Women in Kenya Severely Lack Knowledge on Source of Condom Supply Across All Age Groups And Provinces*

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04 April 2022

Abstract

The use of contraception is a vital part of modern family planning, yet high risk hormonal contraceptives are curiously more widely used than male contraceptives such as condoms. We obtain data from the 1998 DHS Program report regarding the primary sources for women and men of Kenya to obtain condoms and analyze it using several graphs and tables. The data shows a consistent trend for percentage of women who do not know a source of condom supply to be much higher than men in Kenya regardless of age groups and geographical locations, though higher education levels correlates to increased knowledge in sources for condom supply. Findings suggest .

1 Introduction

The usage of contraception has become an important part of modern society. Various contraceptive methods have been invented throughout the years to aid couples in their family planning efforts. These contraceptive methods range from hormonal methods and intrauterine methods to barrier methods, providing many options for both male and female users. Notably, according to the Centers for Disease Control and Prevention, the barrier method known as condom was the most popular male contraceptive used in the United States a few years ago, with it being around 8.7% of total contraceptives used (Daniels and Abma 2018). This is also the case in the country of Kenya, with around 1% of the surveyed individuals reporting to have used condoms, as denoted in the 1998 DHS report (The Demographic and Health Surveys Program 1999).

Another interesting statistic in the studies mentioned above are the high usage rates of female hormonal contraceptives. 12.6% of contraceptive methods used in the United States are of the oral hormonal type (Daniels and Abma 2018), and around 9% of surveyees in Kenya report using oral contraceptives as well (The Demographic and Health Surveys Program 1999). This statistic is perplexing in that the usage rate of hormonal contraceptives are rather high despite the noticeable side effects: Various studies have suggested in the past that female contraceptives often lead to high-risk side effects. For example, the U.S. Department of Health & Human Services notes that oral contraceptives that rely on hormonal controls can lead to higher blood pressure and more blood clots (Office on Women's Health 2019). As such, one would wonder why male contraceptives do not see more wide usage despite a relative lack of harmful side effects in comparison to female hormonal contraceptives. A possible hypothesis is that due to it being a contraceptive meant to be used by men, it is less advertised to women.

This paper attempts to analyze potential reasons for the relative lack of condom usage as a contraceptive method in Kenya utilizing statistics presented in the 1998 DHS final report on Kenya (The Demographic and Health Surveys Program 1999). Specifically, the paper focuses on finding a, of lack thereof, relationship between the age, geographical location, and the knowledge of sources for obtaining condoms.

*Code and data supporting this paper are available at: https://github.com/zhan7818/kenya-condom-knowledge

The remainder of this paper contains analysis on the dataset and the resulting findings. Section 2 details the data analysis of this paper. Section 2.1 discusses the origin of the raw data used in this paper, and 2.2 details the extraction process for the dataset. Subsequent graphs and tables shown in this paper utilize the statistical programming language R (R Core Team 2020) and the `tidyverse` (Wickham et al. 2019), `ggplot2` (Wickham 2016) and `knitr` (Xie 2021) packages. Section 3 details the results from the data analysis, which includes findings on Kenyan women's generally higher lack of knowledge of a viable source for obtaining condoms compared to men. All limitations and potential extensions are discussed in Section 4.

2 Data

2.1 Raw Data Origin and DHS Methodology

The dataset used in this paper is obtained from the PDF "FR102," titled "Kenya Demographic and Healthy Survey 1998" and published in 1998 by the Demographic and Health Surveys Program.[1]

The PDF where the dataset is parsed from is a report compiled by the DHS program using the third Demographic and Health Survey conducted in Kenya, the previous two of which were conducted in 1989 and 1993. (The Demographic and Health Surveys Program 1999). According to the information provided on the DHS Program website, Standard DHS Surveys are described as surveys with a sample size that consists of 5000 to 30000 households conducted on a five year cycle (The Demographic and Health Surveys Program 2022). Since there is around a five year gap between each consecutive Kenya DHS survey, we can safely assume that the PDF report containing the raw data is a standard DHS survey.

