Contraceptive Use For Women of Different Age Groups

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```
##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union

## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.8     v dplyr   1.0.9
## v tidyr   1.2.0     v stringr 1.4.1
## v readr   2.1.2     v forcats 0.5.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x lubridate::as.difftime() masks base::as.difftime()
## x lubridate::date()        masks base::date()
## x dplyr::filter()          masks stats::filter()
## x lubridate::intersect()   masks base::intersect()
## x dplyr::lag()             masks stats::lag()
## x lubridate::setdiff()     masks base::setdiff()
## x lubridate::union()       masks base::union()
##
## Attaching package: 'data.table'
##
##
## The following objects are masked from 'package:dplyr':
##
##     between, first, last
##
##
## The following object is masked from 'package:purrr':
##
##     transpose
##
##
## The following objects are masked from 'package:lubridate':
##
##     hour, isoweek, mday, minute, month, quarter, second, wday, week,
##     yday, year
```

Introduction

Research shows that LARC contraceptives are more effective forms of birth control than M/M methods and are safe for women of all ages to use. Long-acting reversible methods of contraception (LARC) include

birth control implants and IUDs, and most/moderately effective methods of contraceptions (M/M) include oral pills, patches, rings, injectables, female sterilization, or diaphragms. LARC methods could prevent more cases of teenage pregnancy for young women at risk and who are sexually active. However, M/M methods are more widely used and may be perceived by the public to be safer since they don't require surgical insertions of long-term devices into the body. Young women with inadequate knowledge about sex education and reproductive health may not have enough information about the different available contraceptive methods and as a result, be unable to make an informed decision on the contraceptive type that's right for them. The California Health and Human Services Agency has the Contraceptive Care - All Women measure (CCW) on its Open Data Portal for public access. The dataset contains information on women of various demographics at risk for unintended pregnancy and their rates of contraceptive use from 2014 to 2016.

The research question being explored is if younger women (age 15-20) use long-acting reversible methods of contraception (LARC) at a lower rate than older women (age 21-44) and is that trend consistent throughout the three year period?

Methods

The dataset used for this research report was downloaded from the California Health and Human Services Agency (CHHS) Open Data Portal. The Contraceptive Care - All Women measure (CCW), as part of the Maternal and Infant Health Initiative, Contraceptive Care Quality grant, was compiled data taken from Medicaid-recipient women ages 15-44 at risk for unintended pregnancy. The female participants were stratified into two age groups, those who are 15-20 and those who are 21-44 years old, and six racial groups. Contraceptive type either fell under the category of long-acting reversible methods of contraception (LARC) or most/moderately effective methods of contraceptions (M/M). Data was gathered in the California for 3 consecutive years, 2014-2016. Furthermore, "Rate of contraceptive use" in the dataset refers to those who use a type of contraceptive divided by those who are "eligible", defined as those that have ever had sex, are not pregnant or seeking pregnancy, and are fecund. The data was collected through administrative survey measures. The representative sample excluded U.S. women not at risk of unintended pregnancy because they were infecund for non-contraceptive reasons, had a live birth in the last 2 months of the measurement year, or were pregnant or their pregnancy outcome was unknown at the end of the year(s). Once the exclusions were applied, the sample included women who were not pregnant at any point in the 3-year period, those who had a live birth in the first 10 months of the measurement year(s), and those who had a miscarriage, stillbirth, ectopic pregnancy, or induced abortion.

Data cleaning and wrangling:

First, the number of missing values were checked. There were no missing values in the dataset so there was no need to remove observations or impute data. A "regular expression" was used to remove the "%" symbol from the "Rate of Contraceptive Use" column in order to be used for data manipulation. Then the column was changed from a character variable to numeric to be ready for data manipulation. A descriptive summary table of the rates suggested that there is a wide range between the maximum and minimum rates. Average rates of contraception by contraceptive type, age group, and year was computed. The average rates were also calculated by contraceptive type and age group. Lastly, average rates were computed by racial group. Tables were created for all three of these types of average rates. Furthermore, the R packages of data.table, ggplot2, dplyr, stringr, tidyverse, and lubricate were used to make tables, plots, and figures for data exploration.

