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FERTILITY, MARRIAGE AGE, AND CONTRACEPTIVE USE IN CENTRAL ASIA AND NORTH AFRICA: A COMPARATIVE STUDY

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Abstract. This article aims to compare fertility, first age at marriage, family planning, and contraceptive use in Central Asia and North Africa. Factors such as education level, access to contraceptives, religious beliefs, and demand for family planning were analyzed. Rural areas have lower fertility rates than urban areas. In Egypt, the age of first marriage differs from rural to urban areas. Despite the quality of life in urban areas, the rate of first marriage is higher than in rural areas. The results also revealed that Morocco and Kyrgyzstan vary in fertility, Morocco has the highest age at first marriage and Kyrgyzstan has the lowest. The general fertility rate in Tunisia is the lowest in all countries indicating successful government efforts to reduce fertility. However, Kyrgyzstan has the highest fertility rate, with a decrease from 3.9 children per woman in 2011 to 3.05 in 2020. Hence, substantial investigations are needed due to the increase in population of some countries taking into consideration all factors.

Key words: family planning, urban area, fertility, Central Asia, North Africa

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Научная статья

РОЖДАЕМОСТЬ, БРАЧНЫЙ ВОЗРАСТ И ИСПОЛЬЗОВАНИЕ КОНТРАЦЕПЦИИ В ЦЕНТРАЛЬНОЙ АЗИИ И СЕВЕРНОЙ АФРИКЕ: СРАВНИТЕЛЬНОЕ ИССЛЕДОВАНИЕ

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Аннотация. Цель данной работы — сравнить показатели рождаемости, возраста вступления в первый брак, использования контрацепции в странах Центральной Азии и Северной Африки: Кыргызстане, Таджикистане, Узбекистане и Казахстане, Египте, Алжире, Тунисе и Марокко. Результаты исследования показали, что в Марокко самый высокий возраст вступления в первый брак, а в Кыргызстане — самый низкий. В целом в сельских районах уровень рождаемости ниже, чем в городах. Общий коэффициент рождаемости в Марокко составляет 2.35, что свидетельствует об успешных усилиях правительства по снижению рождаемости. Коэффициент рождаемости в Тунисе — самый низкий среди всех стран. На рождаемость влияют такие факторы, как уровень образования, доступ к контрацепции, религиозные убеждения и спрос на услуги по планированию семьи. В Египте возраст вступления в первый брак варьируется в зависимости от места проживания, причем в городских районах он выше, чем в сельской местности. В Кыргызстане самый высокий уровень рождаемости, который снизился с 3.90 ребенка на одну женщину в 2011 г. до 3.05 в 2020 г. Данные показатели требуют серьезных исследований, поскольку население одних стран растет очень быстро, а в других странах его рост замедляется. Снижение рождаемости влияет на численность населения с учетом всех остальных факторов.

Ключевые слова: планирование семьи, городские районы, рождаемость, Центральная Азия, Северная Африка

Introduction

The demography of Central Asia has been highly investigated by many scholars, namely in terms of marriage, contraceptive use, and other factors. Some scholars have focused on the demographic transition period after the disillusion of the Soviet Union.

Some articles explored one country in their investigations, for instant "Between tradition and modernity: marriage dynamics in Kyrgyzstan" [Nedoluzhko, Agadjanian, 2015]; "Understanding marriage and fertility in Uzbekistan" [Agadjanian, Makarova, 2003]. Also, some other studies compared two or three countries in Central Asia and the former Soviet Union [Agadjanian et al., 2013]. While another article compared Kazakhstan, Uzbekistan, and Kyrgyzstan in terms of nuptiality [Dommaraju, Agadjanian, 2008].

On the other hand, a study explored fertility in North Africa particularly in Egypt [Zalak, Goujon, 2017]. In a comparative study of the fertility of Moroccan women in the Netherlands, Schoorl discovered that educated migrant Moroccan women tend to have lower fertility than those women who live in Morocco [Schoorl, 1990]. Tunisia is another example in North Africa, where family planning strategy was examined [Lecomte, Marcoux, 1976; Faour, 1989].

In expanding the existing knowledge, the author compares Central Asia with North Africa. This article nominates these countries due to the reciprocal Islamic background where fertility could be impacted [Ouadah-Bedidi, Vallin, 2013; Eltigany, 2001; Dommaraju, Agadjanian, 2008; Eickelman, 1998; Khazanov, 1995; Faour, 1989]. Therefore, the prohibition of the use of contraceptives, the age of first marriage, and family planning are considered significant factors in fertility. Thus, this study selects Tajikistan, Kyrgyzstan, Uzbekistan, Kazakhstan, Algeria, Morocco, Tunisia, and Egypt. This selection contributes to a vital understanding of fertility in the nominated countries that have common Muslim inhabitants.

The article analyzes the available data for a period of 10 years (2010—2020). The author examines sociocultural, and socioeconomic factors, plus the influence of Islam based on existing scholarships [Eickelman, 1998; Khazanov, 1995]. The study employed secondary quantitative data which was already published on the official websites of these countries in addition to other websites. So, descriptive analysis was applied to indicate fertility, contraceptive use, and the first age of marriage. Tunisia has the lowest overall fertility rate among all countries, indicating successful government initiatives to reduce fertility.

This article starts with an introduction to the chosen theme. The second section reviews the previous study. The third section is data and the method. Section four presents the result. The last section discusses the findings and provides recommendations.