The survey used by the DHS Program was distributed in nearly all districts in Kenya. While the total population of the districts not included in the survey only amounts to less than four percent of the country's population, it is still a substantial percentage of the national population that was not sampled from. The PDF specified that stratified sampling was used, which greatly contributes greatly to the increase in precision of the findings from the survey and generally leads to a sample that better represents the population than a simple random sampling. However, it was unclear to the readers what characteristics or attributes were used to divide the population into strata. Since it was stated later in the PDF that the survey wished to obtain "district-level data for planning purposed" (The Demographic and Health Surveys Program 1999), it should be safe to assume that the strata were constructed based on geographical locations. It is also worth noting that the survey included men from age 15 to 54 while only including women from age 15 to 49. A sufficient justification was not found for this discrepancy and it may have an impact on the accuracy of the findings.

According to the DHS report (The Demographic and Health Surveys Program 1999), the survey questions can be divided into 14 categories. Of those 14, the following subset of topic is related to the focus of this paper:

- Background characteristics such as age and education
- Knowledge and use of family planning methods.

The surveys questions were originally constructed fully in English before being translated into various local languages, and the wording of the questions were revised several times by local pretest teams before being sent out, ensuring that there will not be any inaccuracies or awkward wording present due to the language barrier. (The Demographic and Health Surveys Program 1999). This is especially important due to the sensitive nature of the topics asked in the surveys, and helps in making sure that as many participants answer honestly as possible.

[1]The PDF can be obtained at https://dhsprogram.com/publications/publication-fr102-dhs-final-reports.cfm?csSearch=456440_1.

2.2 Dataset Parsing and Cleaning

The raw dataset is parsed using the package `pdftools` (Ooms 2022) and the statistical programming language R (R Core Team 2020) from Table 10.14.1 and Table 10.14.2 on page 170 and 171 of the PDF respectively (The Demographic and Health Surveys Program 1999). Two tables are parsed instead of one because the tables each present data on only one gender. Therefore a dataset that combines data from both genders in order to provide a more accurate analysis. As such, a new variable, `gender`, is constructed to help distinguish the data between female and male participants. Additionally, there is an issue in that the rows of the tables corresponded to different variables; for example, some rows contained data for certain age groups while other rows contained data for different marital statuses. To simplify the analysis process, only the rows pertaining to age groups, education, and provinces were parsed from the PDF.

The dataset is then cleaned using the `janitor` (Firke 2021) and `dplyr` (Wickham et al. 2022) package. The `pointblank` (Iannone and Vargas 2022) package is used to set up validation tests for the class and the content of the datasets.

The final datasets—clean_data_age.csv, cleaned_data_province.csv and cleaned_data_education.csv—showcased in Table 1, Table 2 and Table 3 respectively, contains the information about the same variables in every column except the first, which is the column that denotes either the age, province or education. The purpose of the other columns are explained in the DHS report (The Demographic and Health Surveys Program 1999), summarized as follows:

- gender: male or female
- know_about_condoms: percentage of participants that know about condoms
- public_sector: percentage of participants that cited government-run health services as their primary source for obtaining condoms
- private_medical_sector: percentage of participants that cited private medical sources as their primary way for obtaining condoms
- private_pharmacy: percentage of participants that cited private pharmacies as their primary source for obtaining condoms
- shop: percentage of participants that cited commercial shops as their primary source for obtaining condoms
- cbd_agent: percentage of participants that cited community-based distribution agents as their primary source for obtaining condoms
- friends_and_relatives: percentage of participants that cited their friends and relatives as their primary source for obtaining condoms
- other_sources: percentage of participants that cited other sources as their primary way for obtaining condoms
- dont_know_a_source: percentage of participants that do not know a source for obtaining condoms
- number_of_people: number of participants that belong in each category

2.3 Preliminary Analysis

Table 1 shows that an overwhelming majority of surveyees know about condoms, with all percentages well over 90%. For women, the percentage of surveyees that know about condoms are relatively lower in age groups 15-19 and 40-49, though there is not a similar trend for men, as more than 97% of men know about condoms in all age groups surveyed. This difference could be due to the fact that condom is a male-contraceptive and is thus less advertised to women. Similarly, Table 1 shows that a larger percentage of men know about condoms than women in every single province survyed, though this difference is minuscule.