```
## [1] 0
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.320   6.975  12.270  20.669  35.610  53.310
```

```
##             Contraceptive Type       Age Group Year Average Rate
##  1: Most/Moderately Effective 15-20 year olds 2014    38.765000
##  2:                       LARC 15-20 year olds 2014     8.635000
##  3: Most/Moderately Effective 21-44 year olds 2014    42.683333
##  4:                       LARC 21-44 year olds 2014     8.290000
##  5:                       LARC 21-44 year olds 2015     6.785714
##  6: Most/Moderately Effective 15-20 year olds 2015    32.613333
##  7:                       LARC 15-20 year olds 2015     5.605000
##  8: Most/Moderately Effective 21-44 year olds 2015    31.471667
##  9: Most/Moderately Effective 15-20 year olds 2016    31.408333
## 10:                       LARC 15-20 year olds 2016     5.156667
## 11: Most/Moderately Effective 21-44 year olds 2016    30.286667
## 12:                       LARC 21-44 year olds 2016     6.576667
```

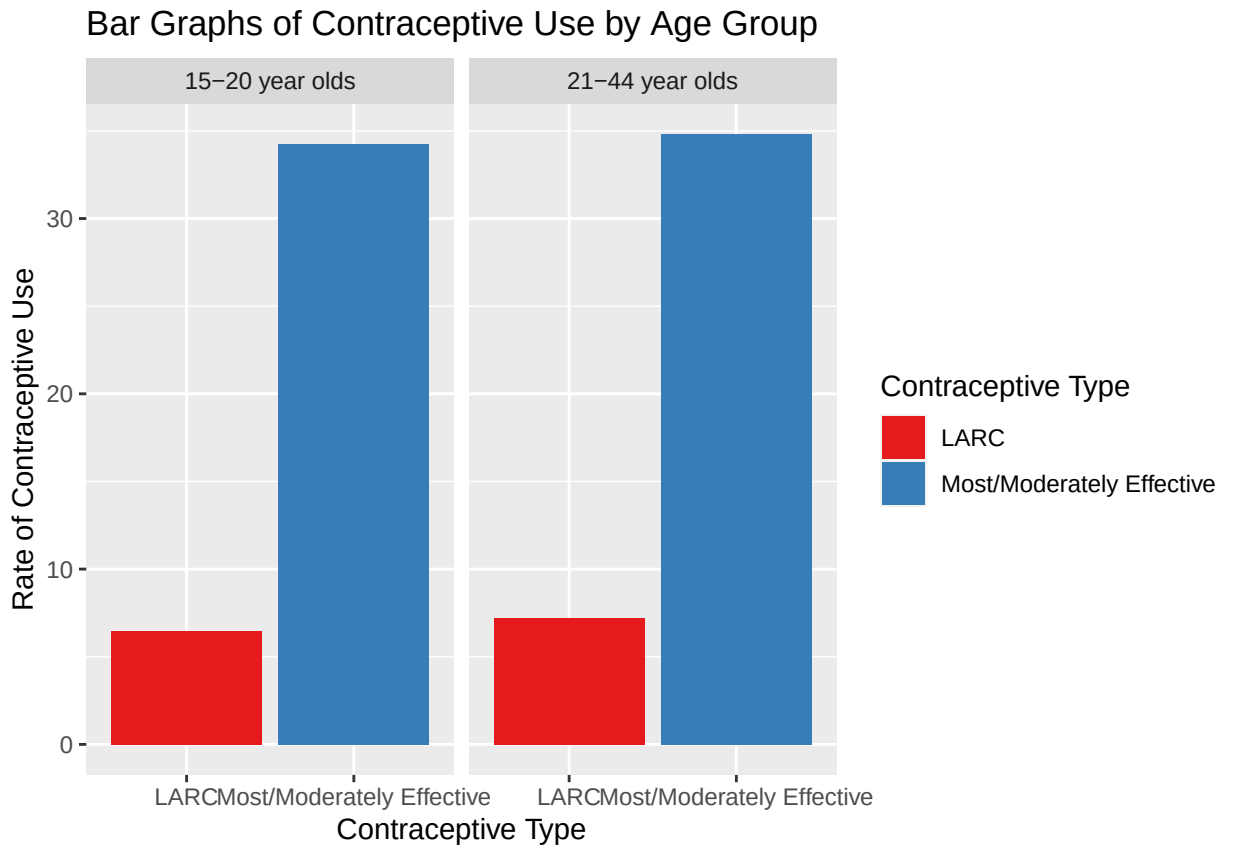
```
##          Age Group        Contraceptive Type Average Rate
## 1: 15-20 year olds Most/Moderately Effective    34.262222
## 2: 15-20 year olds                      LARC     6.465556
## 3: 21-44 year olds Most/Moderately Effective    34.813889
## 4: 21-44 year olds                      LARC     7.217460
```

Results

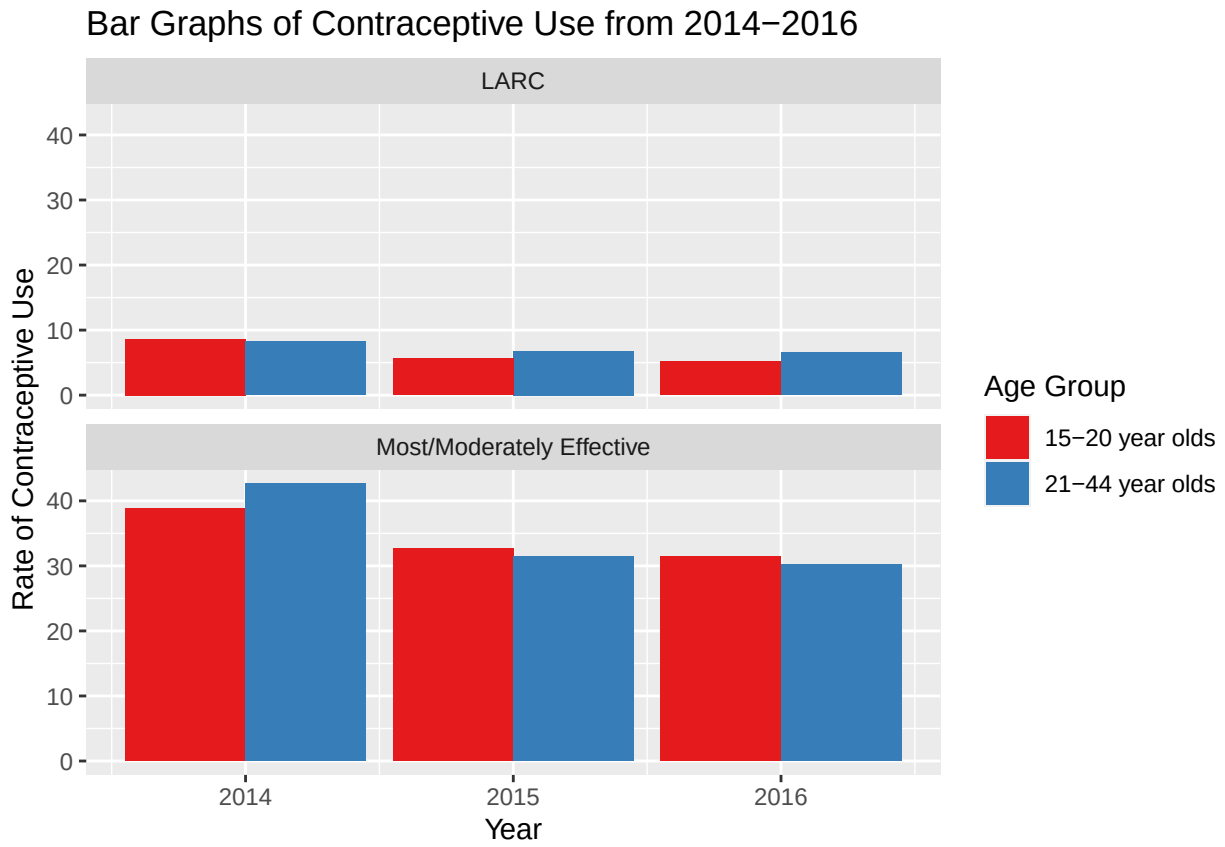
Table 1: Contraceptive Use of Women 2014-2016

Year	Contraceptive.Type	Age.Group	Average.Rate.of.Contraceptive.Use