Reviewing the existing knowledge and theoretical framework

The most appropriate theory to be applied in this study is social change theory. This theory is defined as the main heading in politics, economics, and culture change in a society. So, it could be fitted to this study because all of the selected countries have a cross-cultural border in that they are united by Islam [Eickelman, 1998; Khazanov, 1995; Ouadah-Bedidi, Vallin, 2013; Eltigany, 2001; Dommaraju, Agadjanian, 2008; Faour, 1989]. However, it is important to state that each country belongs to a different continent. Furthermore, this scope allows comparisons to be made across countries that share similar Islamic beliefs [Agadjanian, Makarova, 2003].

The Islamic religion plays a fundamental role in the distribution of contraceptives in developing countries [Agadjanian, 2001]. The relationship between religion and nature

is structured in such a way that studies still express different opinions on this matter (e. g.: [Johnson, 1997]). Among scientific works related to religion and nature, it is worth highlighting the study of Victor Agadjanian, which was published in 2001 [Agadjanian, 2001]. This study revealed that religion has no pronounced effect on fertility [ibid.]. Another study brings to the fore the idea that childbearing and nuptiality are closely related [Faour, 1989]. Muslims believe in the reproduction of children [ibid.]. However many people may not accept the use of contraception. And this is the reason behind the probability of having a second or third child which was discussed in Kazakhstan [Agadjanian et al., 2008]. Moreover, the increase in fertility was observed in the rural areas where the influence of Islam was more prominent than in the urban cities. Another reason is the inaccessibility of modern contraceptives and the lack of access to education for women [Eickelman, 1998].

Strategy for controlling the fertility

Uzbekistan supports the reduction of fertility, while Kazakhstan encourages childbearing. Fertility differs by country of residence and ethnicity. For example, the Uzbeks and Tajiks who live in Tajikistan have higher fertility rates than the Uzbeks who live in Uzbekistan [Nedoluzhko, 2012]. Uzbekistan is the most populated country in Central Asia with 33 million inhabitants. In contrast to this, the government of Uzbekistan tried to increase fertility but it dropped dramatically due to socioeconomic factors [Eickelman, 1998; Khazanov, 1995]. This occurred in 1970 when there were a lot of abortions in the country. The government tried to prevent abortion and protect women's health, so the government promoted the use of oral contraception. Kazakhstan comprises multiethnic groups which include; Europeans, Russians, and Central Asians, so it is easier to apply family planning [Dommaraju, Agadjanian, 2008]. Some countries support the abortion of unwanted pregnancies to reduce fertility [Schoorl, 1990].

Tunisian government adopted a strategy of family planning in 1960—1973 to reduce fertility and achieve a case of 4 children per woman, whereas in Morocco policymakers encouraged family planning and abortion [Lecomte, Marcoux, 1976]. Similarly, in 1983 the Algerian government adopted a policy to reduce the growth of the population [Ouadah-Bedidi, Vallin, 2013].

However, in Egypt in 1990, the fertility was 6.6 children per woman. Then in 2008, it dropped to 3.0. But in 2014, it increased to 3.5 (Table 1). It is important to state here that the Egyptian government proposed a reduction in its fertility from 3.5 to 2.4 per woman by 2030. This proposal was supported by the project of Itnein Kefaya (two are enough) in 2014 [Eltigany, 2001]. The fertility rate in 2020 was 2.96 children per woman [Ambrosetti et al., 2019]. This project was proposed and undertaken because Egypt is the most populated Arabic country in North Africa with 107 million in 2020 (Table 2).

Table 1

Fertility rate number of children (birth per woman), 2011—2020

Items	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average by country	Regional average
Kyrgyzstan	3.90	3.15	3.11	3.19	3.19	3.06	2.95	3.28	3.33	3.05	2.94	7.58
Kazakhstan	–	–	2.64	2.73	2.74	2.77	2.73	2.84	2.90	3.13	1.97	
Uzbekistan	2.12	2.10	2.25	2.33	2.35	2.28	2.21	2.33	2.43	2.46	2.06	
Tajikistan	2.91	2.78	2.59	2.78	2.81	2.66	2.66	2.54	2.56	2.54	2.45	
Algeria	2.88	2.95	2.95	3.00	3.04	3.05	3.05	3.02	2.98	2.94	2.72	7.87
Tunisia	2.91	2.21	2.24	2.25	2.25	2.23	2.22	2.17	2.14	2.11	2.08	
Morocco	2.60	2.59	2.59	2.54	2.53	2.45	2.45	2.41	2.38	2.35	2.27	
Egypt	3.24	3.33	3.41	3.44	3.43	3.20	3.15	3.09	3.00	2.96	3.22	

Table 2

**Distribution of the population of Central Asia
and North African countries, 2011—2020**

Items	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Kyrgyzstan	5477620	5551888	5663133	5776570	5895062	6019480	6140200	6256730	6389500	6.523529
Kazakhstan	16440470	16673933	16910246	17160855	17415715	17669896	17918214	18157337	18395567	18.63177
Uzbekistan	29123367	29555365	29993531	30492812	31022525	31575332	32120463	32656660	33255538	33.905242
Tajikistan	7816000	7995000	8178000	8363000	8549000	8735000	–	–	–	9.543.2
Algeria	36543541	37260563	38000626	38760168	39543154	40339329	41136546	41927007	42705368	43.4516
Tunisia	11032528	11174383	11300284	11428948	115577779	11685667	11811443	11933041	12049314	12.1617
Morocco	32903699	33352169	33803527	34248603	34680458	35107264	35528115	35927511	36304408	36.6887
Egypt	89200054	912403	9337789	95592324	9772379	997840	10178938	10374076	10561867	107.465.0

Early marriage, and the age of first marriage in Central Asia and North Africa

This study investigates the age of first marriage in Central Asia and North Africa, focusing on the likelihood of having first and second children, and the importance of marriage in these regions. Early marriage was observed in the three Central Asian countries [Dommaraju, Agadjanian, 2008]. Dommaraju and Agadjanian examine nuptiality in Central Asia specifically Kazakhstan, Kyrgyzstan, and Uzbekistan. The aforementioned authors find an increase in the first age of marriage for young generations of post-Soviet dissolution. However, there is a decline in the first union age, due to socioeconomic and political factors. Although the marriage rate increased in Uzbekistan and Kyrgyzstan, it was not the same in Kazakhstan [Spoor, 1997].

