influences that may be at the core of the slight but negative trend in intergenerational divergence in age at first pregnancy among both native-born and migrant females.

By strengthening social networks and personal sense of autonomy, a female's odds of having an early pregnancy may be significantly reduced. Further research is needed to identify the contributing factors of social isolation among rural communities. However, these findings suggest attainable and economical strategies to combating adolescent fertility rates. While observed at higher levels in migrants and daughters of

migrants, adolescent pregnancy is not unique to migrant communities and threatens to become more pervasive in native-born populations, and therefore, would be in the best interest of municipal and local governments to expand and extend opportunities for social engagement and extra-curricular activity to its rural and semi-rural communities.

## Appendix A: Table of the percentage of mothers by age group and province

**Cuadro 11 Población femenina de 14 a 19 años. Porcentaje de madres por grupo de edad y jurisdicción. Año 2001.**

Jurisdicción	14 años	15 a 17 años	18 y 19 años	Total
Total país	2,7	7,0	20,5	10,7
Capital Federal	1,6	2,5	7,3	4,2
Total Buenos Aires	2,6	6,1	18,5	9,6
• GBA	2,7	5,9	17,6	9,3
• Resto Bs. As.	2,2	6,4	20,0	10,1
Catamarca	3,8	10,5	28,6	14,9
Córdoba	2,1	6,2	18,2	9,6
Corrientes	3,7	8,8	24,9	12,9
Chaco	4,4	12,0	32,5	17,1
Chubut	3,1	7,9	24,5	12,2
Entre Ríos	2,9	8,3	23,4	12,2
Formosa	3,7	10,1	29,7	14,8
Jujuy	3,1	7,5	24,4	12,0
La Pampa	2,2	6,9	23,8	11,1
La Rioja	3,7	9,0	24,1	13,0
Mendoza	1,6	5,2	17,5	8,5
Misiones	3,3	9,9	29,0	14,5
Neuquén	2,9	7,4	24,1	11,8
Río Negro	2,0	7,5	24,8	11,8
Salta	3,6	9,6	28,0	14,1
San Juan	2,0	6,2	18,7	9,6
San Luis	2,9	8,0	23,9	12,3
Santa Cruz	1,8	6,6	27,1	11,8
Santa Fe	2,8	7,9	21,0	11,4
Santiago del Estero	4,1	10,2	28,9	15,1
Tucumán	2,9	7,9	21,6	11,6
Tierra del Fuego	1,7	6,3	21,5	9,5

Fuente: Instituto Nacional de Estadística y Censos (INDEC). Censo 2001. Tabulados inéditos.

## Appendix B: Places of Origin Represented in Study Population

### Places of Origin

1. Buenos Aires
2. Tucumán
3. San Juan
4. Corrientes
5. Santiago del Estero
6. Mendoza
7. Misiones
8. Entre Ríos
9. Chaco
10. La Pampa
11. Santa Fe
12. Catamarca
13. La Roiga
14. Córdoba
15. La Plata
16. Rosario
17. San Luis de Potosí
18. Paraguay
19. Bolivia
20. Italia
21. Brasil
22. Spain
23. Chile
24. Uruguay



## Appendix C: The Coding System for Anonymity

### A-1: The Coding System

The coding system incorporates letters and numbers, and is designed in a way that will allow the researchers to connect the participants as a group in the analysis stage while maintaining anonymity

The coding system has two parts. The *first part* starts with one of the following letter combinations: AC (if you are the captain), MC (if you are the mother of AC), AA (if you are the friend or sister of AC), and MA (if you are the mother AA). AA participants will have a 1, 2 or 3 following their letter combination. AA1 & AA2 If an AA participant is a sister; the number 3 will follow her letter combination. (Ex. AA3). MA participants will also have either a 1, 2, or 3 following their letter combination, which will correspond with the letter of their participating daughters.

The *second part* of the code will be a two-digit number. The first digit will identify which of the four barrios the participant has been enrolled from. 1:O1, 2: LL, 3: SF1 and 4: PL. The second number will identify the group number. The first group to fill out the survey will be group 1, and so on.

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Here are some examples:

**AC 37:** Captain from O1, 7<sup>th</sup> group, captain.

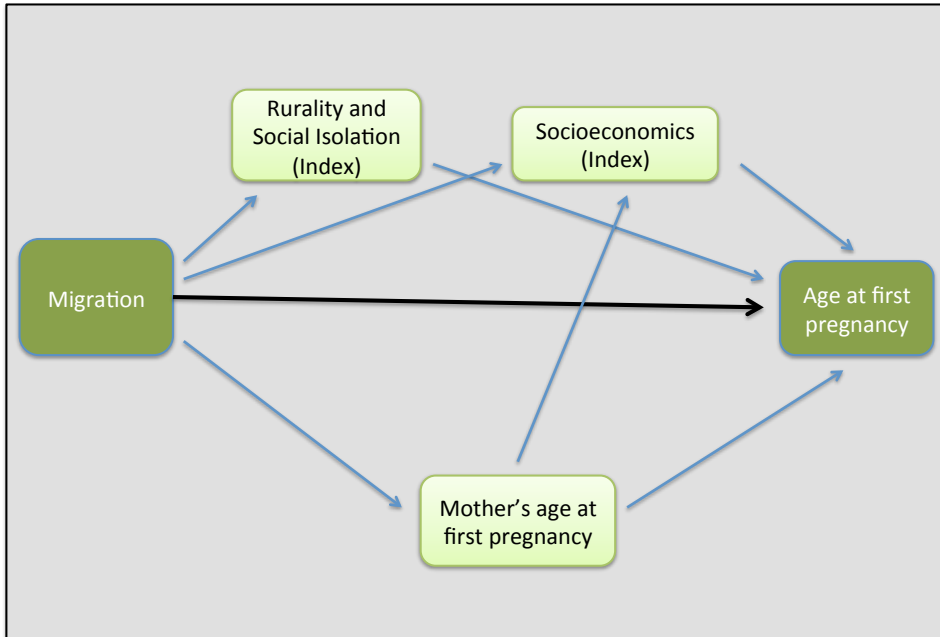
**AA1 37:** Friend of Captain, from O1, 7<sup>th</sup> group, friend #1.

