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Nigerien Fertility Choice in the Face of Desertification

By

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Thesis Advisor

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Abstract

While the majority of the world experienced rapid fertility decline in the second half of the twentieth century, Niger's fertility rate has remained relatively constant. A high fertility rate in itself is not a problem for the population as long as the resulting population can be sustained by the economic activity of the population. This is not the case for Niger, as extreme droughts in the Sahel have cast doubt on the sustainability of the majority-subsistence economy since the mid-1960s. Although not extremely common, there are some demographers and fertility experts who hold the idea that fertility decision-making is driven primarily by education level and knowledge of fertility; and thus tend to promote family planning programs and formal education as a solution to high fertility. In the Nigerien context, this means that Nigeriens are lacking the knowledge to make rational decisions for the population as a whole. Although demographic research accepts formal education as one of the primary factors in fertility-level determination, education is still only one of many factors. The field of economics, however, is concerned with rationality in decision-making. Economists tend to assume that the decisions that people are making are in fact, rational, even if they may not appear to be so from an outside perspective. So the research in this thesis uses the rationality framework of the economics discipline to challenge any paternalistic notions that people are simply too uneducated to make effective fertility choices that benefit the population as a whole. This research discussed in this paper is a multiple regression analysis that uses data from the (ECVM-2011), a national household survey modeled on the World Bank's Living Standards Measurement Surveys, to estimate the relationship between number of children per childbearer and various fertility factors.

Key Words: Fertility, Desertification,

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Section 1

Introduction

While the fertility rates for the majority of the world decreased over the last several decades, the West African nation of Niger has maintained the highest rate of fertility in the world, with an average of 6.8 and 7.2 children per woman. While high fertility and population growth are not problems as long as the population can produce enough to sustain itself, this is not the case in desertifying Niger. Niger is located in the Sahel, which is the geographic zone between the Sahara in the north and the savannah to the south. In the mid-1960s, the Sahara desert began moving South, undermining the sustainability of the majority-subsistence economic activities of rural Nigeriens who constitute roughly 80% of the Nigerien population.

Some demographers and fertility experts attribute high fertility Niger to a lack of knowledge. In one example, fertility expert Malcolm Potts stated that the reason for high fertility in the Sahel “is not that impoverished families necessarily want lots of children, but that they do not have the knowledge or means to separate the passion between the sexes from another unintended pregnancy” (Potts 2013). This view has led to the promotion of family planning programs, which are often ineffective in reducing fertility. In contrast, the field of economics is concerned with rationality in decision-making; so economists tend to assume that the decisions that people are making are rational, even if they may not appear to be from an outside perspective. The research in this thesis uses the rationality framework of the economics discipline to challenge any paternalistic notions that Nigeriens are lacking the knowledge to make effective fertility choices that benefit the population as a whole.

Fertility Theories

All societies control fertility. This is clear because the average woman does not reach the physiological childbearing capacity. What is less clear is why populations have different fertility rates and patterns from one another. Many theories have sought to explain fertility differences. The earliest theories, most notably from Thomas Malthus (Becker 1960, 2), have a simpler approach than later theories. Malthus believed that fertility is a function of age at marriage and sexual activity within the marriage, and that levels of sexual activity are fixed.

Economist Gary Becker argued that the Malthusian approach did not take into account the relationship between population and human capital. Malthus did not live to see the European fall in fertility as incomes increased and the population became healthier and better educated. Becker focused his research on how investments in human capital impact fertility rates. Investments in human capital typically refer to education and health expenditures. Rates of return on human capital investments increase as the level of human capital in society increases. The low initial return on investment, according to Becker (Becker 1990, 16-19), is the primary cause of stagnating high fertility with low human capital. Transitioning to a position with low fertility rates and high levels of human capital requires significant investment funds with low initial returns—an amount of financial capital that is generally not readily available in a low-human-capital economy. Education and health are recognized in this theory as two important factors affecting the fertility rate.