Furthermore, traditional marriages were not affected in rural areas where the dominance of early marriage can be perceived [Brown, Snyder, 2006]. In Central Asia, married couples traditionally give birth to their first or second child at the beginning of their married life. This could most likely occur in their first or second year of marriage [Darsky, Scherbov, 1995]. In other words, early marriage and first childbearing are encouraged in the first two years of marriage. However, there are exceptions to this phenomenon because it mostly happens in developing countries. For instance in North Africa (Egypt, Morocco, and Tunisia), the first age of marriage was recorded as 18.5, 19.7, and 21.1 years [Singh, Samara, 1996; Eltigany, 2001].

Family planning in Central Asia and North Africa

Some countries oppose Malthus's theories which encourage family planning and decrease in fertility. For example, Uzbekistan supported the increase in fertility in the post-Soviet era [Barbieri et al., 1996]. A case study [Kazenin, Kozlov, 2020] examined the factors that boosted fertility in Kyrgyzstan. Kazenin and Kozlov indicated that labor market experience and education among females decrease their likelihood of becoming a mother. In a comparison of fertility in rural and urban areas, Isabekov observed that families in rural areas tend to have more children than in urban areas where having children depends on income level [Isabekov, 2016]. This action which was observed in rural areas is against Malthus theory.

The Tunisian government tends to decrease fertility by adopting a family strategy in addition to the rise of the legal age of first marriage. Tunisia and Morocco succeeded in promoting family planning in 1970 [Lecomte, Marcoux, 1976]. This promotion comprised the use of contraceptives. Tunisia had a powerful family planning program which ranked 40 out of 90 countries in 1982 [Cochrane, Guilkey, 1995; Lapham, 1970]. Similarly, Egypt distributed contraceptives amongst families to support family planning. This strategy which occurred from 1985 to 1995 was successful [Ambrosetti et al., 2019].

The impact of education on fertility in rural and urban areas

Many scholars indicate that the fertility rate in the rural areas is higher than in the urban city [Brown, Snyder, 2006; Ambrosetti et al., 2019; Agadjanian, Makarova, 2003; Nedoluzhko, Agadjanian, 2015; Isabekov, 2016].

The rural areas of Egypt reported a higher fertility rate than urban areas due to a lack of access to education [Ambrosetti et al., 2019]. The hypothesis that states that low education is connected with high fertility was globally observed and tested [Courbage, 1999; Zalak, Goujon, 2017]. Women with high education in urban areas, tend to control fertility more than women who reside in rural areas [Eltigany, 2001; Faour, 1989]. Therefore, the fertility in rural places is higher than what is obtainable in urban areas. More so, this takes into account socioeconomic and sociocultural factors. Educated migrant women expressed fertility decline in urban areas [Lecomte, Marcoux, 1976]. According to Eltigany, the birth rate in Morocco is declining due to socioeconomic factors such as the cost of living and cohabitation of two married couples and family members [Eltigany, 2001].

Investing in education and increasing the quality of life in rich families demotivate women to have more children [Amar, 2014]. In testing the impact of socio-educational factors on fertility in Tunisia, Audi and Ali explored the negative relationship between women's education and urban life on fertility [Audi, Ali, 2016]. This negative relationship reflects women's desire not to have a lot of children. Education influences women's fertility because the more years they spend on education, the less desire they have for childbearing. In contrast, Ouadah-Bedidi et al. argue that the decrease in fertility spread to rural areas rather than urban areas which have less quality of life and less education [Ouadah-Bedidi et al., 2012]. Similarly, Baschieri reveals the desire to limit childbearing, and that women in rural areas tend to limit their childbearing more than women in urban areas [Baschieri, 2007].

The use of contraception in Central Asia and North Africa

Meyer examined the use of contraceptives in Kyrgyzstan, as this method is prohibited in the country because families believe that it is against Islam [Meyer, 2011]. Abortion is considered illegal in the majority of the countries which was selected as a sample for the study. Although some women connected the use of oral contraceptives with cancer, policymakers still considered solving the issue of sterilizing women to control fertility in Uzbekistan [Barbieri et al., 1996].

Shekhar et al. examined the potential intent of women to use contraceptives after having their first child. The researchers discovered that to reduce fertility, it is needed to increase the awareness of using contraceptives among women and their partners in Kyrgyzstan [Shekhar et al., 2010]. However, in line with Islam, it is revealed that access to contraceptives is associated with marriage [Meyer, 2011]. Therefore, if a female is not married, contraceptives are prohibited. This means that sex outside marriage is also forbidden in Islam [Ouadah-Bedidim, Vallin, 2013; Zalak, Goujon, 2017; Ouadah-Bedidi et al., 2012].

In addition to the discourse on contraceptives, the government of Kazakhstan promotes the use of contraceptives to avoid abortion because it is linked to health complications in women [Agadjanian, 2002]. To buttress more on this issue, in Kyrgyzstan, 24.5 % of interviewed women were interested in having family planning more than their male counterparts who expressed opposition. This acceptance by women could reflect socioeconomic and sociocultural dynamic factors. Eltigany examined the use of contraceptives in Egypt among married women [Eltigany, 2001]. It is important to note that contraceptive use is related to the number of children and family size. Thus, Egyptian families intend to drastically reduce the fertility rate by 2030.

