

**Association Between Fertility Rates
and Socioeconomic Status in Tunisia**

Nour Chida

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Committee:

Sheri D. Reder

Lloyd A. Mancl

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Abstract

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Nour Chida

Chair of the Supervisory Committee:
Clinical Instructor Sheri D.Reder
Department of Health Services

Background: After the launching of a family planning program in Tunisia in 1964, the fertility rate dropped from 7.2 births per women to 2.02 births per women in 2004. Tunisia has also experienced a significant improvement of its economy and its social indicators. However, marked disparities still persist between the industrialized coast and the disadvantaged western inland.

Objective: To examine the association between 12 socioeconomic status (SES) indicators and the fertility rates of Tunisian women in each of the 24 governorates.

Methods: This descriptive, cross-sectional study used data collected and published by the Tunisian National Statistics Institute. Association between SES indicators and fertility rates variables were determined by the Pearson correlation coefficient and linear regression.

Results: Bivariate results show two indicators of high SES, percentage of women with higher education (slope = $-.191$) and percentage of villa type housing (slope = $-.185$), were negatively associated with fertility rates ($p < .05$). Two indicators of low SES, percentage of illiterate women (slope = $.131$) and percentage of dwellings with only one room (slope = $.169$), were positively associated with fertility rates ($p < .05$). Surprisingly, in a multivariate analysis, after adjusting for the other SES indicators, the lack of access to potable water was negatively associated with fertility rates (slope = $-.222$; $p = .014$). Among all SES indicators, the percentage of women with higher education showed the strongest bivariate association ($R^2 = 36.7\%$).

Conclusions: The fertility rate in Tunisia is low, with some of the poorest regions in the country having lower fertility rates than the national rate, mostly due to impressive family planning efforts. The Tunisian family planning program can be considered a successful model for other developing countries.

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Dedication

To women of Tunisia

Introduction

Tunisia, the northernmost country in Africa, is situated at the heart of the Mediterranean Basin at the crossroads of the Arab, African and European worlds (Figure 1). The majority of Tunisians are Arabized-Berber, speakers of Tunisian Arabic. Islam is the dominant religion. Smaller than Washington State in size, the country is subdivided into 24 governorates (Figure A1). The coastal regions cover a third of the country, with 67% of the population and 90% of industrial activity (1).

In 1964 Tunisia launched a family planning (FP) program to reduce fertility rates (average number of children per woman given current birth rates) and curb



Figure1: Tunisia at the heart of the Mediterranean basin

population growth. When the program started the fertility rate was 7.2 births per women (2), dropping to 2.02 births/woman in 2012. Happening at the same time, impressive improvements of the country's social indicators and economic performances. Despite these achievements, marked disparities still persist between the industrialized eastern coast and the disadvantaged western areas.

The main objective of this study is to examine the association between socioeconomic status (SES) and the fertility rate of Tunisian women in each of the 24 governorates. Very little information on this relationship is available for the country. Indicators of low socioeconomic status in each governorate are women's illiteracy, houses lacking sanitary equipment, dwellings with only one room, and rudimentary dwellings, male unemployment, needy families, no access to potable water and no electricity. Indicators of high socioeconomic status in each governorate are male employment, women with higher education, houses with 5 rooms and over, and villa type housing.

The literature on the relationship between SES and fertility rates indicates that there are two contrasting types of relationships between fertility and social class. In the majority of studies, these variables are inversely related; that is, the fertility decreases with increase in socio-economic position. But in a few studies, the variables are positively related.

Background and Significance

When Tunisia gained independence from France in 1956, poverty rates were high (estimated at 40%); the country was largely rural and agricultural, with a limited industrial base and few natural resources, and overpopulation was believed to be a major obstacle to socioeconomic development. The adoption of family planning program was necessary to curb population growth, reduce poverty, and improve human development. Under the direction of president Bourguiba, Tunisia became the first Arab and African country to adopt a specific population policy (3).

A family planning program emerged as an organized entity with the introduction of an experimental program in 1964, this experimental phase subsequently developed into a national family planning program in 1966. At the same time the government promoted education for girls and employment for women, encouraged social and economic development, and invested in education. Religious leaders supported the program and encouraged the use of contraception. In 1965, Tunisia was the first Muslim country to liberalize its abortion law, and it still stands apart, along with Turkey, among Islamic countries in legalizing the procedure (3).

The roots of Tunisia's pioneering role in women's affairs reach back to the beginning of the 20th century. It was then that a modernizing Islamic reformer, Tahar Haddad, a scholar of Zitouna University, called for freeing women from all of their traditional bonds. In a book entitled "Our Women in the Sharia and Society", published in 1930, he advocated formal education for women and maintained that over many years Islam had been distorted and misinterpreted to such an extent that women were no longer aware of their duties in life and the legitimate advantages they could expect (4).

Major social and family planning program developments 1959- 2012

After independence in 1956, family planning services were made available free of charge and modern methods of contraception were also made available. The IUD was the most popular contraceptive method, followed by female sterilization and the pill (6). The Tunisian Family Planning Association was created in 1968 under the leadership of Dr. Tawhida Ben Cheikh, the first Tunisian and Arab female gynecologist, with the support of the International Planned Parenthood Federation (6).

The Tunisian government has put forth considerable effort to promote family planning, but it also has upgraded the status of women. Families have been encouraged to send girls as well as boys to school.

Through the UNFT (The Tunisian Women's National Union) and with government encouragement, women have been urged to participate in the non-agricultural labor force of a modernizing society, in politics and in local organizations; women have been encouraged to get involved in something beyond the traditional homemaker, child-rearing role (7).

An article published in 1969 by Amor Daly discusses the legal changes of the ten years prior to 1969, which show the will of the national authorities to fight against fatalistic traditions and to promote any measure, including birth control, which will raise the standard of living (8). In addition to extension of voting rights to women, Daly cites six legal foundations of the family planning program:

- 1) The legal status of the woman, who acquires the rights of a complete citizen.
- 2) The freedom of information about contraception and of distribution of contraceptive products.
- 3) The limitations of family allowances to the first four children, to put an end to the pronatalist policy instituted in the time of the French protectorate.
- 4) Prohibition of polygamy.
- 5) The raising of marriage age, which is set to seventeen years for women and twenty years for men.
- 6) The legislation of abortion, for social reasons, in the first three months of pregnancy after the fifth child.

In 1970 RJ Lapham analyzed the effects of family planning program in Tunisia; he found that the downturn in the crude birth rate occurred shortly after the inauguration of national FP program. However, he suggested that only about one-third of the decrease in the birth rate could be attributed to accomplishments of the FP program. Occurring at the same time were changes in the age structure of the population, which led to smaller numbers of women in the peak reproductive ages, and changes in the social status of women, which included a sharp reduction in the proportion of married women in the age group 15-19 years old (7, 9).

The creation of the National Office for Family Planning and Development in 1973 marked the maturing of the program beyond family planning services and greatly strengthened its capacity. For the first time, a full-time professional staff was dedicated to the program. The new objectives included emphasis on the overall social well-being, an expanded training effort, economic and social research, and a broader public information and education program (6). Figure 2 shows the timeline for Population and Family Planning between 1956 and 1973.

Timeline for Population and Family Planning

1956–61: Legislation is passed to improve the status of women, including the right to vote and to remove the veil, the prohibition of polygamy, an increase in the minimum age of marriage, the provision of equal divorce rights, and the legalization of abortion after the fifth child and of female sterilization.

1962: The government's 10-year Economic and Social Development Plan urges reduced population growth rate to achieve economic and social goals. The government and Ford Foundation officials discuss collaboration in relation to population issues.

1963: Tunisian officials visit population and family planning programs in Asia. The government designs an experimental family planning program, emphasizing intrauterine devices.

1964: Tunisian officials visit U.S. population and family planning programs and attend the International Intrauterine Device Conference.

A national family planning conference is held.

The experimental family planning program begins.