The datasets also show that there are more than twice the number of female participants than male participants. Note that according to Faria (Faria 2022), the gender ratio in Kenya in 2000 is about 98.6 males per 100 females, meaning that there is no significant numerical difference between genders in Kenya. Therefore, the unequal sample size in the dataset could lead to unequal variances between the male and female samples and would negatively affect the results of any tests that require the assumption of equal variances.

Table 1: First 5 columns on percentage of participants, categorized by age groups, that know about and/or cite a specific source for condoms, or do not know about condoms

Age	Gender	Know About Condoms	Public Sector	Private Medical Sector
15-19	female	95.9	18.8	4.3
20-24	female	97.7	33.9	7.6
25-29	female	97.4	40.3	9.0
30-39	female	96.3	36.7	8.4
40-49	female	93.8	31.3	6.2
Total	female	96.3	33.8	7.5
15-19	male	99.9	17.3	4.0
20-24	male	99.4	22.5	7.8
25-29	male	99.2	22.6	10.0
30-39	male	99.3	26.1	7.9
40-49	male	97.9	23.2	7.3
50-54	male	97.9	19.5	3.7
Total	male	99.0	22.6	7.3

Table 2: First 5 columns on percentage of participants, categorized by provinces, that know about and/or cite a specific source for condoms, or do not know about condoms

Province	Gender	Know About Condoms	Public Sector	Private Medical Sector
Nairobi	female	99.4	20.5	8.2
Central	female	97.9	41.3	8.1
Coast	female	92.2	34.7	11.4
Eastern	female	97.8	29.7	9.1
Nyanza	female	98.2	43.3	5.6
Rift Valley	female	92.2	26.2	7.9
Western	female	97.0	39.9	3.8
Total	female	96.3	33.8	7.5
Nairobi	male	100.0	19.0	6.3
Central	male	99.4	24.5	11.7
Coast	male	97.9	16.7	3.4
Eastern	male	100.0	17.0	5.0
Nyanza	male	100.0	34.0	4.8
Rift Valley	male	97.5	24.3	13.1
Western	male	97.9	14.4	2.2
Total	male	99.0	22.6	7.3

Table 3: First 5 columns on percentage of participants, categorized by education level, that know about and/or cite a specific source for condoms, or do not know about condoms

Education	Gender	Know About Condoms	Public Sector	Private Medical Sector
No education	female	87.4	26.5	4.5
Primary incomplete	female	95.5	30.6	5.8
Primary complete	female	98.1	34.1	8.4
Secondary+	female	99.8	40.5	10.0
Total	female	96.3	33.8	7.5
No education	male	85.6	13.9	3.7
Primary incomplete	male	99.5	20.1	4.5
Primary complete	male	99.0	20.6	8.5
Secondary+	male	100.0	26.3	8.5
Total	male	99.0	22.6	7.3