However, contraceptive use is higher in Tunisia and Morocco than in any other North African country [Lecomte, Marcoux, 1976]. In 1973, the Tunisian and Moroccan governments adopted a family planning strategy to decrease fertility through the Ministry of Public Health. Statistics as shown in a 1974 comparative study conducted on Tunisia [ibid.], indicate that 74,000 people use contraceptives in Morocco and 81,000 in Tunisia. To increase the labor participation of women in Tunisia, the use of contraceptives is being motivated [Frini, Muller, 2012]. The use of contraceptives in Tunisia has a negative outcome on fertility, hence the government strategy to reduce fertility was successful [Cochrane, Guilkey, 1995; Frini, Muller, 2012]. In Algeria, the government supported family planning and subsided contraceptives for married couples. However, fertility did not reduce because of government support but because of other associated socioeconomic factors [Ouadah-Bedidi, Vallin, 2013].

Research questions

This study compares Central Asia and North Africa in terms of fertility, contraceptive use, age at first marriage, and family planning. So, the article addressed the following questions:

1. To what extent does family planning strategy effectiveness and the use of contraceptives reduce fertility in North Africa and Central Asia?
2. To what level do North Africa and Central Asia reduce fertility?
3. What is the fertility rate in urban cities as compared to rural areas?
4. How does education affect fertility in North Africa and Central Asia?

Data and method

The study employed the most advanced recent Demography and Health Survey (DHS) [Department…], and Multiple Indicator Cluster Survey (MICS) [Multiple Indicator…] data for the selected countries [Kazenin, Kozlov, 2020]. This data differs from one country to another. The study analyzed Kyrgyzstan DHS which was conducted in April and June 2014. The DHS survey involved 6,854 women aged 15—49. The recent MICS for Kyrgyzstan conducted in 2020 that interviewed 3,869 women aged 15—49. Tajikistan's recent DHS was conducted in 2017. It interviewed 10,718 women aged 15—49. The recent MICS for Tajikistan was conducted in 2005. It was interviewed 10,243 women aged 15—49. Kazakhstan's DHS interviewed 4,800 women aged 15—49 in 1999. For Kazakhstan's recent MICS that took place in 2015, it was interviewed 12,670 women aged 15—49. Uzbekistan's recent DHS was directed in June—October 1996. It interviewed 4,415 women. The recent MICS in Uzbekistan was conducted in 2021—2022. It interviewed 4,180 women aged 15—49.

For North Africa, the study employed recent Egyptian DHS which was completed in 2014 and contains 21.000 married women aged 15—49. The survey contains information about fertility, place of residence, education, and family planning. The most recent MICS in Egypt was conducted in 2013—2014 and surveyed 7,046 women. Among them, 5,847 ever-married women (age 15—49 years) were identified. Morocco's recent DHS interviewed 9,398 women in 2003. Tunisia's most recent DHS was conducted in 1983

which involved 2260 married women. The MICS, conducted in Tunisia in 2018, surveyed 10,559 women aged 15–49 years. Algeria's most current MICS was conducted in 2018, it was interviewed 35,111 women aged 15—49. The DHS provides valuable information on interviewed women, including age at first marriage, family planning, contraceptive use, modern methods, place of residence, fertility, and other socio-demographic variables. The researcher analyzed the population census from 2010 to 2020 [Spoorenberg, 2013]. Population census is conducted every 10 years to better know the population dynamics and other national characteristics worldwide [Dommaraju, Agadjanian, 2008].

This article acknowledges the limitation of the data for some countries which do not have cohabitation which was a little bit hard to analyze. It should also be noted that data was difficult to obtain. Therefore the analysis is based on the age at first marriage and then the use of contraceptives, family planning, and fertility which is linked to formal marriage in Muslim regions. Another possible limitation women may not declare their religion during interviews, as in Kazakhstan, 29.2 % of its population are Russians. The data collected during interviews may not accurately reflect women's awareness of contraception, which could limit the effectiveness of testing the use of contraception in all countries. The last limitation relates to Muslim views on the use of contraception in Islam in general. Why do some countries accept to use, while others do not accept the use?

Results

Regression analysis was not conducted due to unidentified full survival time for some censoring [Box-Steffensmeier, Jones, 1997; Hosmer, Lemeshow, 1999]. This article descriptively analyzed the age at first marriage, the use of contraceptives, and fertility. The author combined all the data in one single dataset to enable the researcher to carry out the analysis despite the limitations. To strengthen the findings, data was collected from different websites, including DHS, World Bank data, and the United Nations International Children's Emergency Fund (UNICEF).

The demand for family planning in Central Asia and North Africa

In 2014, the demand for family planning in urban areas in Egypt was 81.4 %. This was the highest in the selected group (Central Asia and North Africa). While Kazakhstan recorded 69.5 %, Kyrgyzstan scored 62.1 %. Similarly, the demand for family planning in urban areas in Morocco was 72.8 %, whereas Uzbekistan had the highest demand for family planning in Central Asia with a total of 72.2 %. Tajikistan had the lowest for all the selected groups with a total of 57 %.

The demand for family planning in rural Egypt was 79.2 %. This happens to be the highest among all the selected countries. Kazakhstan scored 65.8 %, while Kyrgyzstan recorded 61.9 %. Morocco has 73.7 %, while Tajikistan has the lowest at 50.6 %. The demand for family planning in rural areas of Uzbekistan peaked at 75.4 % (the highest in Central Asia).