**MA1 37:** Mother of a friend of the captain, from O1, 7<sup>th</sup> group, mother of AA1 373

**AA3 37:** Sister of Captain, from O1, 7<sup>th</sup> group, sister.



## Appendix D: DAG Diagram

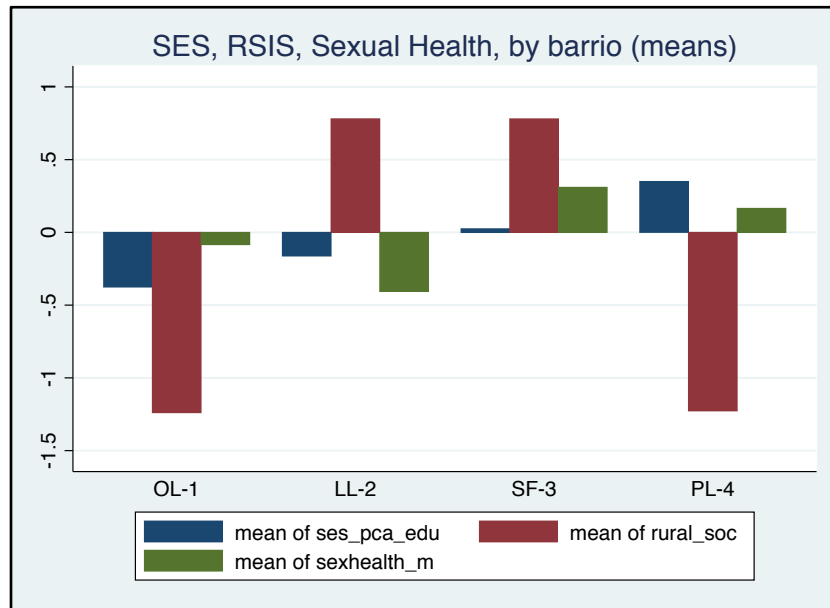


## Appendix E: Barrio Descriptions (table and bar chart)

Table 3 Population Description, by barrio

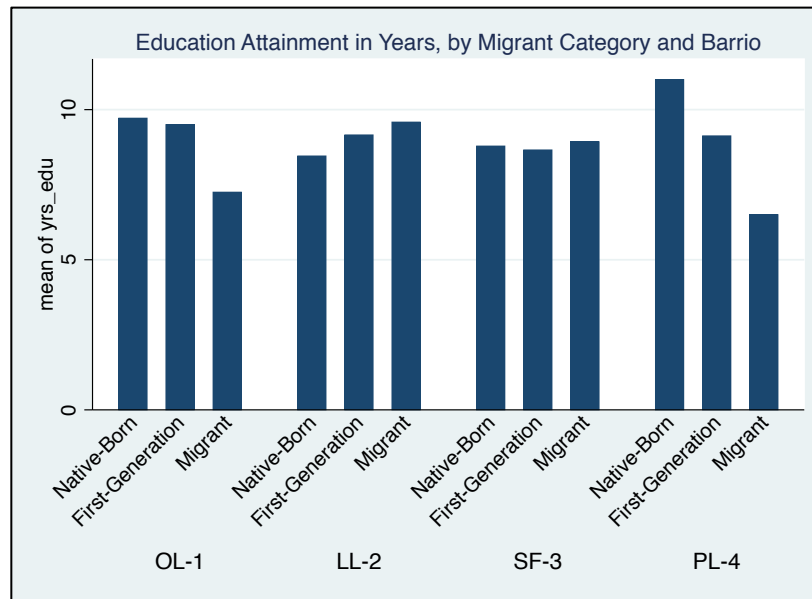
		Barrio 1			Barrio 2			Barrio 3			Barrio 4		
		#	%	mean	#	%	mean	#	%	mean	#	%	mean
<b>AFP</b>		17.45			17.66			15.94			17.82		
<b>0</b>		9	64.29	18.83	19	50	20.9	9	25.71	20.2	19	59.38	20.77
<b>1</b>		5	35.71	15.8	19	50	15.95	26	74.29	15.12	13	40.62	15.77
<b>Native-born</b>		7	53.85		12	33.33		8	25		7	21.88	
<b>First-generation</b>		4	30.77		18	50		17	53.12		21	65.62	
<b>1migrant parent</b>		0			9	25		10	31.25		12	37.5	
<b>2migrant parents</b>		4	30.77		9	25		7	21.88		9	28.12	
<b>Migrant</b>		2	15.38		6	16.67		7	21.88		4	12.5	
<b>RSIS</b>		-1.65			0.86			0.77			-1.03		
<b>SES</b>		1.09			-0.16			0.025			0.33		
<b>Sexual Health</b>		0.08			-4.01			0.31			0.17		
<b>Education<sup>3</sup> (in years)</b>		74.4		8.93	74.6		8.96	73.73		8.85	76.25		9.15
<b>Total</b>		14	11.76		38	31.93		35	29.41		32	26.89	

<sup>3</sup> Percentage out of 12 years, the minimum number of years necessary to complete primary and secondary school



**Barrio Description, Socioeconomics (ses\_pca\_edu), RSIS (rural\_soc), Sexual Health (sexhealth\_m)**

## Appendix F: Education Attainment in years, by migrant category and by barrios.



Education attainment in years, by migrant category and barrios

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