A survey of knowledge, attitudes, and practices in relation to family planning is conducted.

Population Council technical assistance is initiated.

1965: Mobile family planning clinics are inaugurated.

The Neo-Destour Party and the National Women's Union become actively engaged.

1966: The National Family Planning Program is launched.

President Bourguiba, in a speech, expresses concern about reducing the population growth rate too rapidly.

President Bourguiba signs the United Nations Declaration on Population.

1967: Oral contraceptives are made widely available.

A postpartum program is initiated.

U.S. Agency for International Development assistance commences.

1968: The Tunisian Family Planning Association is launched.

President Bourguiba speaks in strong support of family planning.

1973: The National Office for Family Planning and Development is established.

The management of the Family Planning Program is strengthened, increasing the range of methods and improving education.

The abortion law is further liberalized, removing earlier restrictions.

Robinson, Warren C., and John A. Ross. [The Global Family Planning Revolution Three Decades of Population Policies and Programs](#). Washington, D.C.: World Bank, 2007

Figure 2: Timeline for Population and Family Planning 1956-1973

The abortion law was further liberalized in 1973, eliminating many restrictions on abortions. The new law made abortion available upon request free of charge for any women married or not, on the sole basis of her agreement with a legally practicing physician. However, the intervention must be performed during the first trimester of pregnancy. This legislation conforms to Islamic law. In Islam, the soul is believed to be breathed into the fetus at around 120 days from conception, after the bones are clothed with flesh; the fetus becomes a living human being after 4 months. After the first trimester, an abortion may be performed when there is a risk that the health or mental balance of the mother will be compromised by the continuation of the pregnancy or a risk that the unborn child will suffer from a serious disease or infirmity.

In 1974 more importance was given to sterilization. The number of sterilizations increased from 5,000 in 1973 to 10,750 in 1974 (10). As Tunisia witnessed significant political and social changes in the 1980s, the National Office for Family Planning and Development continued to expand. In 1981, an

outreach program was implemented to increase the use of contraceptives, this program aimed at improving and expanding rural health care services through mobile clinics, and implementing an information, education, and communication outreach program (11). In 1987, as President Ben Ali succeeded President Bourguiba, the support for the program was maintained (6). In 1988, the number of children entitled to receive family allowances was further limited to three.

A sustained multimedia advertising campaign assisted the national FP program from 1987 to 1992. Evaluation of the campaign showed that knowledge of FP methods increased to 100%, modern method usage increased from 39.4% to 46.7%, and husband-wife communication increased from 60% to 88% (5). Statistics showed a steady increase in contraceptive use from 12 percent in 1971 to 60 percent in 1994, an average increase of 2.1 percentage points per year over 23 years, which is well above the international average. Prior to 1998, the program was reaching out to women only (6). In 1998 Tunisia's government began educating men and school children about contraception; teaching sessions were conducted in many of the country's underprivileged areas "zones d'ombre", or "shadow zones," that remain largely untouched by modern life.

By 2006, the total fertility rate had decreased to two births per woman, below the replacement level fertility. Thus, in 40 years, Tunisia has fully achieved its goal of reducing fertility and achieving low population growth rates (6). Such changes have transformed Tunisian society. With fewer children to raise, women have become a bigger part of the work force (2).

Since the Structural Adjustment Plan (1986), Tunisia has sustained remarkable economic development with progressive liberalization and integration into global markets. During the period 1986-2006, the GDP increased more than six fold with an economic growth averaging nearly five percent per year (12). Tunisia was, however, still at a stage of development that did not offer sufficient opportunities for economic integration into the society and created incentives to emigrate. A survey in 2006 suggested that emigration would continue to play a role in Tunisia in the short term. Over 63% of respondents aged 18–40 years old said they were thinking of leaving Tunisia to live and work abroad. The survey clearly demonstrated that the main factors for emigration were a desire to improve the standards of living of individuals and their families, and a lack of sufficient job opportunities (13).

On January 14, 2011 President Zine El Abidine Ben Ali left power after a month of protests and violent confrontations that left over 200 dead. The social unrest and political turmoil that engulfed Tunisia indicated that despite the country's comparative economic success, key social and development challenges had not been addressed. The combination of regional disparities, youth

unemployment, conspicuous and predatory corruption, and political and economic disenfranchisement had created an untenable condition of discontent amongst Tunisians that erupted in a revolution, and ended the 23 year rule of the country's second President. At the heart of the problems that led to the Tunisian Revolution are the vivid inequalities between different regions of the country. Besides job opportunities, the coastal areas have the bulk of the infrastructure and amenities, whereas some regions of the western "interior" lack almost everything for its inhabitants to lead a decent life. Coastal regions tend to be wealthier in general, but these disparities are much more severe in Tunisia. Factories and employment prospects have long been concentrated along Tunisia's coast. The coastal regions cover a third of the country, with 67% of the population and 90% of industrial activity (1). Figure 3 shows marked disparities in the distribution of companies, mostly located on the coast. Graph 4 shows a barometer of regional development, based on several indicators: unemployment, density of enterprises, disparities men/women in the job market, rate of criminality, education, internet access and healthcare access. The scale is 0 to 1, higher values mean more development. This figure shows marked differences between western and eastern governorates. The capital Tunis is the most regionally developed and Kasserine is the least developed. Table 1 shows high rates of negative migration in the western part of the country, between 1999 and 2004, 45.3 thousand migrants left the north-west, and 52.5 thousand migrants left the center-west. The main reason for internal migration is work for men and family migration for women.

Since the January 2011 uprising, a peaceful transition of power has offered some political stability, but nothing has really changed for those young unemployed men and women who ignited the revolt. They are still unemployed, with little or no opportunities to climb the social ladder. Gaping economic and developmental discrepancies between the coastal region and the interior remain a key challenge for the new government.