However, in 2014, the demand for family planning amongst uneducated women in Egypt was 79.2 % (the highest among all countries). Morocco has a score of 72.6 %, while Tajikistan has a score of 44.4 % (the lowest in the group). It is important to state here that Kazakhstan, Kyrgyzstan, and Uzbekistan did not have any valid data on uneducated women.

In 2014, the demand for family planning among women with primary education in Egypt was 79.8 % (the highest in our comparison). While Morocco had 76.6 %, Tajikistan had 41.1 % (the lowest of all selected countries). Kazakhstan, Kyrgyzstan, and Uzbekistan had no valid data on women with primary education.

In Egypt, the demand for family planning among women with secondary education was 80.4 % (the highest of all countries). Kazakhstan had 66.6 %, while Kyrgyzstan had 60.9 %. Morocco had 74.7 %, while Tajikistan had the lowest of all countries with 51.5 %. Uzbekistan had the highest score in Central Asia with 74.3 %.

Egypt has the highest demand for family amongst women with higher education 79.9 %, followed by Kazakhstan at 72.4 % which is the highest in Central Asia. Uzbekistan had 72.2 %, Kyrgyzstan had 63.3 %, whereas Morocco had 60.7 %. Tajikistan had the lowest with 58 %. There are no statistics available for Algeria and Tunisia.

The use of contraceptives in Central Asia and North Africa

The use of contraceptives varies in quite a few ways. This includes the year of the survey within the same nation and between countries, women in urban and rural areas, and level of education. For example, in 2008, contraceptive use was 61.6 % in Egypt's largest metropolitan area. But in 2014, this figure decreased to 59.5 %. In 1995, the use of contraceptives in Kazakhstan was 47 %, then in 1999, it increased to 54.2 %. While in 2012, the use of contraceptives in Kyrgyzstan which was at 55 % in 1992 decreased to 34.2 %. In 2003—2004, the use of contraceptives in Morocco which was at 45.8 % increased significantly in 1992 to 56 %. In 2012, 29 % of women in Tajikistan used contraceptives, while 31.5 % did so in 2017. Tunisia had one DHS survey in 1988, with a score of 47.6 %, while Uzbekistan had one year of data in 1996 with a score of 50.2 % in the urban areas.

In 2008, the use of contraceptives in Egypt's rural areas which was at 54.8 % increased to 55.5 % in 2014. In 1995, it was 44.9 % in Kazakhstan which increased to 51.2 % in 1999. In 1997, the use of contraceptives in Kyrgyzstan which was at 46 % decreased from 33.4 % in 2012. In 1992, it was 53.2 % in Morocco which declined to 27.7 % in 2003—2004. In 2012, it was 24.8 % in Tajikistan which was increased to 25.8 % in 2017. In 1988, Tunisia received a score of 30.1 %. Finally, in 1996, the use of contraceptives in rural Uzbekistan was 52 %.

Of particular note is the data on the use of contraceptives amongst uneducated women. For example in 2008 in Egypt, it was 55.5 % which increased to 57.9 % in 2014. In 1992 Morocco's cases, it was at 31.4 % which increased to 53.7 % in 2003—2004. In 2012 in Tajikistan, it was 22.6 % which decreased 19.6 % in 2017. Tunisia recorded 37.4 % in 1988. It is essential to state that Kazakhstan, Kyrgyzstan, and Uzbekistan, had no data on uneducated women.

This study found the following data on the use of contraceptives amongst women with primary education: in 2008 in Egypt, it was 59.3 % which decreased to 57.7 % in 2014. In 1992 in Morocco, it was at 47.5 %, which increased to 56.8 % in 2003—2004. While in 2012 in Tajikistan, it was 18.7 % which increased to 19.9 % in 2017. Tunisia had 44.1 % in 1988. It is important to state that Kazakhstan, Kyrgyzstan, and Uzbekistan have no data on primary education for women.

The use of contraceptives amongst women with secondary education in 2008 in Egypt, was 58.7 % which decreased to 56.8 % in 2014. For Kazakhstan in 1995, it was

46 % which increased to 51.6 % in 1999. While in 2012 in Kyrgyzstan, it was at 48.6 % which decreased to 32.8 % in 2012. For Morocco in 1992, it was at 51.4 % which increased to 59 % in 2003—2004. In Tajikistan in 2012, it was at 25 % which increased to 26.8 % in 2017. As for Tunisia, there is one single year of survey conducted in 1988 which shows 45.2 %. In Uzbekistan, it shows 51.6 % in 1988.

The use of contraceptives amongst women with higher education in 2008 in Egypt, was 56.9 % which decreased to 55.1 % in 2014. While in 1995 in Kazakhstan it was at 47.6 which increased to 57.6 in 1999. For Kyrgyzstan in 1997, the use of contraceptives was 51.2 % which decreased to 35 % in 2012. Whereas in 1992 in Morocco, it was at 50.6 % which decreased to 40.2 % in 2003—2004. While in 2012 in Tajikistan, it was at 33.5 % which decreased to 31.1 % in 2017. For Tunisia, there is one year of survey data, which showed 40 % in 1988. Similarly, one year of survey for Uzbekistan showed 50 % in 1996.

Fertility in Central Asia and North Africa

In 2008, Egypt's urban fertility rate was 2.7 which increased to 2.9 in 2014. In 1995, Kazakhstan had the lowest fertility rate in the selected countries which was 2 children per woman which was reduced to 1.5 in 1999. In 1997, in Kyrgyzstan, it was 2.3 which was increased to 3 children per woman in 2012. For Morocco in 1992, it was 2.5 which decreased to 2 children per woman in 2003—2004. Despite the decrease in fertility rate in Tajikistan and Tunisia which was 3.3 children per woman to 3, it was still the highest fertility in all selected countries. In 2012 in Tajikistan, it was 3.3 which decreased to 3 in 2017. Similar to Tunisia in 1988. However, there was not have enough data for the subsequent year (Table 2). For Uzbekistan, urban areas reported 2.7 children per woman in 1996.