2.4 Knowledge of a source for condom: Age Groups

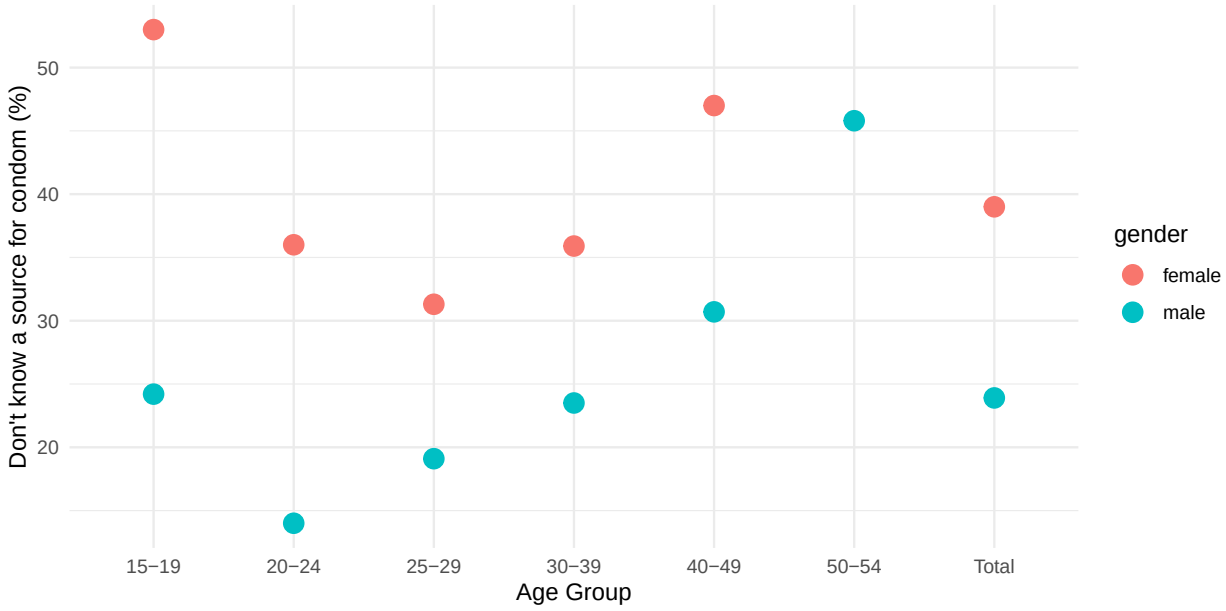

Figure 1: Percentage of Surveyee Without Knowledge of A Source for Condom versus Age Groups

We can observe from Figure 1 that there is a substantially higher percentage of women who possess no knowledge of ways to obtain condoms In all age groups, there are on average twice as many women who do not know a source to obtain condoms compared to men. This difference is much more drastic in the younger population (age 15-19).

Note that the female age group of 50-54 was not included in the sample, thus leaving no way for us to compare the difference in percentage for that specific age group.

2.5 Knowledge of a source for condom: Geographical Location

Figure 2 plots the percentage of male and female surveyees without knowledge on a source for condoms in each province surveyed and in total.