Education level is correlated with lower fertility rates for a number of reasons, many of which have nothing to do with the resulting knowledge. First, people who spend more time in school defer childbearing until a later time. Second, those who intend to receive an education

usually plan to enter a high skills and high wage career. Because their opportunity cost of the time is high, they have little economic incentive to bear many children. Third, those who are engaged in agro-pastoral production, or other subsistence activities, will lose child labor on the farm and money by sending children to school. Education provides employment opportunities outside of low-skilled manufacturing and subsistence labor. The type of labor that education allows for does not require as many laborers as manufacturing or subsistence activities. Further, education levels of women are particularly salient to fertility rates because women who attend school past the age of childbearing capacity often defer marriage and childbearing until after graduation. If they leave their subsistence activities, they also have less time to take care of children and are more likely to invest in the human-capital of the children that they do have. Their children will have higher educational and vocational opportunities than their parents and this cycle will continue until fertility is low. Access to contraceptives and family planning information sometimes does have an impact on fertility rates; but the efficacy of fertility education and contraceptive outreach programs varies widely from place-to-place. People everywhere have ways of controlling fertility, even without contraceptives and formal education on family planning.

Health is another strong determinant of fertility rates. In areas with high child mortality rates and subsistence economic activity that requires large amounts of labor, people are likely to have more children. Many children are necessary to support the subsistence activities of their families. In contrast, children in urban areas are costly to parents. The children are not providing labor that adds to the value of the home and are instead, a financial burden. Further, urban areas tend to have more health resources, so urban families usually do not anticipate their childrens'

mortality at the same level as their rural counterparts. Health of a population is affected both by available healthcare resources, and by public health infrastructure. Public health infrastructure encompasses everything from potable public water access to public waste sanitation to vaccination.

Increasing education levels, health, and fertility programs requires significant investment and planning to create. In order to bring a population from Becker's high fertility steady-state to the low fertility steady-state, resources must be mobilized with a sustainable plan. Without adequate and sustained investment, along with institutions to carry out the plans, fertility is likely to remain in the high fertility steady-state.

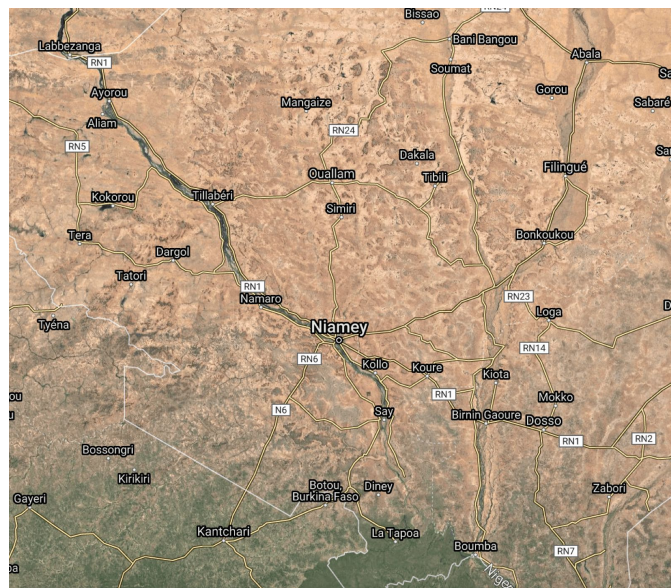
Nigerien Ecology and History

While the majority of the world experienced rapid fertility decline, Niger's fertility rate has remained nearly unchanged, fluctuating at rates between 6.8-7.2. Given that the sustainability of pastoral and agricultural labor is declining, this is a strong concern for the economic development of Niger. The urban populations are engaged in market-based activities, but this demographic comprises only twenty-percent of the population. In the case of rural Nigeriens, who constitute nearly eighty-percent of the Nigerien population, human labor and demographic sustainability of the community is vital to survival. The majority of rural-dwellers reside in small, sometimes mobile, agrarian and pastoral villages. The residents graze animals on rapidly-disappearing Sahelian pastures. Up until the last fifty years, this activity proved lucrative enough to support the pastoral population. In the late 1960s, desertification and rapid population growth began to challenge the sustainability of pastoral living in Niger. Professor Benedetta

Rossi (Rossi 2015, 240-241) states in her book *From Slavery to Aid: Politics, Labour, and Ecology in the Nigerien Sahel, 1800-2000* that this prompted Nigerien political leaders and international organizations to intervene. These leaders and organizations hoped to slow the Sahelian desertification and to integrate many rural Nigeriens into the market-based urban economy, but few to none of the attempts experienced success. Uncovering the reasons for the continuation of a pastoral majority in Niger requires an examination of the end of French colonial rule.