In 2008, the fertility rate in Egypt's rural areas was 3.2 which increased to 3.8 in 2014. In 1995, in Kazakhstan, it was 3.1 which decreased to 2.7 in 1999. Kyrgyzstan and Tajikistan recorded the highest in Central Asia. In 1997 it was 3.9 which was increased to 4 children per woman in 2012. The same statistics were recorded respectively in 2012, and 2017 for these countries. In 1992, Morocco's fertility was 5.5 which declined sharply to 3 in 2003—2004. Whereas in 1988, Tunisia recorded the highest fertility in all of the selected countries and North Africa with 5.6. The fertility rate in Uzbekistan was 3.7 children per woman in rural areas in 1996.

The fertility rate amongst uneducated women in 2008 in Egypt, was 3.4 which increased to 3.8 in 2014. In 1992, Morocco's fertility was 4.9 which declined to 3 children per woman. Similarly for Tajikistan in 2012, it was 4.2 which decreased to 3.1 in 2017, whereas Tunisia showed 4.9 in 1988. It is important to state that there was not enough data available for Kazakhstan, Kyrgyzstan, and Uzbekistan on women without education.

The author analyzed data on the fertility rate amongst women with primary education. For example in 2008, in Egypt, it was 3.2 increased which was increased to 3.6 in 2014. In contrast in 1992, Morocco's fertility was 2.4 which decreased to 2.3 in 2003—2004. In 2012 in Tajikistan, it was 3.9 which increased to 4.4 in 2017 showing the highest in Central Asia and all the selected countries. It is important to state that there was not enough data available for Kazakhstan, Kyrgyzstan, and Uzbekistan on women with primary education.

The fertility rate amongst women with secondary education for instance in 2008 in Egypt, was 3.2 which increased to 3.6 in 2014. For Kazakhstan in 1995, it was 2.6 which decreased to 2.2 in 1999. For Kyrgyzstan in 1997, it was 3.6 which was increased to 3.9. Morocco's fertility rate in 1992 was 2 children per woman which decreased to 1.9 in 2003—2004, making it the lowest in North Africa and the selected countries. In 2012 and 2017, Tajikistan showed no changes in fertility rate with 3.9 children per woman indicating the highest similarity with Kyrgyzstan in all selected countries. Tunisia showed 2.3 in 1988. While Uzbekistan had 3.4 in 1996 amongst women with secondary education.

The fertility rate amongst women with higher education in 2008 in Egypt, was 2.6 children per woman which increased to 3 children per woman in 2014. While in 1995, in Kazakhstan it was 2 children per woman which decreased to 1.5 in 1999 indicating the lowest fertility rate in Central Asia. In 1997 in Kyrgyzstan, it was 2.4 which was increased to 3.4 in 2012 making it the highest in all selected countries. For Morocco in 1992, it was 1.9 which decreased to 1.4 in 2003—2004 showing the lowest in all selected countries. In 2012 in Tajikistan, it was 2.9 which was increased to 3.2 in 2017. In 1988, Tunisia had 2.1 children per woman. The last country was Uzbekistan which showed 2.8 children per woman with higher education in 1996.

Age at first marriage in Central Asia and North Africa

In 2008 in Egypt, the age at first marriage in urban women was 22.2 years of age was increased to 22.4 years of age in 2014. In 1995 in Kazakhstan, it was 21.2 which increased to 21.3 in 1999. In 1997 in Kyrgyzstan, it was 20.9 which increased to 21.3 in 2012. In 1992 in Morocco, it was 20.9 increased to 22.6 in 2003—2004. Tajikistan has the lowest age at first marriage in all selected countries. In 2012, it was 20.5 with no changes in 2017. Whereas in 1988 in Tunisia, it was 21.8 years. The last country is Uzbekistan which showed 20.8 years of age in 1996.

In 2008 in Egypt, the age at first marriage in rural areas was 19.4 years of age that was increased to 20 years of age in 2014. In 1995 in Kazakhstan, it was 20.9 which increased to 21.1 in 1999. Whereas in 1997 in Kyrgyzstan, it was 20.2 and remained without change in 2012. For Morocco in 1992, it was 18.8 was increased to 19.8 in 2003—2004 making it the lowest in North Africa. In 2012 in Tajikistan, it was 20.1 and has remained without change in 2017. For Tunisia, it was 21.3 in 1988. Whereas Uzbekistan's rural areas were 19.6 years of age in 1996 indicating the lowest in all studied nations.

Data on the age at first marriage amongst women without education were analyzed. For example in 2008 in Egypt, it was 18 years of age which increased a little bit to 18.6 in 2014. In 1995 in Kazakhstan, it was 21.5 which was increased to 24 in 1999 indicating the highest in all selected nations. For Morocco in 1992, it was 18.7 which increased to 19.5 in 2003—2004. For Tajikistan in 2012, it was 19.7 which was increased to 21.6 years in 2017. Tunisia showed 20.1 years of age in 1988. While Uzbekistan indicated 17.5 in 1996 amongst women with no education. It is essential to state that Kyrgyzstan did not have enough data about uneducated women in 1997—2012.