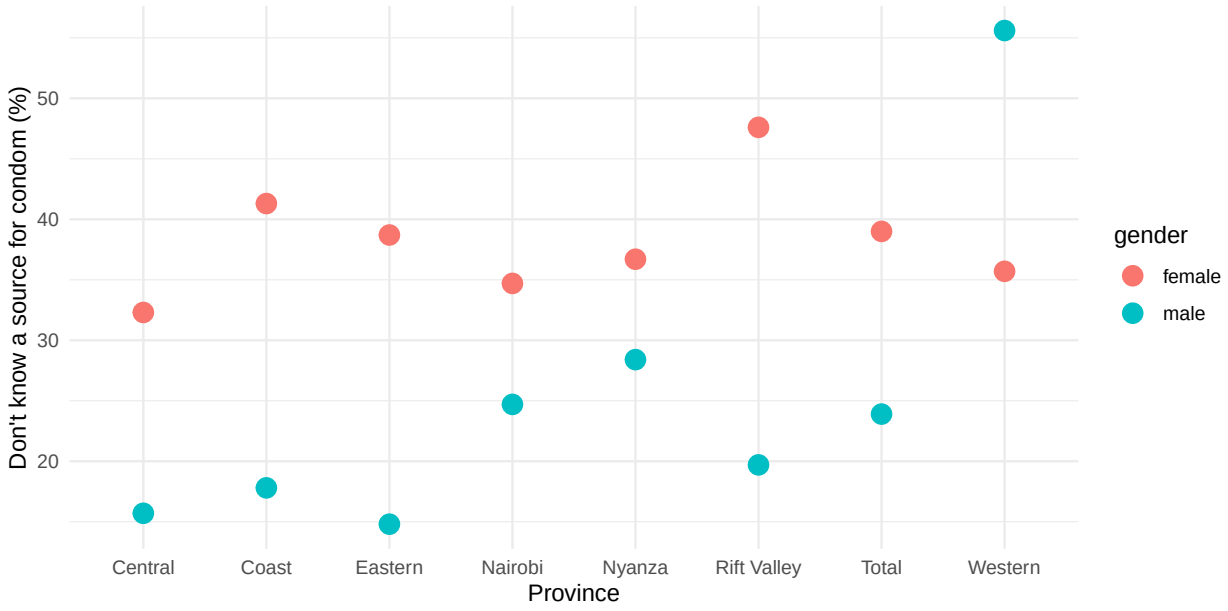

Figure 2: Percentage of Surveyee Without Knowledge of A Source for Condom versus Provinces

Similar to the trend shown in Figure 1, the difference in percentage between female and male participants are at the minimum 10%, with women being far more likely to know no source for condoms.

According to Table 2.4 in the Kenya Population and Housing Census in 2019 (Kenya National Bureau of Statistics 2019), Nairobi, the capital city of Kenya, has a population density of 6247 personnel per square kilometer, dwarfing any other county or province in Kenya. One hypothesis is that this level of population density and urbanization may be a reason as to why the gap between female and male knowledge on condom sources is relatively smaller in Nairobi. However, Nyanza, a province where the population density of its counties range from 393 to 958 personnel per square kilometer, has a difference in female and male knowledge on condom sources very similar to Nairobi's.

2.6 Knowledge of a source for condoms: Education Level

Figure 3 shows a trend that is similar to the previous two; a higher percentage of women do not know a source for condoms compared to men. A notable outlier is when there is a complete lack of education: Both female and male surveyees without any education have nearly identical level of ignorance regarding ways to obtain condoms.

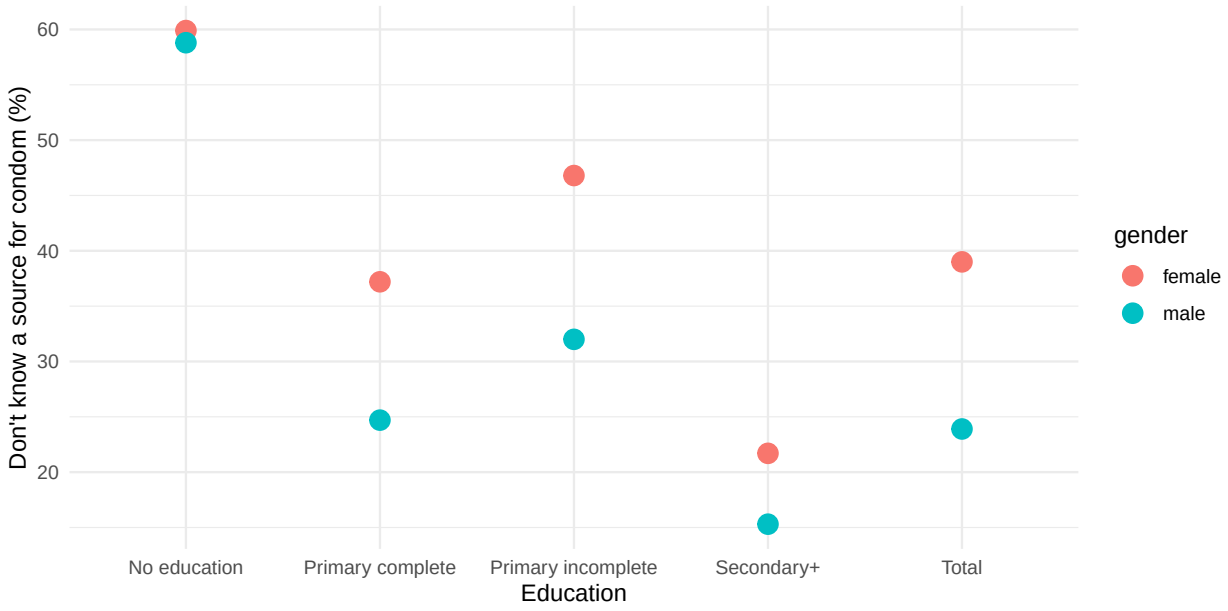

Figure 3: Percentage of Surveyee Without Knowledge of A Source for Condom versus Education Level