2014	Most/Moderately Effective	15-20 year olds	38.765000
2014	LARC	15-20 year olds	8.635000
2014	Most/Moderately Effective	21-44 year olds	42.683333
2014	LARC	21-44 year olds	8.290000
2015	LARC	21-44 year olds	6.785714
2015	Most/Moderately Effective	15-20 year olds	32.613333
2015	LARC	15-20 year olds	5.605000
2015	Most/Moderately Effective	21-44 year olds	31.471667
2016	Most/Moderately Effective	15-20 year olds	31.408333
2016	LARC	15-20 year olds	5.156667
2016	Most/Moderately Effective	21-44 year olds	30.286667
2016	LARC	21-44 year olds	6.576667

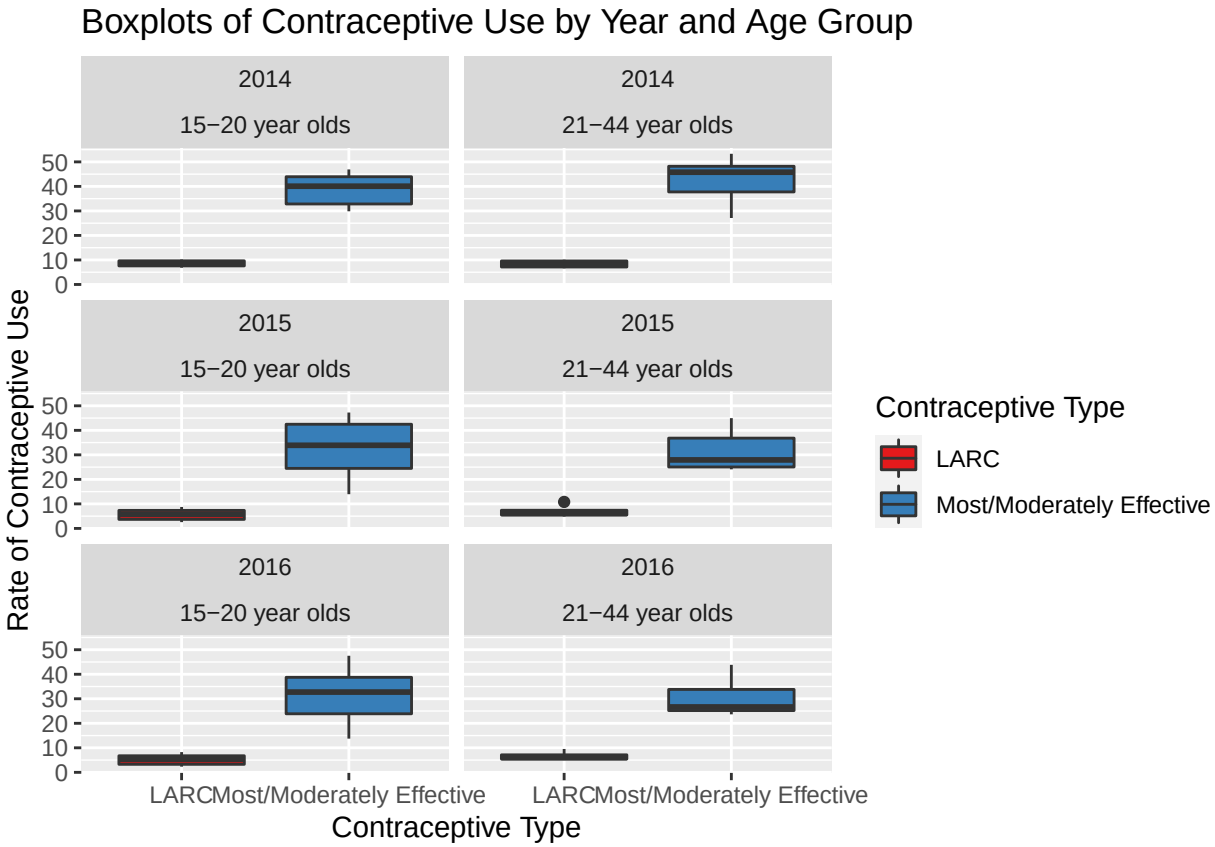
Here is a data table that contains the average rates of contraception by age group, contraceptive type and year. The following visuals will give a better representation of the data.



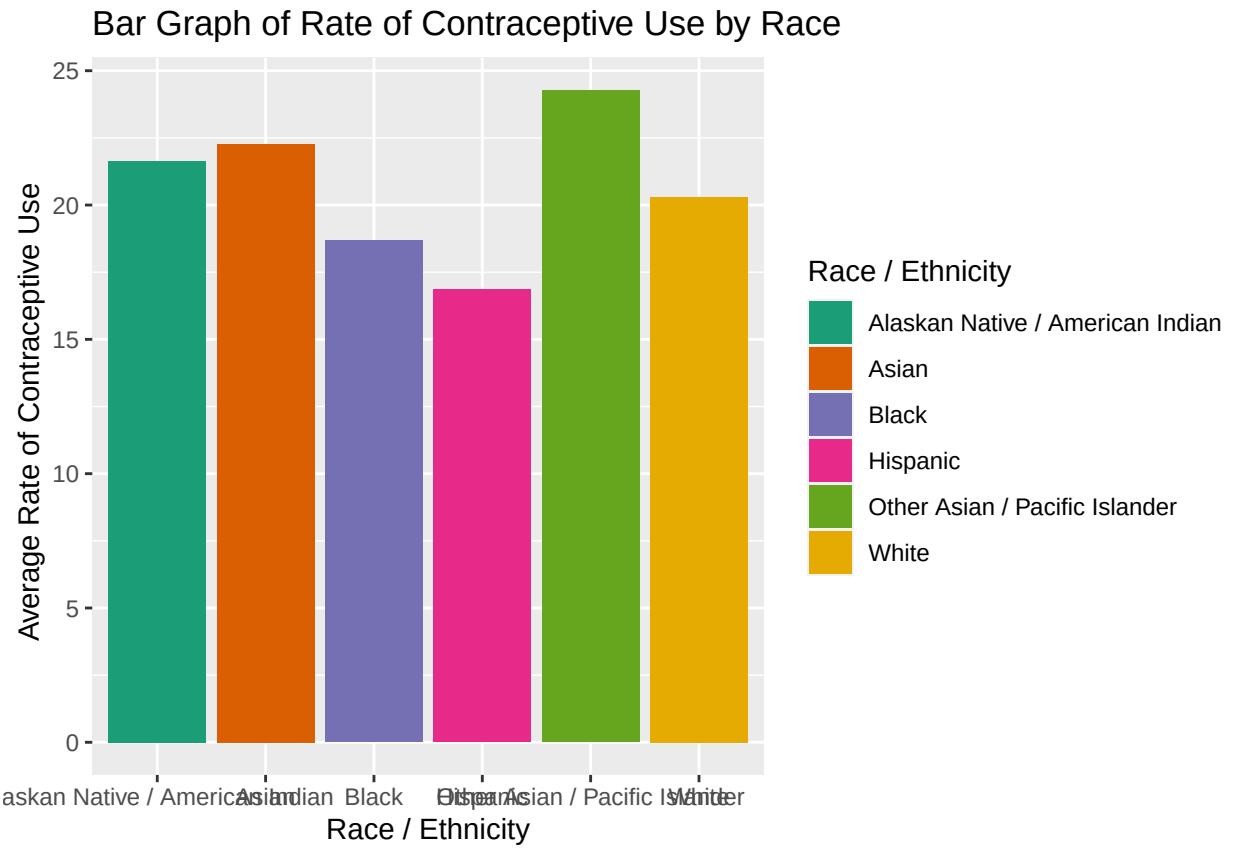
These bar graphs show the rates of contraceptive use, LARC or Most/Moderately Effective methods, per age group. The figure suggests that older women use LARC methods at a slightly higher rate. Since these bar graphs are so similar, I wanted to see if the graphs would depict different patterns when stratified by year. Perhaps a different trend will appear.



These bar graphs stratify the avgerage rates of contraceptive use by year. Interestingly enough, older women used LARC methods at a lower rate than younger women in 2014 (see website for numeric value of bar). In the next two years, the rates for 15-20 year olds decreased and were lower than the rates