The author examined data on the age at first marriage amongst women with primary education. For example in 2008 in Egypt, it was 18.8 which was increased to 19.1 years of age in 2014. For Kazakhstan in 1992, it was 17.9 which was increased to

24.2 in 1999 making it the highest in all chosen countries. In 1997 in Kyrgyzstan, it was 17.7 which was increased to 19.6 years in 2012. In 1992 in Morocco, it was 21.4 which increased to 22.7 in 2003—2004. Tajikistan showed little changes it was 20.9 in 2012 which was to 20.6 in 2017. Tunisia recorded 22.2 years in 1988. While in 1996 Uzbekistan showed 17.2 years indicating the lowest age at first marriage amongst women with primary education.

In 2008 in Egypt, the age at first marriage amongst women with secondary education was 21.3 years of age that was decreased to 20.9 in 2014. For Kazakhstan in 1992, it was 20.7 that remained without change in 1999. In 1997 in Kyrgyzstan, it was 20 which decreased to 19.7 in 2012. Whereas in 2012 in Tajikistan it was 19.9 remained without change in 2017 it was the lowest in all selected countries. For Tunisia in 1988, it indicated 23.1 years which was the highest in the selected countries. In 1996, the age at first marriage for women with secondary education in Uzbekistan was recorded at 19.8 years.

Data on the age at first marriage amongst women with higher education were studied. It is worth highlighting a year-long survey, the results of which showed that in all selected countries, women with higher education most often get married for the first time at 24 years old.

For Kazakhstan in 1992, it was 22.6 which increased to 23.1 in 1999. In 1997 in Kyrgyzstan, it was 22.3 which decreased to 21.5 in 2012. For Tajikistan in 2012, it was 21.5 which decreased to 21.4 in 2017. In 1996 in Uzbekistan, the age at first marriage for women with a higher education was 21.9 years of age. It is important to state that there is not enough data for Tunisia and Morocco. (Please note that there is not enough data available for Algeria in DHS in the selected years.)

Discussion

This study compared fertility, age at first marriage, demand for family planning, and the use of contraceptives in North Africa and Central Asia. The article employed the most recent survey from DHS and MICS. It also employed data from countries' official websites in addition to the data that is freely accessible.

The findings revealed that Morocco has the highest age at first marriage among all the countries. This accounts for Morocco's fertility regardless of education level. For example, in rural areas, the age at first marriage was lower than in urban areas by three years. This means that when women marry at 19 years old, there is a high probability of having the first child in the first or second year of marriage [Singh, Samara, 1996]. The fertility of women in rural areas makes them more fertile than women who live in metropolitan areas and marry at 22 years of age. These results are similar to Ouadah-Bedidi et al. [Ouadah-Bedidi et al., 2012] who stated that fertility in rural areas is higher than in urban areas. The author was faced with the task of considering the demand for family planning after having the first child.

Although the demand for family planning in rural areas is higher than in urban areas, the use of contraceptives in rural areas is lower than in urban areas. This occurs due to education. It could also be due to the widespread use of contraceptives in this country regardless of place of residence [Lecomte, Marcoux, 1976]. The fertility of women with no education is lower than women with higher education. Women with higher education demonstrated the largest reduction in fertility in North Africa.

These findings could be compared to Lecomte and Marcoux (1976) and Kazenin and Kozlov (2020) who stated that education is associated with a reduction of fertility. In 2020, the general fertility rate in Morocco was 2.35 %, indicating the success of government efforts to reduce fertility in Morocco. This reduction in fertility could be due to economic viewpoints rather than religious beliefs because an increase of 4 million people in ten years (Table 1) is very low in comparison to other countries. If this reduction continues Morocco's population could increase to 38 million in 2030, taking into account female education, family planning demand, the use of contraceptives, and the age of first marriage.

The second country is Tunisia which had one single year in DHS (1988). The age at first marriage in rural and urban areas is almost the same. But for women with no education, it was 20.1 years of age, compared to women with secondary education which was 23.1. This is significantly different. But considering that there was no data on women with higher education the forecast would be difficult.

The use of contraceptives among women with no education is lower than among women with higher education. The fertility rate in Tunisia's urban areas is high, while rural areas have the highest fertility rate in North Africa and all groups, with 5.6 children per woman. However, the fertility rate in recent years has declined, making it the lowest fertility rate in all countries [Eltigany, 2001]. The fertility rate in rural and urban areas in North Africa is higher than in Central Asia.

The effect of family planning in Tunisia has an impact on fertility and the population which increased to 12 million. This slow increase explains the success of the government's strategy to reduce fertility. These findings are compared to Frini and Muller [Frini, Muller, 2012], Cochrane and Guilkey [Cochrane, Guilkey, 1995]. But if Tunisia's population growth of 1 million inhabitants over 10 years is compared with the birth rate in Morocco, the author concludes that Tunisian policies are more effective [Lecomte, Marcoux, 1976]. If this reduction continues until 2030, the Tunisian population may not increase by the same number of people putting into consideration the global economic changes. So the answer to the first research question is that North Africa succeeded in reducing fertility.

The age of first marriage amongst Egyptian women differs depending on the place of residence. For example, earlier it was 22.4 years in urban areas and 20 years in rural areas. The difference of two years is significant when other factors are measured, such as level of education, access to contraceptives, religious beliefs, and demand for family planning.

The age at first marriage in rural areas of Egypt for women with no education and women with higher education was the highest in all countries in metropolitan areas. At this age, women may have a bachelor's or master's degree, which means they have access to contraceptives. Moreover, these women may not give birth in the first year of marriage due to economic instability. When factoring in access to the labor market, marriage at 24, and birth postponement, the result is a decline in fertility. The demand for family planning is affected by the age of the first marriage. The demand for family planning in urban and rural Egypt, amongst illiterate women and women with higher education is the highest in all nations.