3 Results

The graphs in the Data section have demonstrated that a significantly higher percentage of women in Kenya have no knowledge on a source to obtain condoms; the difference in percentage ranges from 28.8% to 12.2% depending on the age group, and on average, the difference in percentage of women and men who have no konwledge on a source to obtain condoms is 15.1%.

3.1 Population density and knowledge on condoms

As shown in Figure 2, the difference in ignorance of condom sources between women and men vary by a significant amount between provinces. The initial hypothesis presented in this paper is that the difference could be linked to the population density in each province. However, after reviewing the Kenya Population Census (Kenya National Bureau of Statistics 2019), no apparent pattern is found. Some provinces with relatively massive population density such as Nairobi have a smaller difference in condom source ignorance as hypothesized to be due to its greater urbanization. However, other provinces that contain counties with population density comparable to Nairobi, such as the Coast province, have a much large difference in condom source ignorance between men and women: Mombasa, a county in the Coast province, has the second largest population density at 5495 personnel per square kilometer, yet the overall gap between female and male knowledge on condom sources is still relatively large in the Coast province. On the other hand, Nyanza, a province where the population density of its counties range from 393 to 958 personnel per square kilometer, has a difference in female and male knowledge on condom sources very similar to Nairobi's. It is unclear as to whether population density plays an important role in determining the region's ignorance of sources to obtain condoms.

3.2 Age Group and knowledge on condoms

Figure 1 shows that lack of knowledge on a source for condoms is much higher in the younger age group (age 15 to 19), decreases in older age groups, and once ago rises in the oldest age groups (age 40 to 49 and age 50 to 54).

In general, the disparity between percentage of women and men that do not know a source for condoms remains largely unaffected by age groups, though is worth noting however that younger surveyees (people in the age of 15 to 19) have a relatively higher difference in this regard. In total, the percentage of women that do not know of a source for condoms are 15.1% higher than men.

3.3 Education Level and knowledge on condoms

As demonstrated in Figure 3, a staggeringly high percentage of women and men with no education have no knowledge on where to obtain condoms. The graph also shows that receiving a higher level of education correlates to an overall decrease in lack of knowledge on sources for condom supply in both genders. However, the difference in condom source ignorance between women and men seem to not be correlated to education level, as the difference in condom source ignorance between genders is lower in both the 'No Education' and 'Secondary+' levels compared to the 'Primary Incomplete' and 'Primary Complete' levels.