for 21-44 year olds. These graphs are more effective in showing how the rate distribution changes for the two age groups over the years. They suggest that time might be confounder in the association between contraceptive type and age group since the pattern changes throughout the 3 year period.



Again, the boxplots depict the distribution of contraceptive rates by year, age group, and contraceptive type. Similar to average rates in the bar graphs, these boxplots confirm that the median LARC contraceptive use rates for younger women are only higher than for older women only in 2014 (see website for median values). The opposite is true for the next two years. There seems to be an outlier for LARC contraceptive types in 2015 for 21-44 year olds. By examining the data more closely, we can see that the outlier is not particularly concerning because it comes from the "Other Asian/Pacific Islander" racial group and they consistently have higher rates throughout the dataset.



This distribution shows the variability in contraceptive rates across the six ethnic groups. This bar graph indicates that women of Black and Hispanic race use contraception at a lower rate than women of other races. This observation should be considered for future research. There could potentially be lack of access, resources, health education for other barriers or these racial groups. Furthermore, the general variability in rates across ethnic groups could suggest that there are more underlying factors that affect women's access to contraception or openness to use it, such as cultural or religious values.

Conclusion and Summary

Although statistical analyses should be conducted in order to determine a more accurate conclusion, we can look at the figures and table to reach a preliminary conclusion. In reference to the formulated research question, younger women do indeed use LARC contraceptive methods at a lower rate than older women, but this was not true for all 3 years, 2014-2016. In 2014, younger women actually had slightly higher rates for LARC contraceptive use. More research should be conducted as to why there was a change between 2014 and 2015 and if the trend has held the same past 2016. Introducing LARC contraceptive methods to younger women could reduce unwanted pregnancies and offer alternative, long-term contraception options. Observing how the trends have changed throughout the years can give researchers better ideas on how and who is lacking access to contraception With these findings, it's also important to note the limitations of the data. The measure doesn't account for several aspects of women's risk of unintended pregnancy including sexual experience, pregnancy intention,sterilization or LARC insertion in a year preceding the measurement year, and infertility for non-contraceptive reasons. These factors surely affect the rates reported in the data as some of the study participants may not actually be at risk for unintended pregnancy and eligible for the study.