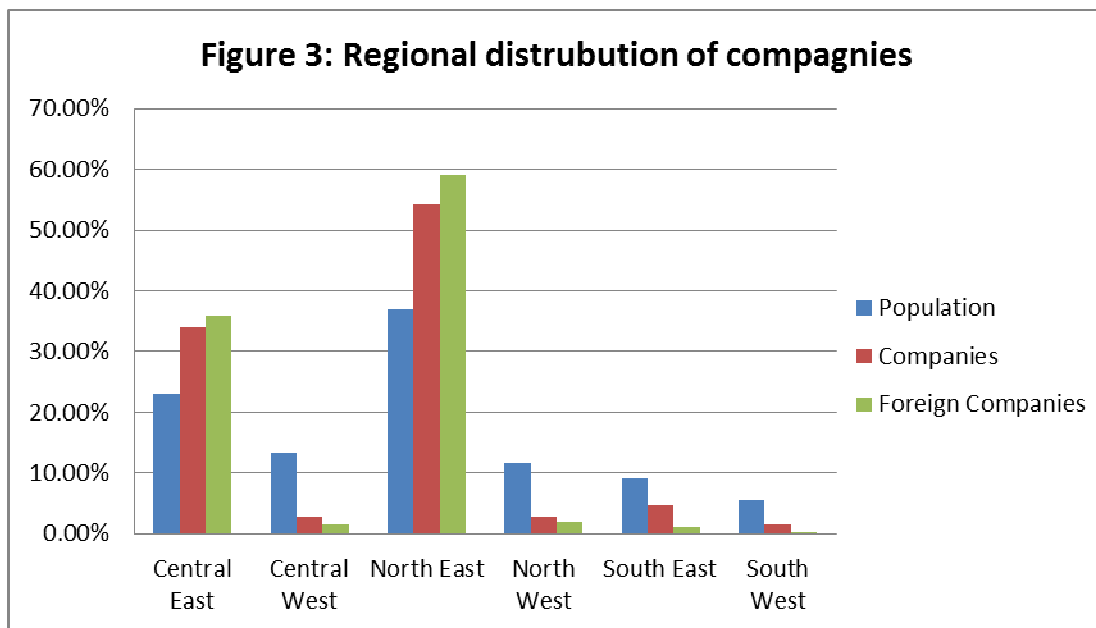


Figure 4: Barometer of regional development

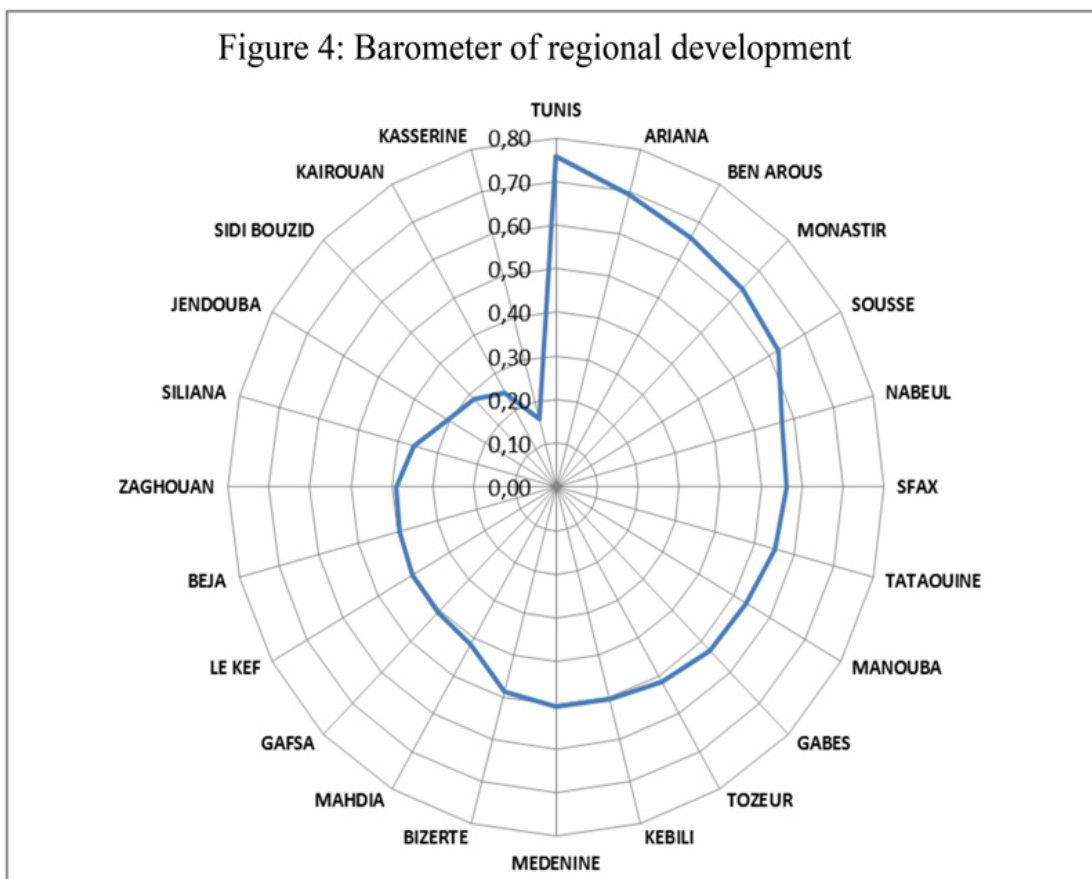


Table 1. Inter-governorate internal migration by region (1999-2004)

	Entering immigrants, thousand	Outgoing migrants, thousand	Net migration (1999-2004), thousand
Grand Tunis	200,3	141,8	58,5
North east	41,5	37,0	4,5
North West	25,2	70,5	-45,3
Eastern central	106,6	57,0	49,6
Western central	22,1	74,6	-52,5
South east	32,7	37,2	-4,5
South west	16,2	26,5	-10,3
Total	444,6	444,6	0,0

Relationship between socioeconomic status (SES) and fertility rates:

Socioeconomic status (SES) is a complex and multidimensional concept, usually measured by education level, occupation, income, wealth, and place of residence. The literature on the relationship between SES and fertility rates indicates that there are two contrasting types of relationships between fertility and social class. In the majority of studies, these variables are inversely related; that is, the fertility decreases with increasing socio-economic position (14). Wrong (1956) states "The higher fertility of the lower classes has been observed so often in so many different countries that the existence of a negative correlation between fertility and socioeconomic status has virtually acquired the force of a sociodemographic law" (15).

A few studies, however, have shown a more complex relation between fertility and socioeconomic status; the middle class usually having lower fertility than the poorest class, but the upper class having a higher fertility than the middle class and sometimes equaling or exceeding the lower classes (16). In terms of expected fertility pattern and desired number of children, Stycos (17) has found that women of the upper socio-economic classes in Peru want more children than do women of the lower classes. Thus, the so-called "sociodemographic law" does not appear to have universal validity. Comparing the Demographic Transition of Tunisia and Morocco, Ben Siddik pointed out that low fertility rates in Tunisia could be explained by Malthusianism: because of food scarcity, having more children is viewed as a threat to the immediate survival of the family (18). A study in 2000 exploring the association between poverty and fertility rates across different regions of Tunisia found that the least developed part of the country, the north-west, had the lowest fertility rates (19).

A study published in 1979 formed and analyzed 6 main classes of determinants of fertility and contraceptive use: demographic; sociopsychological; experiential or behavioral; informational, including knowledge about reproduction and birth control; husband and wife interaction; and environmental. In general, the following groups of individuals have relatively high fertility and/or relatively low or ineffective contraceptive use: low socioeconomic status, adolescents and people aged 40 years and older, Catholics and highly religious, rural, many siblings, unemployed women or working women who do not attach great importance to their careers; and ethnic minorities (20).

Education became a common SES indicator early in the 20th century and bypasses income/wealth in the 1950-1974 period as the most common measure of SES. In the period 1990-2006 for the whole world, highly educated women have 29.9% fewer children than women with low education, while highly educated men have 11.6% fewer children than low educated women (21). The results of another

study performed in the U.S indicate that more schooled couples have a wider knowledge of contraceptive methods; use more efficiently those contraceptive methods for which there is little information and large scope for misuse; and are better able to mitigate the effects of their biological constraints (fecundity) on their fertility compared to less-schooled couples (22).

The main objective of this proposal is to examine the relationship between the socioeconomic status and the fertility rate of Tunisian women. Little information on this relationship is available for Tunisia. This study will examine fertility variations across the country and explore SES factors influencing fertility levels. Results will allow us to better understand the variations of fertility levels across the country, and will be useful for policy making and implementation strategies of family planning programs in different areas according to their socioeconomic status indicators.

Methods

Design

This is a cross sectional study, examining the association between fertility rates and 12 socioeconomic indicators in 24 different governorates in Tunisia. Indicators of low socioeconomic status in each governorate are: women's illiteracy, houses lacking sanitary equipment, dwellings with only one room, and rudimentary dwellings, male unemployment, needy families, no access to potable water and no electricity. Indicators of high socioeconomic status in each governorate are male employment, women with higher education, houses with 5 rooms and over, and villa type housing. The fertility rates and the SES indicators for each governorate were collected by the Tunisian National Institute of Statistics (<http://www.ins.nat.tn/indexen.php>).

Research hypothesis

For the year 2004, fertility rates across the 24 governorates will be positively correlated with measures of low socioeconomic: illiterate women, houses lacking sanitary equipment, dwellings with only one room, rudimentary dwellings, male unemployment, needy families, households with no access to potable water and households with no electricity. Fertility rates across the 24 governorates will be negatively correlated with measures of high socioeconomic status: male employment, women with higher education, houses with 5 rooms and over, and villa type housing.

Study Population

Inclusion Criteria

All 24 governorates of Tunisia with reported rates of fertility and SES for the year 2004. The results will be generalizable to the total Tunisian population to estimate fertility rate in lower versus higher socioeconomic characteristics of different governorates.