During their occupation of Niger, the French invested little in education. In 1956, only six-hundred children completed a high-school level education (Charlick 1991, 36). This lack of investment continued after the French left Niger and further extended to investment in infrastructure and health. To France, Niger did not contain significant enough resources or a convenient enough location relative to the coastal French colonies to warrant significant investment.

The map to the right shows the Sahara's Southward movement across the Sahel

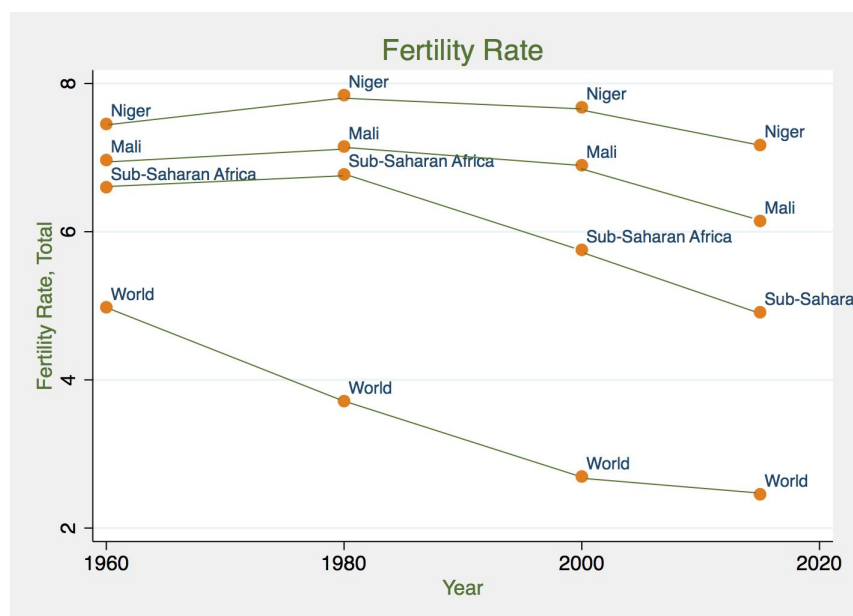


Created with R "ggmap"

Niamey, Niger's largest city, located in the southwest corner of Niger, provides an example of Nigerien urban life. This city is the "nerve center of the nation's political, administrative, commercial, and intellectual activity" (Youngstedt 2004, 96). The majority of the people who live in Niamey are the few Nigeriens who acquired an education and sought employment in politics, banking, administration, services, and in private business ventures selling uranium and oil on the world market (Youngstedt 2004, 96). The rest of the people living in Niamey are migrant workers who travel from drought-stricken rural areas to work in informal services. International aid programs and migrant work are the only major measurable connections between the subsistence and market-based economic systems in Niger.

Around twenty percent of the population lives in urban areas. Niger's urban centers grew rapidly beginning in the 1960s. Part of the reason for this is the desertification that forced people out of rural areas. The increased urbanization and marketization is further due to some government reforms that sought to improve infrastructure. Four times as many people live in Niamey as in 1960 (Trading Economics 12/2019). This movement reached a peak and has now leveled out (Human Development Reports 2018). The majority of people who moved to urban areas did so out of necessity in response to the droughts and famines (Youngstedt 2004, 97). Additionally, without adequate educational resources and investment in factories, the urban population cannot move beyond the lowest-tier manufacturing and informal services. Instead, there is an urban dichotomy between those that work in investments, banking, services, oil, and uranium, and the migrant workers that perform low-skilled services. Despite the movement to urban areas in response to desertification, nearly eighty-percent of the population in Niger is still rural-dwelling, with just under twenty percent in urban areas. The majority of rural-dwellers

reside in small, mobile, and pastoral villages. The people in these pastoral villages graze animals on rapidly-disappearing Sahelian pastures. Up until the last fifty years, this activity proved lucrative enough to support the pastoral population. In the late 1960s, desertification began to challenge the sustainability of pastoral living in Niger. During the period of desertification's onset, the majority of the world experienced rapid fertility decline, but Niger's fertility rate remained nearly unchanged.



Created with World Bank data

Given that the stability of pastoral and agricultural labor is declining, high fertility a major concern for the sustainability of Nigerien life. Given the time-sensitivity created by desertification, my thesis uses the rationality framework of economics to answer the following questions: Why does high fertility persist in the face of desertification, and why is this high fertility a rational decision for Nigeriens? My hypothesis is that given the influence of economic

activity and public health on fertility behavior, Nigeriens retain high fertility because of the substantial labor demand for subsistence activities and the uncertainty for childhood survival.