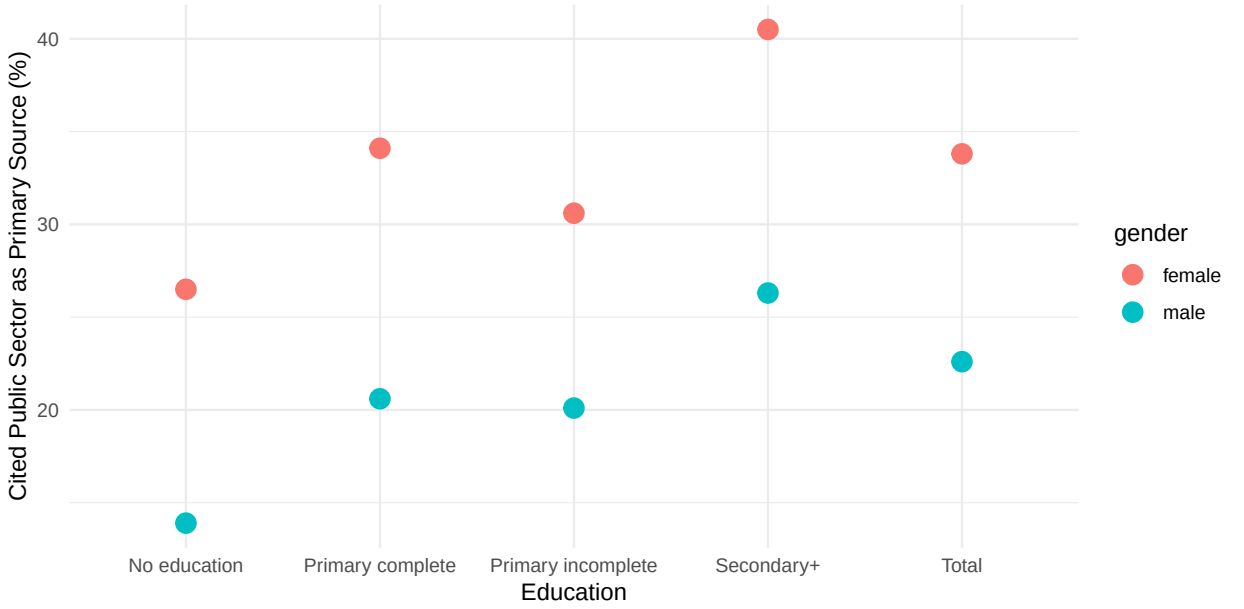

Figure 4: Percentage of Surveyees Citing Public Sector as Primary Source for Condom versus Education Level

Another important thing to note is shown in Figure 4, as a larger percentage of both men and women in Kenya cite government-funded public services as their primary source of condom supply as their education levels increase. This suggests that an increase in public sector advertisement campaign targeted towards poorly educated citizens could increase usage rate of condoms.

4 Discussion

4.1 Level of Variance in Population Density

As discussed in the Results section, we seemingly cannot establish a relationship between population density of a province and the difference in condom source ignorance between its female and male residents. The reasoning is that provinces that contain counties with similar levels of population density have very difference disparities in the percentage of women and men that know where to obtain condoms. However, it is important to note that each province is sectioned into different numbers of counties. A possible connection that was

not analyzed in this paper is the hypothesis that the aforementioned disparities were caused by the level of variance in population density among the counties for each province. For example, according to the Kenya Population Census (Kenya National Bureau of Statistics 2019), Nyanza, a province where the population density of its counties range from 393 to 958 personnel per square kilometer, has a difference in female and male knowledge on condom sources very similar to that of the Nairobi province. On the other hand, the Rift Valley province contains counties with population density ranging from 14 to 397 personnel per square kilometer, and the Eastern province contains counties with population density ranging from 6 to 236 personnel per square kilometer. In these two provinces which have relatively lower variance in its counties' population densities, the difference in percentage of women and men that know sources for condoms are much larger compared to Nyanza, a province with a higher variance in its counties' population densities. There is a possibility of correlation in here, and this direction could prove to be an interesting add-on or extension of this paper.

4.2 Higher percentage of women with no knowledge of condom sources on average

Across all the tables and graphs presented in this paper, it is apparent that on average, a significantly higher percentage of women have no knowledge sources for condoms. It is unclear as to why this disparity exists. One possible reasoning is that condom is a male-contraceptive and thus less advertised to women. This suggests that creating more condom advertisements targeted at women in Kenya could potentially lead to an increase in condom usage as contraceptive method.

4.3 Higher level of education leads to less ignorance on sources of condom supply

Figure 3 shows that higher levels of education seemingly correlates with a sharp decrease in ignorance of sources of condom supply. While it may be difficult to increase the country's educational findings and quality on a national scale, it could be beneficial to set up clinics or government-sponsored services that inform the less educated population about sources of condom supply, especially given what is presented in Figure 4.