Sample Size / Power

With $n = 24$ governorate, the power is 80% to demonstrate a correlation of 0.55 or greater between the fertility rate and a SES indicator based on a two-sided test at 0.05 significance level.

Data Source

Data was collected and published by the National Institute of Statistics (NIS) which is the technical government agency responsible for the coordination and supervision of all public statistical activities taking place in Tunisia. The NIS was created in 1969; it's part of the Ministry of Development and International Cooperation; it is therefore a government agency whose personnel are government employees. It operates under government accounting rules and receives its funding from the State's general budget.

The NIS has the direct responsibility for the methodological design, the organization and supervision of all national survey and census operations, as well as the elaboration and compilation of basic social and economic indicators and the production of other basic statistical information. The NIS is responsible for the production of public statistics under appropriate quality and methodological standards, to ensure reliability and comparability of data obtained from many different sources and jurisdictions.

The NIS is headed by a Director General who is assisted by Deputy Directors General. It has six Departments:

1. Department of Social and Demographic Statistics, responsible for collecting and compiling primary data on social affairs, education, health, information and culture; and for conducting censuses and surveys as well as data processing, statistical and demographic analysis;
2. Department National Accounts Statistics; provides an overview statistic on the national economy;

3. Department of Economic Statistics, responsible for collecting and compiling data on agriculture, industry, commerce, construction, telecommunication, transport, tourism and environment.
4. Department of Statistics of Enterprises; gathers data on small, medium and large enterprises and presents them in an easily accessible format;
5. Department of informatics and coordination; responsible for the coordination between departments; dissemination of results and international cooperation.
6. Department of Regional Statistics; the NIS is represented at the regional level by six District Agencies (Fig.5).

The NIS has a total staff strength of 405 distributed amongst the six Departments (June 2005), 56% of them work in the regional offices.

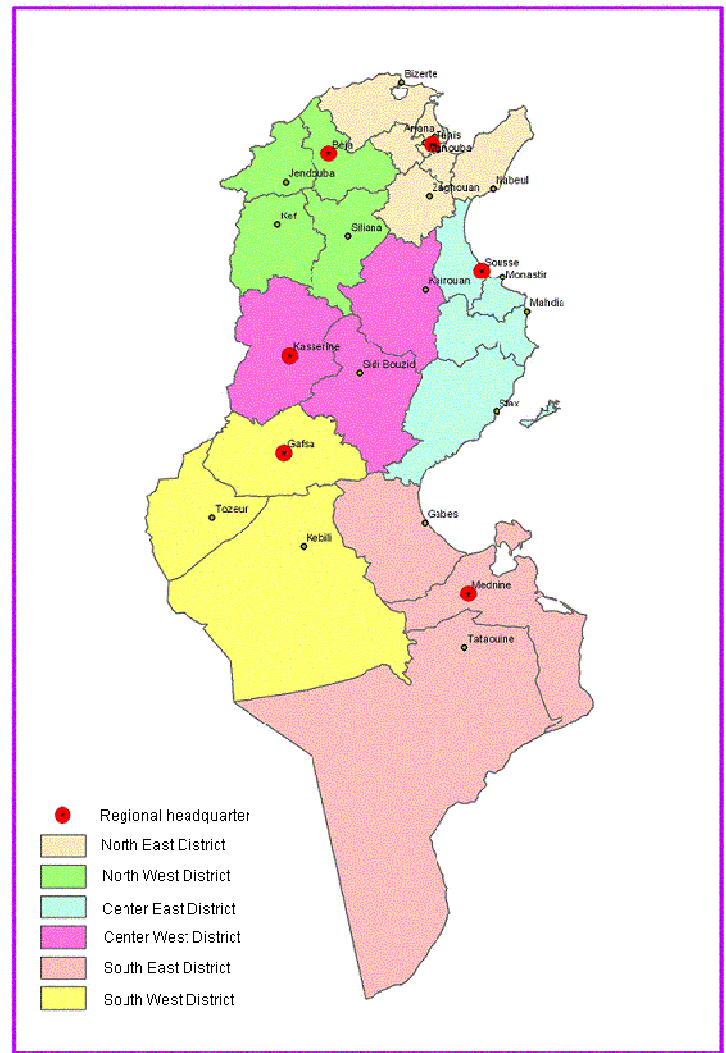


Figure 5. Regional headquarters of the NIS

Primary Variables

Fertility rates in the 24 governorates

Tunisia is divided into 24 units called governorates (Wilayah) for administrative purposes. The governorates are named after their capital city: Ariana, Béja, Ben Arous, Bizerte, Gabès, Gafsa, Jendouba, Kairouan, Kasserine, Kebili, Kef, Mahdia, Manouba, Medenine, Monastir, Nabeul, Sfax, Sidi Bouzid, Siliana, Sousse, Tataouine, Tozeur, Tunis, and Zaghouan (Figure A1). Fertility rate or total fertility rate (TFR) is the average number of children a woman would bear during her lifetime, assuming her childbearing conforms to her age-specific fertility rate every year of her childbearing years. Fertility rates range from more than 7 children per woman in developing countries in Africa, to around 1 child per woman in Eastern European countries. The fertility rates for married Tunisian women aged 15 to 49 that were recorded in 2004 for each governorate are used in this study (Table A1).

Women's illiteracy percentage in each governorate

Evidence from several studies showed that female education is an important factor as a determinant of fertility, even after controlling for related variables such as place of residence (rural or urban), income levels of households and educational levels of husbands. The distribution of illiterates aged 10 and more by governorate and age group is available (Table A2). The percentages of illiterate women of reproductive age (defined as ages 15 to 49) are calculated: for the age group 15 to 49, the total number of illiterates is divided by the total number of women aged 15 to 49 for each governorate (Table A3).

Percentage of houses lacking sanitary equipment in each governorate

Sanitation is the hygienic means of promoting health through prevention of human contact with the hazards of wastes. Hazards can be physical, microbiological, biological or chemical agents of disease. Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and feces. Sanitation is a serious issue that is affecting most parts of the world especially the developing countries. Lack of sanitary equipment is directly related to poverty. Also poor sanitation leads to sickness and disease, which lead to low productivity, and, consequently, to poverty. Numbers of dwelling units not containing a bathroom in each governorate is available (Table A4), percentages are calculated: for each governorate, number of dwellings not containing a bathroom divided by the total number of dwellings, the non-declared dwellings were not included (Table A3).

Percentage of dwellings with only one room in each governorate

Housing characteristics measure material aspects of socioeconomic circumstances. A one room only dwelling indicates that the owner does not have sufficient means to purchase extra space or can't afford construction/maintenance cost for extra rooms. Number of dwellings with only one room by governorate is available (Table A5), the percentages are calculated: for each governorate, the number of dwellings with only one room is divided by the total number of dwellings; the non-declared dwellings were not included (Table A3).

Percentage of rudimentary dwellings in each governorate

A rudimentary dwelling is a basic dwelling that has some but not all of the essential facilities of a conventional dwelling. It may be a room or a suite of rooms without some of the conventional dwelling facilities such as kitchen, fixed bath or shower, piped water or toilet. The number of rudimentary dwellings per governorate is available (Table A6), the percentages are calculated: for each governorate, the number of rudimentary dwellings is divided by the total number of dwellings; the non-declared dwellings were not included (Table A3).

Employment percentage for men in each governorate

Occupation as one component of SES, encompasses both income and educational attainment. Occupational status reflects the educational attainment required to obtain the job and income levels that vary with different jobs and within ranks of occupations. Data about working women is available, however, it won't be used in this study, given the fact that wealthy women and women with higher educational attainment might choose not work, and very poor women might be obliged to work. Women constitute only 26.6% of the workforce of Tunisia, the rate of working women is not a good indicator of SES. Distribution of the active male population over 15 years old by governorate is available (Table A7), percentages are calculated: for each governorate, the number of working males over 15 is divided by the total number of males over 15 (Table A8).