Section 2

Research Methods

I used the Niger Enquête Nationale sur les Conditions de Vie des Ménages for 2011 (ECVM-2011), a national household survey modeled on the World Bank's Living Standards Measurement Surveys to conduct this research. The ECVM survey includes information on demographics, health, and economic wellbeing. The survey is comprehensive, sampling from all but the 5% of the population living and working in the Northern uranium mining city of Arlit. Before performing the regression analysis, the sampling characteristics needed to be specified to take into account the survey design. Then, children needed to be matched to the mothers of child-bearing age interviewed in each household to create a new variable—*kids*—containing the count of children of each mother. This variable served as the outcome variable for the majority of regressions performed. Mothers in the study were limited to those under the age of 25. Because the women included in the regressions have not finished having children, the *kids* variable shows fertility outcomes that are lower than the fertility rate of the Nigerien population as a whole. For the predictor variables, I chose factors related to standard fertility theory. These included education, public health, economic activity, and urban or rural location. Survey questions on formal education were not sufficiently standardized to ensure accurate results. In lieu of formal schooling variables, I created a binary variable on literacy. Those that have the ability to read were assigned a value of 1, and those who cannot—just over half of the

population—were assigned a value of 0. I used the same binary variable assignment for other predictors; including urban location, familial ownership of one or more fields, and connection to public water supply. Below is a table of the variables used and their relationship to the fertility theories in the introduction.

Variable Name	Variable Type	Contents	Relationship to Fertility Theories
<i>kids</i>	Continuous	Number of children	Measure of fertility
<i>reads</i>	Binary	Literate (1=yes, 0=no)	Standardized measure of education
<i>fields</i>	Binary	Owns 1+ fields (1=yes, 0=no)	Type of economic activity (subsistence or not)
<i>water</i>	Binary	Dwelling connected to the public water network (1=yes, 0=no)	Measure of public health infrastructure.
<i>urban</i>	Binary	Lives in an urban location (1=yes, 0=no)	Urban/Rural location

I started with the standard multiple regression analysis and later switched to negative binomial regression. After performing the regressions, I conducted hypothesis tests to determine the statistical significance of the estimates. For example, one group of hypotheses tests the correlation of the ability to read with fertility rates in various circumstances. While the two regression types yielded similar results for the coefficient estimates, the hypothesis tests differ significantly. Negative binomial regression fits non-continuous data more accurately than the

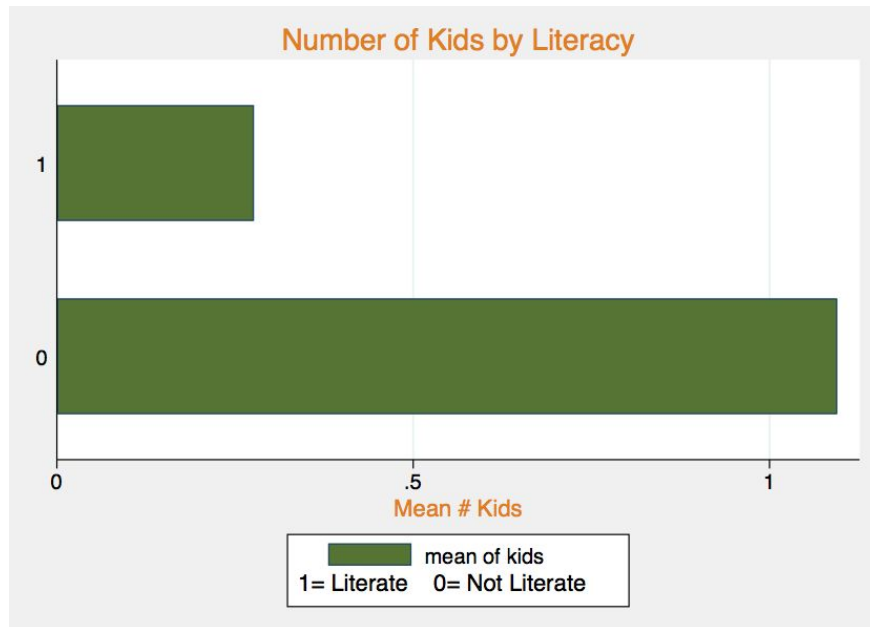
standard regression, which assumes continuous variables; so this is the regression type used to draw conclusions.