The use of contraceptives amongst uneducated women increased, indicating that they had access to all kinds of modern methods. Whereas the use of contraceptives

amongst women with higher education declined. This decline necessitates further study. What is expected is that the use of contraceptives amongst highly educated women should increase because women with higher education are expected to have access to contraceptives. Fertility increased in both urban and rural Egypt amongst uneducated and educated women. Looking at recent years, the fertility rate in 2011 was 3.24 children per woman and then dropped to 2.96 in 2020, which was still the highest in North Africa. The average fertility of the indicated years was 3.22, which is still very high compared to Morocco, Tunisia, and Algeria. According to the Egyptian plan which is to reduce fertility to 2.4 children per woman by 2030. The answer to the fourth research question is education did not have an impact on women's fertility in North Africa.

However, this increase in fertility has influenced the general population. The Egyptian population was 89 million in 2011, then increased to 107 million in 2020. The increase of 18 million in ten years makes it nearly as large as the Tunisian population. If fertility continues increasing despite the highest education and the highest demand for family planning, the Egyptian population will be 125 million inhabitants by 2030. This could indicate the ineffectiveness of the government's strategy to decrease fertility in Egypt. Therefore, according to the author, the project of Itnein Kefaya (two projects were considered), launched in 2014, turned out to be ineffective or requires some changes.

When this project was launched, the population was 95 million, and in 2020 increased to 107 million. The increase of 12 million in 6 years could explain the influence of Islam regarding fertility reduction. Families may not want to reduce fertility [Faour, 1989].

Furthermore, substantial research is required to explain the reason why despite the increase in demand for family planning the population continues to increase. In addition, it is necessary to assess Egypt's economic difficulties as well as its political situation. According to statistics, fertility is dropping yearly but the population is increasing quickly, even faster than before the launching of the project of Itnein Kefaya (two projects were considered). Instead, the government may decide that one is sufficient to decrease the number of inhabitants. All North African countries indicated that the age of first marriage in rural areas is lower than in urban areas. This affects the fertility of the countries in general.

The age at first marriage in Kazakhstan is one year different from what is obtainable in urban and rural areas. But other factors should be taken into account, such as the need for family planning amongst women without education, which was the highest in all countries analyzed. This is a rather unusual situation, since women without education tend to have more children, as scholars point out (e. g.: [Ambrosetti et al., 2019]). While women with higher education took second place after Egypt.

The demand for family planning in Kazakhstan is normal in both urban and rural areas; however, this country lacks data on uneducated women. Whereas educated women ranked second after Egypt in terms of family planning, but ranked first place in Central Asia.

Then, the use of contraceptives in urban and rural areas increased, indicating that the place of residency in this country does not affect fertility. The data further shows that women with higher education are less likely to use contraceptives which is the reason for the decline in their fertility. This result is compared to Egypt which

recorded the same. Kazakhstan ranked second among the selected countries and first in Central Asia. This result is in contrast with Nedoluzhko [Nedoluzhko, 2012]. If all the socioeconomic, sociopolitical and sociocultural factors are taken into account, it can be concluded that the government's strategy was successful because it promotes the use of contraception to avoid abortion [Agadjanian, 2002], although it is against Islam. Another factor could be the character of the population, which includes some Russian ethnicities and European origin. However, Kazakhstan's fertility rate in 2020 was the highest among all selected countries. In 2011, the population was 16 million, and it increased to 18 million in 2020. When all of the aforementioned considerations are measured, 2 million in 10 years is logical. However, the rising birth rate should also be taken into account, as it is expected to be the highest in 10 years and rise to 30 million by 2030.

The age at first marriage in the Republic of Kyrgyzstan shows no substantial difference between urban and rural areas. This is amongst women with higher education, where it recorded a reduction from 22 to 21 years. Kyrgyzstan has the highest fertility in the urban and rural areas. The age at first marriage in Tajikistan was the lowest in all selected countries. Even in rural areas the age at first marriage amongst women without education and with higher education the age did not differ significantly. So the fertility rate should be the lowest, but it was not; Kazakhstan was the lowest. The age at first marriage was the lowest in the urban areas. It was expected that by 2030 there would be significant population growth. Tajikistan had the lowest demand for family planning and use of contraceptives in urban and rural areas. This result is comparable to Nedoluzhko [Nedoluzhko, 2012]. Tajikistan and Tunisia have the highest urban fertility rates. This is the reason Tajikistan's rural areas have the highest fertility rate in Central Asia. In 2011, the fertility rate was 3.9 children per woman, it decreased to 3.05 in 2020 ranking it second amongst the eight countries. The population was 5 million in 2011. It increased to 6 million in 2020. According to statistics, one million in ten years is not a big increase, yet why was fertility so high and the slow increase in population? Recent fertility is dropping yearly according to data, demonstrating the success of the government's fertility-reduction effort.

Uzbekistan has the lowest age at first marriage in rural areas. The demand for family planning in both urban and rural areas is the highest in Central Asia. Uzbekistan's population increased from 29 million to 33 million inhabitants in 2020 which shows a slow increase despite the country being considered the most populated country in Central Asia.

Although Algeria lacked sufficient data, it still ranked second after Egypt in North Africa, with fertility rates ranging from 2.88 % in 2011 to 2.94 % in 2020. This increase impacted on population which increased from 36 million to 43 million inhabitants in 10 years. According to the analysis of the data provided, an increase of 8 million is expected by 2030.

Conclusion

This article compared North Africa and Central Asia in terms of fertility, age at first marriage, and contraceptive use. In conclusion, some countries have achieved a reduction in fertility, however, the population is still increasing very fast which needs substantial investigations, for example, Egypt. While some countries are slowing like

Tunisia. If fertility is declining, then it should impact on population taking into consideration all other factors. Data limitations must be acknowledged. Future research might include Algeria if enough data is obtainable.

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