Percentage of women with higher education in each governorate

In the early 20th century, some urban families began to educate their daughters, and this trend gained a forceful momentum after independence (1956). A 1958 reform introduced the idea of generalized and free education from ages 6 to 14 for all, creating conditions for the massive schooling of girls. The comprehensive 1991 reform of the educational system made attendance for both girls and boys compulsory from ages 6 to 16, resulting in a dramatic increase in the enrollment rates to secondary schools. In 2009, 59.5% of university students were female (26). Education in Tunisia is free, but most universities are in the capital and on the coasts, low income student coming from the inland are

granted dormitories and very cheap meals for only one year, many quit university after that because they can't afford big cities' high cost of living (Table A9).

Percentage of houses with 5 rooms and over in each governorate

A family living in a house with 5 rooms and more belongs to the high SES category. Only richer people can afford to pay the extra space, the construction material to build all the rooms and the maintenance of such a home. Distribution of dwelling units by governorate with 5 or more rooms is available (Table A5), percentages are calculated: for each governorate, total number of dwellings with 5 rooms and over, divided by the total number of dwellings, the non-declared dwellings were not included (Table 8).

Percentage of villa type housing in each governorate

A villa type dwelling is usually a large house belonging to a well to do family; it's a sign of high SES. Distribution of villa type housing by governorate is available (table A6), percentages are calculated: for each governorate, the number of villa type housing is divided by the total number of dwellings; the non-declared dwellings were not included (Table A8).

Percentage of male unemployment in each governorate

Percentage of males without work that are actively seeking work (Table A10).

Percentage of needy families in each governorate

Conditions to be classified as needy are families with no support and no resources, families with no resources and whose breadwinner is incapable of working, and families whose revenue is insufficient given the family size (Table A10).

Percentage of households with no access to potable water

Potable water is water with microbial, chemical and physical characteristics that meet national standards on drinking water quality. Access to drinking water means that the source is less than 1 kilometer away from its place of use and that it is possible to reliably obtain at least 20 liters per member of a household per day. Percentages of household with access to potable water are available, and percentages of households with no access to potable water were calculated: 100- percentage of household with access to potable water (Table A10).

Percentage of households with no electricity

Households with no access to electricity are dependent on traditional energy options, such as fuel wood, charcoal, agricultural wastes and animal dung. Percentages of households with electricity are available, and percentages of household with no electricity were calculated: 100- percentage of households with electricity (Table A10).

Statistical Analysis

The fertility rate (number of children per women) and SES indicators (prevalence) are reported for each of the 24 governorates, as well as the mean, standard deviation, and minimum and maximum values. The Pearson correlation coefficient was used to describe the association among the SES indicators, and bivariate and multivariate linear regression was used to determine the association between fertility rates and the SES indicators. Due to severe collinearity among several of the SES indicator variables it was not appropriate to report the multivariate linear regression results with all SES indicator variables included in the multivariate linear regression model. To determine which SES indicators to include in the multivariate linear regression model, all variables were included in the model and then eliminated in sequential fashion until severe collinearity among the independent variables was no longer evident, as determined by a variance inflation factor (VIF) of less than 5 for all variables (24).

Results

Fertility rate and SES characteristics of the 24 governorates

The average (standard deviation [SD]) fertility rate among the 24 governorates is 2.07 (.31) (Table 2). Within the 24 governorates the fertility rate is the highest in Zaghouan at 2.63 children per women and the lowest in Ariana at 1.52 (Table 3 and Figure 6).

Percentage of illiterate women is the highest in Kairouan (41.1%); Kairouan was historically a cultural center and a Muslim capital of learning. The lowest percentage is in the capital Tunis (9.5%), and the average (SD) was 22.8% (9.8). Dwellings with no sanitary equipment are the highest in Kasserine (79.61%), the lowest in Medenine (18.94%) and the average (SD) was 46.2% (21.6). Dwellings with only one room are the highest in Kairouan (15.2%), the lowest in Ariana (2.9%) and the average (SD) was 7.4% (3.3). Percent of rudimentary dwellings, which are mostly located in slums, is the highest in Jendouba (1.8%), the capital Tunis has the third highest rate (1.5%), the lowest is in Sfax (0.3%) and the average (SD) is 0.8% (0.4). Percent of women with higher education is the highest in Ariana at

14% and lowest in Kasserine at 3% and the average (SD) was 6.02 % (3.08). Percent of villa type housing is the highest in Ben Arous at 63.36%, and the lowest in Kairouan at 11.83% and the average (SD) was 34.13 (14.06).

In general, Tunis and its neighboring governorates of Ariana and Ben Arous, along with the coastal governorates of Monastir, Sfax and Medenine have the highest rates of high SES indicators and lowest rates of the low SES indicators. The north-western governorates of Jendouba and Siliana, and the central-western governorates of Kasserine and Kairouan have the lowest rates of high SES indicators, and the highest rates of low SES indicators. A few notable exceptions are male employment that was highest in the neglected governorate of Beja. This apparent contradiction could be explained by high rates of migration of unemployed men from the northwest to the capital and other coastal towns. Other unexpected results are the high levels of needy families in the governorates of Tozeur and Kebili, which are not the poorest. These high rates might be due to the lack of knowledge of the rights to be registered as needy families in the poorest regions. Another exception is Tataouine which is not the richest but has the highest rate of dwellings with 5 or more rooms; this is due to the fact that Tataouine is the governorate where there are many Troglodytic below ground cave dwellings and other traditional Berber housing, all composed of many rooms.

Table 2. Summary of fertility rate and SES indicators

Measure	Mean (SD)	Minimum- governorate	Maximum- governorate
Fertility Rate	2.07 (0.3)	1.52- Ariana	2.63- Zaghouan
Illiterate women	22.8 (9.8)	9.47- Tunis	41.13- Kairouan
Dwellings with no sanitary equipment	46.2 (21.6)	18.94- Medenine	79.61- Kasserine
Dwellings with only one room	7.4 (3.3)	2.86- Ariana	15.23- Kairouan
Rudimentary dwellings	0.8 (0.4)	.32- Sfax	1.76- Jendouba
Employed men	67.8 (2.7)	61.35- Tataouine	72.39- Beja
Women with higher education	6.0 (3.1)	3.00- Kasserine	14.00- Ariana
Dwellings with 5 or more rooms	8.8 (3.0)	4.99- Siliana	15.99- Tataouine
Villa type housing	34.1 (14.1)	11.83- Kairouan	63.36- Ben Arous
Male unemployment	13.7 (3.9)	7.80- Monastir	21.00- Jendouba
Needy families	6.9 (4.1)	2.00- Ariana	16.30- Tozeur
No access to potable water	4.9 (5.8)	.00- Tunis-Monastir	19.60- Jendouba
No Electricity	1.3 (0.9)	.10- Tunis	3.30- Siliana

Figure 6. Boxplot showing fertility rates and labeling the highest and lowest rates

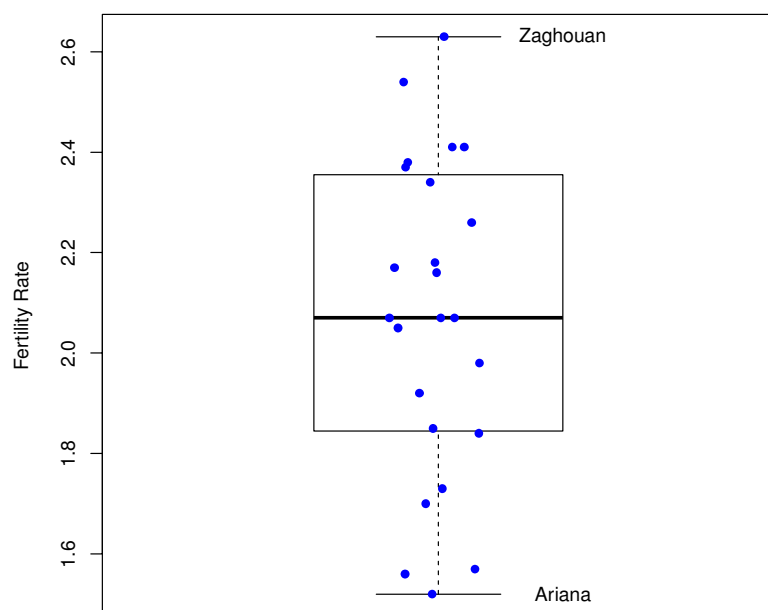


Table 3. Fertility rates (number of child per women) and SES indicators (%) in each governorate