Section 3

Results

The regressions performed confirmed a statistically significant correlation between fertility and literacy, urban versus rural location, and field ownership; but could not establish a significant relationship between fertility and public health. The inability to establish a relationship between the chosen public health variable and fertility does not mean that this is not a factor. The data available may simply be inadequate for estimating the impact of public health factors.

A first look at the correlation between literacy and fertility shows a strong negative relationship:



Any conclusion drawn based on the relationship in this graph would support the idea that education level (represented by literacy rate) is the sole factor in fertility rate determination. When other factors are looked at alongside literacy, however, there are clear relationships between other variables and number of children:

Figure 1.



Figure 1. shows correlation between literacy and fertility alongside the correlation between Urban vs. Rural locality and fertility. The two look very similar side-by-side. This suggests that education is not the only factor in fertility rate determination, and that urban versus rural residence should also be explored.

Figure 2.

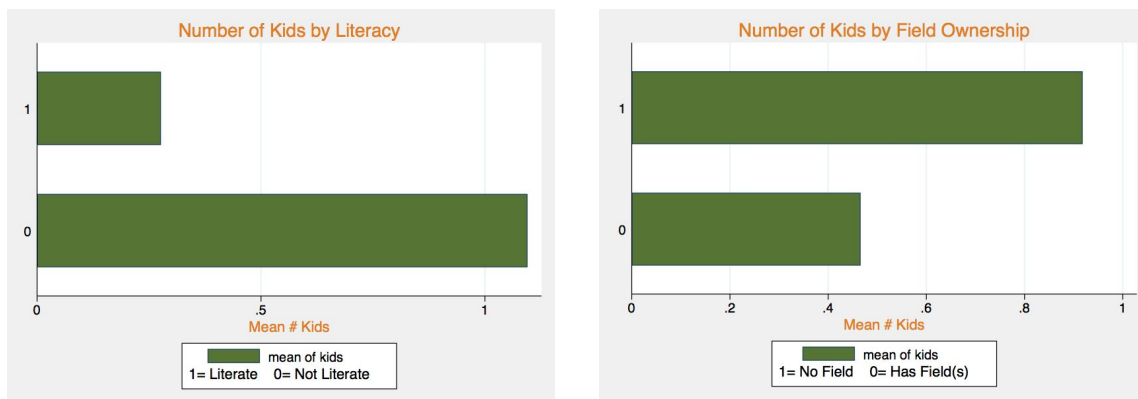


Figure 2. is a similar comparison to the one in **Figure 1.**, but presents a comparison with the variable *fields*, representative of field ownership. This suggests that economic activity should also be explored in the regression analysis.

Figure 3.

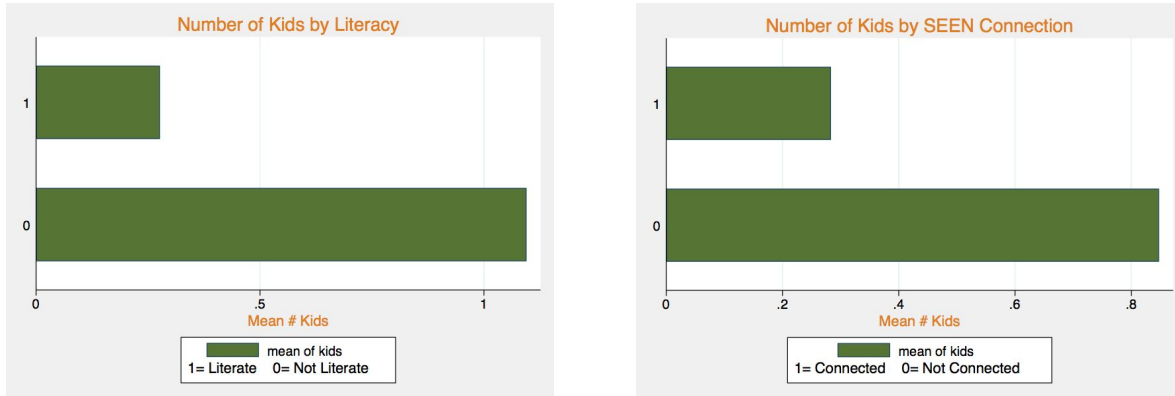


Figure 3. displays literacy and fertility alongside the connection to the public water network. This water network is the best representation of public health infrastructure included in the Niger ECVI data.