4.4 Limitations

4.4.1 Unequal sampling size between genders

As discussed in the beginning of the Data section, in the report conducted by the DHS Program that is used to extract the raw data for this paper from, there are more than twice the number of female surveyees than male surveyees, yet, according to Faria (Faria 2022), the gender ratio in Kenya in 2000 is about 98.6 males per 100 females, meaning that there is no significant numerical difference between genders in Kenya. Therefore, there is no feasible justification for this difference in sample size between genders. This disadvantage could negatively affect the accuracy of any tests based on the assumption of equal variances.

4.4.2 Inexplicable lack of data

As showcased in Figure 1, there is a lack of data for women in the age group of 50 to 54 and we could not locate an explanation for it in the DHS Program report. It could be that there were simply not enough female surveyees in the age group of 50 to 54; While it was stated in the DHS Program report (The Demographic and Health Surveys Program 1999) that it used stratified sampling, the report did not specify which characteristic the sample was stratified on, leaving no way for us to figure out the reasoning behind this discrepancy.

4.4.3 Omission of certain counties and estimation for certain counties

The survey used by the DHS Program was distributed in nearly all districts in Kenya. While the total population of the districts not included in the survey only amounts to less than four percent of the country's population, it is still a substantial percentage of the national population that was not sampled from.

Additionally, the DHS Program report (The Demographic and Health Surveys Program 1999) noted that due to a drastic increase in number of counties in the country in the few years prior to the publication of the report, values for certain variables for some rural counties were estimated instead. One of the reasons for doing so, as stated in the DHS Program report, was that these districts were included in the previous two DHS Program reports of the same nature on Kenya, and thus reliable estimates could be achieved. It is unclear as to how much these estimates deviate from the true data or how much effect this has on the overall dataset, but it is nevertheless a potential source of error that sadly cannot be remedied in the scope of this paper alone.

Appendix

A Additional details

References

Daniels, Kimberly, and Joyce C. Abma. 2018. *Current Contraceptive Status Among Women Aged 15–49: United States, 2015–2017*. Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/products/databriefs/db327.htm#:~:text=The%20most%20common%20contraceptive%20methods,and%20male%20condom%20(8.7%25).

Faria, Julia. 2022. *Male to Female Ratio of the Total Population in Kenya from 2000 to 2020*. Statista. https://www.statista.com/statistics/1226942/male-to-female-ratio-of-the-total-population-in-kenya/#:~:text=As%20of%202020%2C%20Kenya's%20population,the%20country%20registered%20minimal%20increases.

Firke, Sam. 2021. *Janitor: Simple Tools for Examining and Cleaning Dirty Data*. https://CRAN.R-project.org/package=janitor.

Iannone, Richard, and Mauricio Vargas. 2022. *Pointblank: Data Validation and Organization of Metadata for Local and Remote Tables*. https://CRAN.R-project.org/package=pointblank.

Kenya National Bureau of Statistics. 2019. *Volume 1: Population by County and Sub-County*. https://www.knbs.or.ke/?wpdmpro=2019-kenya-population-and-housing-census-volume-i-population-by-county-and-sub-county.

Office on Women's Health. 2019. *Birth Control Methods*. U.S. Department of Health & Human Services. https://www.womenshealth.gov/a-z-topics/birth-control-methods.

Ooms, Jeroen. 2022. *Pdftools: Text Extraction, Rendering and Converting of PDF Documents*. https://CRAN.R-project.org/package=pdftools.

R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

The Demographic and Health Surveys Program. 1999. *Kenya Demographic and Healthy Survey 1998*. National Council for Population and Development. https://dhsprogram.com/publications/publication-fr102-dhs-final-reports.cfm?csSearch=456440_1.

———. 2022. *Demographic and Health Survey (DHS)*. USAID. https://dhsprogram.com/Methodology/Survey-Types/DHS.cfm.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.

Wickham, Hadley, Romain François, Lionel Henry, and Kirill Müller. 2022. *Dplyr: A Grammar of Data Manipulation*. https://CRAN.R-project.org/package=dplyr.

Xie, Yihui. 2021. *Knitr: A General-Purpose Package for Dynamic Report Generation in r*. https://yihui.org/knitr/.