Governorate	Fertility rate (Child/Women)	Illiterate women, %	Dwellings with no sanitary equipment, %	Dwellings with only one room, %	Rudimentary dwellings, %	Employed men, %	Women with higher education, %
Tunis	1.57	9.47	24.56	3.91	1.47	64.92	13.3
Ariana	1.52	13.96	21.82	2.86	0.45	69.44	14.0
Ben Arous	1.56	10.98	23.62	3.32	1.08	67.67	11.1
Manouba	1.70	17.68	44.74	3.46	0.44	68.32	6.9
Nabeul	2.16	16.80	37.14	7.38	0.60	72.31	5.6
Zaghouan	2.63	32.40	66.90	12.26	1.56	71.78	3.4
Bizerte	1.92	20.75	45.44	6.64	1.46	67.29	6.0
Béja	1.73	31.02	72.54	13.07	1.09	72.39	4.0
Jendouba	1.84	35.60	73.35	8.91	1.76	68.51	3.7
Le Kef	1.85	27.27	71.16	7.68	0.81	66.18	4.5
Siliana	1.98	32.49	76.94	9.58	0.58	68.29	4.2
Kairouan	2.38	41.13	70.29	15.23	0.88	67.07	3.8
Kasserine	2.54	38.80	79.61	12.02	0.76	68.86	3.0
Sidi Bouzid	2.41	39.62	74.01	10.62	0.72	65.38	3.1
Sousse	2.26	15.76	20.85	6.06	0.59	68.83	8.6
Monastir	2.41	10.44	20.53	4.80	0.59	68.19	8.5
Mahdia	2.37	28.56	38.92	9.14	0.50	67.68	4.0
Sfax	2.05	18.27	21.44	4.78	0.32	67.66	7.3
Gafsa	2.17	22.43	54.65	7.23	0.51	63.25	6.0
Tozeur	2.34	15.63	42.07	7.82	0.79	71.16	4.8
Kébili	2.18	16.70	28.30	4.80	0.48	66.20	5.0
Gabès	2.07	19.06	39.80	6.15	1.06	65.40	6.1
Médenine	2.07	15.87	18.94	5.27	0.65	68.00	4.1
Tataouine	2.07	17.43	41.21	5.23	1.00	61.35	3.5

Table 3 (continued). Fertility rates (number of child per women) and SES indicators (%) in each governorate

Governorate	Dwellings with 5 or more rooms, %	Villa type housing, %	Male unemployment, %	Needy families, %	No access to potable water, %	No Electricity, %
Tunis	10.24	34.32	12.8	2.6	0	0.1
Ariana	12.72	57.33	10.5	2	0.1	0.4
Ben Arous	9.58	63.36	14.7	3.1	0.7	0.4
Manouba	8.95	48.54	12.2	2.8	0.8	1.2
Nabeul	6.15	50.89	8.9	2.2	1.6	0.7
Zaghouan	6.02	29.00	20.1	10	3.2	2.5
Bizerte	5.47	58.63	15.7	5	7.8	1.5
Béja	5.43	28.26	14.8	7	12.9	2.6
Jendouba	6.33	40.99	21.0	9	19.6	2
Le Kef	7.09	27.15	19.6	12	11.3	1.5
Siliana	4.99	21.05	16.1	13	16.9	3.3
Kairouan	5.65	11.83	14.5	6.4	10.2	0.9
Kasserine	6.51	20.62	18.9	10.7	9.4	2.9
Sidi Bouzid	5.97	21.51	12.9	6.7	9.3	1.2
Sousse	8.52	39.69	10.1	3.2	0.3	0.3
Monastir	8.86	30.49	7.8	3.5	0	0.2
Mahdia	8.49	28.03	10.5	5.4	5.2	0.7
Sfax	8.24	44.07	9.7	2.2	1.9	0.7
Gafsa	10.86	23.83	18.5	10	1.5	1.4
Tozeur	10.67	21.25	13.3	16.3	0.2	0.5
Kébili	13.75	28.62	10.1	11.4	2.2	0.3
Gabès	13.74	15.40	14.0	6.7	1.1	1.8
Médenine	10.10	42.26	8.5	4.9	0.5	1.2
Tataouine	15.99	32.10	13.8	10.8	0.9	2.6

Bivariate associations with fertility rate

There is a positive association between the percentage of illiterate women and the fertility rate (slope = .131; p-value = .043), and 17.3% of the variation in fertility rates can be attributed to the variation in the percentage of illiterate women (Table 4). Having only one room is also positively associated with the fertility rate (slope = .169; p-value = .007); explaining 28.8% of the variation in fertility rates. The percent of villa type housing has a negative association with fertility rate (slope = -.185; p-value = .003); explaining 34.4% of the variation in fertility rates. The strongest association with fertility is a negative one with percentage of women with higher education (slope = -.191; p-value = .002), which explains 36.7% of the variation in fertility rates (Figure 7). None of the other SES indicators shows a significant association with fertility ($p > 0.05$).

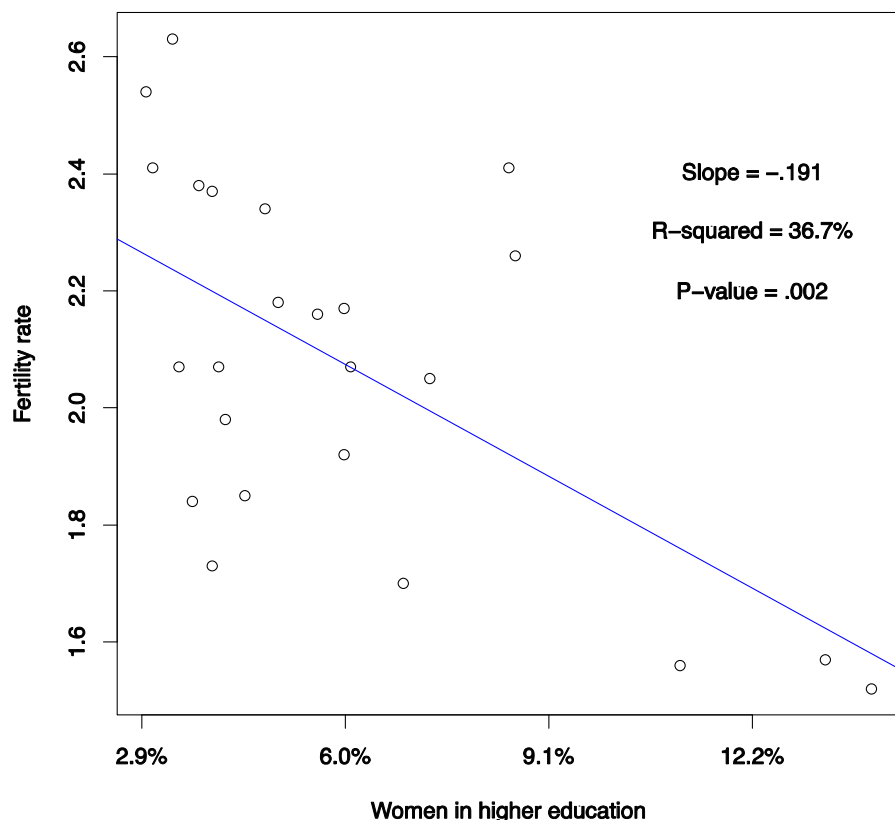
Table 4. Bivariate linear regression results for the association between fertility rate and SES indicators.