When literacy is contextualized among other fertility-affecting variables, education alone is clearly not the only relevant factor in determining Nigerien fertility rates. The following regressions examine the relationships between these variables and fertility. **Table #1** displays the results of each standard regression (regressions A through E), and **Table #2** shows the outputs from the Negative Binomial Regressions (regressions A through E). Below each table are the hypothesis tests performed.

Table #1: Regression Results for Number of Kids (standard errors in parentheses below coefficients)

* $p < 0.05$

	A	B	C	D	E	F
Constant	1.033* (.0460)	1.185* (.0457)	1.184* (0.0471)	1.184* (0.0457)	.9659* (.0632)	0.9782* (0.0952)
Urban	-0.571* (.0605)	-0.2335* (.0694)	-0.2141* (0.0931)	-0.1957* (0.0699)		
Reads		-0.6901* (.0723)	-0.6827* (0.0919)	-0.6847* (0.0731)	-0.7162* (0.0678)	-0.7340* (0.0997)
Urban*Reads			-0.0329 (0.1210)			
Water				-0.0964 (0.0522)		
Fields					0.2160* (0.0661)	0.2020 (0.110)
Fields*Reads						0.0224 (0.1290)
R-squared	0.033	0.0845	0.0846	0.0848	0.0840	0.0840

Wald Hypothesis Tests:

Test that Urban*Reads=0

P-value: **.2139**

Test that Fields*Reads=0

P-value: **0.1378**

Table #2: Negative-Binomial Regression Results for Number of Kids (standard errors in parentheses below coefficients)

* p<0.05

	A	B	C	D	E	F
Constant	.0333 (.0445)	.1854* (.0396)	.1686* (.0398)	.1832* (.0396)	-.2007* (.1003)	-.0220 (.0973)
Urban	-.8046* (.0960)	-.4032* (0.1139)	-.1996* (.0919)	-.3076 (.1055)		
Reads		-.9755* (.1406)	-.8598* (.1705)	-.9578* (.1416)	-1.0126* (0.1351)	-1.3887* (.1544)
Water				-.2884* (.1357)		
Fields					.3810* (0.1076)	.1880 (.1083)
Fields*Reads						.4650* (.2136)
Urban*Reads			-.4798* (.2076)			
alpha	1.1992	0.9825	0.9749	0.9787	0.9863	0.9802

Wald Hypothesis Tests:

Test that Urban*Reads=0

P-value: **0.0217***

Test that Fields*Reads=0

P-value: **0.0305***

Both regression tables show that there is a causal relationship between literacy- the variable used for education- and fertility. Literacy, however, does not have the same effect on fertility for people engaged in subsistence production (represented by *fields*) and those who are not, based on the hypothesis tests from the negative binomial regression. The hypothesis test that among the literate, fertility rate for those who own a field is predicted to be the same as for those who do not was rejected at a 5% significance level. The ability to read has a smaller predicted correlation for those engaged in subsistence production as for those who are not. The same relationship was found in the hypothesis test that literacy has the same impact for those in urban areas as in rural areas. This is expected, as rural versus urban locality is nearly interchangeable with subsistence versus other economic activity- represented by *fields*. Additionally, while public health factors are accepted as having a strong impact on fertility rates, the variable *water* was not statistically significant in either type of regression.

Section 4

Conclusion

The results of this regression analysis confirm the hypothesis that Nigerien fertility decisions are in part a result of the type of economic activity that people are engaged in, and thus, not solely a result of education levels; but no conclusion can be reached from this research about the role of public health infrastructure in Nigerien fertility decision-making. Further research on this subject might explore other public health and education variables to obtain more robust results. For example, additional education might be measured through a variable that estimates years of formal schooling. Additionally, there are models that allow researchers to

calculate expected fertility rates of a population without waiting until those individuals are done with childbearing. This would allow for the inclusion of all surveyed women in the regression, which strengthens conclusions made from the regression. While the research in this thesis cannot definitively determine all factors and their degrees of impact on Nigerien fertility decision-making, a few things are clear: Education, Urban versus Rural location, and type of economic activity all have a correlation to fertility behavior in Niger; so Nigerien decision-making is a result of more factors than simply “lacking the knowledge or means.”

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