SES Indicator¹	Slope (SE)	p-value	R-squared
Illiterate women	.131 (.061)	.043**	17.3%
No sanitary equipment	.078 (.065)	.24	6.1%
Only one room	.169 (.057)	.007***	28.8%
Rudimentary dwellings	-.047 (.066)	.49	2.2%
Employed men	.028 (.067)	.68	0.8%
Women with higher education	-.191 (.053)	.002***	36.7%
5 or more rooms	-.058 (.066)	.39	3.4%
Villa type housing	-.185 (.054)	.003***	34.4%
Male unemployment	.004 (.067)	.95	0%
Needy families	.111 (.063)	.09*	12.5%
No access to potable water	-.004 (.067)	.95	0%
No Electricity	.042 (.067)	.54	1.7%

¹All SES indicators are divided the standard deviation; slope is expressed in standard deviation units

*P < 0.1, **P < 0.05, ***P < 0.01

Figure 7. Bivariate linear regression for percent of women in higher education



Correlation among the SES indicators

Several of the SES indicators are highly correlated with each other ($|r| \geq .70$; Table 5). There is a strong positive correlation between the percentage of illiterate women and dwellings with no sanitary equipment ($r = .90$), dwellings with only one room ($r = .90$) and people with no access to potable water ($r = .79$), and a strong negative correlation between percentage of illiterate women and women with higher education ($r = -.70$). A strong positive association is found between dwellings with no sanitary equipment and dwellings with only one room ($r = .82$), male unemployment ($r = .77$), no access to potable water ($r = .82$) and no access to electricity ($r = .74$). There is a number of other moderately strong associations between other SES indicators ($|r| = .5$ to $.7$; Table 5).

Table 5: Correlation between SES indicators

SES indicator	No sanitary equipment	Only one room	Rudimentary dwellings	Employed men	Women with higher education	5 or more rooms	Villa type housing	male unemployment	Needy families	No access to potable water	No Electricity
Illiterate women	.90***	.89***	.20	.10	-.70***	-.62***	-.54***	.59***	.40*	.79***	.61***
No sanitary equipment		.82***	.31	.09	-.67***	-.58***	-.53***	.77***	.57***	.82***	.74***
Only one room			.25	.30	-.69***	-.64***	-.62***	.49**	.41**	.65***	.53***
Rudimentary dwellings				.03	-.07	-.21	.05	.59***	.13	.34	.31
Employed men					-.04	-.53***	.20	-.07	-.09	.13	.02
Women with higher education						.33	.55***	-.36*	-.61***	-.52***	-.62***
5 or more rooms							.03	-.32	.04	-.65***	-.28
Villa type housing								-.26	-.62***	-.29	-.34
Male unemployment									.56***	.60***	.65***
Needy families										.38*	.52***
No access to potable water											.61***

*P < 0.1, **P < 0.05, ***P < 0.01

Multivariate associations with fertility rate

Multivariate linear regression results for the association between fertility rate and SES indicators are shown in Table 6. Three of the SES indicators, illiterate women, dwellings with no sanitary equipment and dwellings with only one room, are not included in the multivariate linear regression model due to severe collinearity (variance inflation factor ≥ 5) with no access to potable water. After adjustment for the other SES indicators, there is a significant negative association between the fertility rate and no access to potable water (slope = -0.222 ; p-value = 0.014) and 14.8% of the variation in fertility rates could be uniquely attributed to the variation in access to potable water. Percent of women in higher education (slope = -0.200 ; p-value = 0.018) and percent of villa type housing (slope = -0.139 ; p-value = 0.038) continue to show a negative association with the fertility rate after controlling for the other SES indicators. Taken together the nine SES indicators account nearly three quarters of the variation in the fertility rate among the governorates (R-squared = 73.6%). Three additional multivariate linear regressions were performed, where SES indicator no potable water was replaced with either the SES indicator for illiterate women, no sanitary equipment or dwellings with only one room, to determine how the exclusion of these variables affected the multivariate linear regression

results and whether any of these variables has an independent association with the fertility rate. None of the excluded SES indicators has a significant association with the fertility rate, and the linear regression results for the other SES indicators are similar to those shown in Table 6. In addition, the multiple R-squared for these additional regressions (59 to 66%) is less than the R-squared for linear regression model that included no access to potable water.

Table 6. Multivariate linear regression results for the association between fertility rate and SES indicators

SES Indicator ¹	Slope (SE)	p-value	Partial R-squared
Rudimentary dwellings	.002 (.058)	.98	0%
Employed men	.005 (.067)	.94	0%
Women with higher education	-.200 (.075)	.018**	13.5%
5 or more rooms	-.142 (.090)	.14	4.7%
Villa type housing	-.139 (.061)	.038**	9.9%
Male unemployment	.002 (.092)	.99	0%
Needy families	.016 (.088)	.86	0.1%
No access to potable water	-.222 (.079)	.014**	14.8%
No electricity	-.045 (.072)	.55	0.7%

Constant (SE) = 2.074 (0.042); R-square = 73.6%

¹All SES indicators are mean centered and divided the standard deviation; slope is expressed in standard deviation units

*P < 0.1, **P < 0.05, ***P < 0.01

Discussion

Fertility and wealth are usually correlated; countries with the highest fertility rates are among the poorest (with lowest GDP per capita) and low fertility countries typically tend to be rich (with highest GDP per capita). Tunisia is a developing country and had a low fertility rate of 2.02 births/women in 2012. Surprisingly, this study of the association between fertility rates and socio-economic status indicators shows that some of the poorest governorates in Tunisia have lower fertility rates than the national average.

Using data from 2004, the study shows that two poor governorates, Jendouba and Siliana have the highest rates of no access to potable water, and have lower fertility rates than the national average of 2.02 births/women (respectively 1.98 births/women and 1.84 births/women). These results concur with previous studies revealing that the poorest areas in Tunisia have low fertility rates (21-22). Outside of Tunisia, the poorest populations in other countries tend to have larger families. For example, farther south of Tunisia, Niger and Mali are among the world's poorest countries and both have high fertility rates. In 2004 their fertility rates were respectively 7.34 and 6.65 births per woman.

Why is Tunisia's case different? This phenomenon may be attributed to several factors, including Malthusianism theory and changes in family structure in the Tunisian society, but it's mostly due to the excellent family planning efforts that made it possible for the most destitute women to access birth control, enabling them to limit the size of their families. Malthusianism refers primarily to ideas derived from the political and economic thought of Thomas Robert Malthus. Malthus principle of population is the law of supply and demand applied to the relationships between food production and population growth. Malthus claimed that population growth is exponential while the food supply was expected to increase at a constant rate, hence populations have tendency to outstrip available food supplies. He argued that the mass of people would limit population increase when subjected to physical distress, such as a lack of food and other necessities, and felt that the fear of famine was a major motive to reduce birth rate. He thought that potential parents are less likely to have children when they know that their children are likely to starve, and due to food scarcity, having an extra mouth to feed would be viewed as a threat to the immediate survival of the family (25). The poor would therefore seek family planning and use contraception if it's accessible. "The Malthusianism of poverty" maintains that fertility can decline as result of poverty.

Even the most destitute in the Tunisian society have access to family planning services, where sterilization, abortion, birth control pills, IUD and other contraceptives are available free of charge. When Tunisia gained independence from France in 1956 poverty rates were high. The country was then largely rural and agricultural, with a limited industrial base and few natural resources, and overpopulation was believed to be a major obstacle to socioeconomic development. The adoption of family planning program was necessary to curb population growth, reduce poverty, and improve human development. Tunisia became the first Arab and African country to adopt a specific population policy. Tunisia was also the first Muslim country to liberalize abortion; it is legal to have an abortion as long as it is performed by a qualified practitioner within the first three months of pregnancy. Since its launching, the family planning program, it has received support from religious authorities, who have openly encouraged the use of contraception and devoted Friday sermons in mosques to reproductive health, claiming that Islam is for family planning. Backed by the government and several NGOs, the program continued to progress and expand through the use of mobile teams to bring the message to isolated rural areas, by limiting the number of children entitled to receive family allowances to three, and educating men and school children about family planning. Although birth rates have dropped in just about every developing country, the decline in Tunisia has been especially sharp. When the program started in 1964 the fertility rate was 7.2 births per women, and by 2012 it had fallen to 2.02 births per woman. Clearly, Tunisia's aggressive approach has been successful.

Changes in family structure in the Tunisian society have also contributed to the decrease in the birth rate. The 1956 Personal Status Code introduced radical changes to the organization of the family in Tunisia, including the abolition of polygamy, giving both spouses the right to initiate divorce, giving women the right to vote, and setting the minimum age for marriage to 17 for women and 20 for men. Families were encouraged to send their daughters to school and women were urged to participate in the non-agricultural labor force of a modernizing society. Women became progressively a bigger part of the workforce and more active in politics and local organizations, and started outnumbering men in universities. Women's emancipation happened even in the most remote areas of the country. It became common for young women to migrate from their rural home to a city for a job and to become the sole breadwinner in the family. Girls that used to be married off as soon as possible became salaried, providing regular and much needed income to the family. This societal change has revolutionized the traditional perception of women confined to their domestic homes. In 2004, the average age at first marriage for women was 29 years; for many women, education and economic independence have become more important priorities than marriage. In addition, in some rural areas, where families live in extreme poverty, microcredit lending started targeting women only, as men were unable to pay back their loans. Women turned out to be better entrepreneurs and most of them

were successful at paying back the loans. Microloans empowered hardworking women in need. Men were not pleased with the change at first then accepted it and even became proud husbands as their wives were able to provide food and basic needs for the family. Over the last decades, the role of Tunisian women has evolved, with many social, economic and cultural changes contributing to the drop in fertility rate.

Even though fertility rates are low, the study shows there are some disparities between high and low socioeconomic indicators. In the bivariate linear regression analysis, two indicators of high SES, percentage of women with higher education and percentage of villa type housing, are negatively associated with fertility rates. Two indicators of low SES, percentage of illiterate women and percentage of dwellings with only one room, are positively associated with fertility rates. Highly educated women have lower fertility rates than illiterate women, with higher education women might be marrying at a later age, are busier with work other than childrearing work, and they also have a better understanding of the use of various contraceptive methods. High income families owning villa type housing have fewer children than lower income families owning dwellings with only one room; even though villas have more room for more children. This contradiction confirms the demographic-economic paradox, observing that nations or subpopulations with higher GDP per capita have fewer children, even though a richer population can support more children. In a multivariate analysis, which adjusted for the other SES indicators, the percentage of women in higher education and percentage of villa type housing remained negatively associated with fertility rates. Interestingly, after adjusting for the other SES indicators, the lack of access to potable water is negatively associated with fertility rates. Rural women are usually responsible for fetching and carrying heavy water containers, and often walk many kilometers to obtain water, a process that typically takes several hours a day. This strenuous job, which takes up valuable time and energy, might cause women to limit the number of children, and hence, explain the negative association between fertility rates and this low SES indicator.

Among all SES indicators, the percentage of women with higher education shows the strongest association with fertility rates, explaining over a third of the variation in fertility rates. A large body of research substantiates that higher education is consistently associated with lower fertility (29). Women's educational advancement is a powerful catalyst for sustained fertility decline. Schooling is mandatory and free for all students between 6 and 16 years old. However, illiteracy rates are still high in the poorest parts of the country. In Kairouan, historically a former capital of learning and sciences, female illiteracy is higher than 40%, the highest in the country. The poorest families are unable to buy basic school supplies; others do not send their daughters to school because of distance, and fear for their girl's safety, as many families in rural areas live in mountains or in forests far from

any public institution, and with no public transportation available. Many destitute villagers deprive their daughters from education, sometimes as young as 10 year olds, to send them to work as domestics in the capital or other big cities, guaranteeing a monthly income for the rest of the family. The main reasons for high female illiteracy rates are poverty and distant schools, caused by regional disparities, inflicted primarily by governmental discriminatory policies. The study reveals marked disparities between different regions of the coastal east and the rest of the country. The capital Tunis and other coastal governorates have the highest rates of high SES indicators and the lowest rates of low SES indicators. Whereas the inland areas of the center-west and north-west have the lowest rates of high SES indicators and the highest rates of low SES indicators. For example the percentage of household with no access to potable water is 0% in the eastern coastal governorates of Tunis and Monastir, versus 19.6% in the north-western governorate of Jendouba. Another example is the percentage of dwellings with no sanitary equipment which is 18.9% in the coastal governorate of Medenine versus 79.6% in the center-western governorate of Kasserine. The eastern coast is richer, more educated and developed than the western inland. The western inland is poorer, less developed and less educated than the eastern coast, explaining the higher illiteracy rates.

Tunisia's social and economic achievements in the last decade have masked these severe regional disparities in income and education, which still need to be addressed by the government. Sound macroeconomics alongside impressive social management accomplishments set Tunisia apart as one of the most robust performers in Africa, ranking as the most competitive economy of Africa in 2007, also ranking first in the Arab World and 29th globally (15). Tunisia's remarkable progress towards achieving the Millennium Development Goals (MDGs) led many to believe Tunisia is, by-and-large, a sustainable good practice development model (16). These accomplishments masked widening social inequality and regional disparities, misrepresenting the situation in the hinterlands where the revolution began. It took the self-immolation of a young unemployed man from Sidi-Bouzyd, a governorate where unemployment and poverty rates are unbearable, to trigger protests for more equitable distribution and access to employment, followed by a general revolution which led to the ouster of the Tunisian president Ben Ali in January 2011. Since the beginning of the uprising, Tunisians have enjoyed a flurry of newly-found freedoms such as freedom of expression, freedom to protest, and the freedom to form a political party, yet little has been done so far to address the deep-seated economic and social disparities. To address interregional inequality, the current and future governments need to design a comprehensive regional development strategy. They should promote private-sector development in the interior part of the country, and allocate state resources to regions based on socioeconomic criteria such as poverty rates. In 2010, the capital and the center-east had the bulk of private investments (77.4 %), and almost half of public investments were spent in the capital

and the north-east. Government expenditure on public schools also differs from a governorate to another, which affects women's literacy. For example, the coast has more schools per million inhabitants, more teachers per 100 students, and higher expenditure per student. With less human and material resources allocated for public schools in the west, kids have crowded classes in poorly equipped schools and have longer distance to walk to school contributing to higher illiteracy rates especially among girls.

The revolution's newly found freedom has also led to more religious freedom, including religious extremism, which had been ruthlessly suppressed by Tunisia's old regimes. The country has witnessed an intrusion by the Wahhabi/Salafi sect, which has taken over many mosques, mostly in poor neighborhoods. Founded in the 18th century in Saudi Arabia, the Wahhabi/Salafi ideology is ultra-conservative and pronatalist. Although the Salafist component in Tunisia remains a small minority, it is already threatening some women's access to abortion, education and work.

Tackling regional disparities remains the biggest challenge for the current government. Solving these disparities is complicated by an unstable economy and a difficult political situation, which has been aggravated by the rise of Salafist movements. Reducing inequalities and extending educational opportunities to all Tunisian girls will not only reap vast rewards in reducing population growth, but also contribute to economic productivity. Tunisia has been successful in providing access of the rural, poor, and least educated to family planning, giving all women control over the size of their families. The fertility rate in Tunisia is low, but some of the poorest regions in the country have lower fertility rates than the national rate. The Tunisian family planning program can be considered a successful model for other developing countries, like many poor sub-Saharan countries where fertility rates are still higher than 6 births per women.

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Appendix

Figure A1. Tunisia's political map showing the 24 governorates



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