Global Unmet Need for Contraception

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Data Origins

The data was obtained from the Global Burden of Disease Study 2019 which was reported by the Institute for Health Metrics and Evaluation (https://ghdx.healthdata.org/record/ihme-data/contraceptive-prevalence-estimates-1970-2019). This data consisted of global contraceptive prevalence estimates of woman of reproductive age from the years 1970 to 2019. The specific data-set used in this project provided a more recent estimate, as it consisted of the years 1990 to 2019.

The data included both the average and percentile annual estimates for contraception prevalence as a proportion of all women. It further measured different methods of contraception, the unmet need for contraception and the demand satisfied with current contraception methods. These measures were assessed in 204 countries in women aged between 15 and 49 years. Ages were grouped into nine age ranges. Additional columns provided a numerical identifier for location, sex and age.

```
# load data
df <- read_csv(here("data", "data.csv"))
head(df)
```

```
## # A tibble: 6 x 12
##   measure  locat~1 locat~2 sex_id sex_n~3 age_g~4 age_g~5 metric year_id    mean
##   <chr>      <dbl> <chr>    <dbl> <chr>     <dbl> <chr>   <chr>    <dbl>   <dbl>
## 1 Any con~       6 China        2 Female        8 15-19 ~ Propo~    1990 0.00978
## 2 Any con~       6 China        2 Female        9 20-24 ~ Propo~    1990 0.274
## 3 Any con~       6 China        2 Female       10 25-29 ~ Propo~    1990 0.750
## 4 Any con~       6 China        2 Female       11 30-34 ~ Propo~    1990 0.881
## 5 Any con~       6 China        2 Female       12 35-39 ~ Propo~    1990 0.898
## 6 Any con~       6 China        2 Female       13 40-44 ~ Propo~    1990 0.871
## # ... with 2 more variables: upper <dbl>, lower <dbl>, and abbreviated variable
## #   names 1: location_id, 2: location_name, 3: sex_name, 4: age_group_id,
## #   5: age_group_name
```

Background and Research Question

The goal to meet contraception needs of all women cannot be met without the knowledge of disparity for contraception across the world. The unmet need for contraception is recognised by the Global Burden of Disease Study (Global Burden of Disease Collaborative Network, 2019) as an important aspect that could affect the health of women. Until this need is met, women will continue to be marginalized and expected to manage the complications that can occur with unplanned pregnancy, such as abortion related health risks (Klima., 1998). Yet, as this is a global problem, women in some countries will be more likely to be exposed to this risk than others, so it is not easily solvable.

The data from the Global Burden of Disease study (Global Burden of Disease Collaborative Network, 2019) will be able to provide insight into annual trends for the unmet need of contraception, and additionally show

any global differences in this unmet need. Therefore, this project questioned whether the problem of unmet need for contraception is improving, and examined the world disparity in this.

Data Preparation

For ease of readability, i first created new column names.

```
col_names <- c("measure", "location_id", "location", "sex_id", "sex",
               "age_group_id", "age_group","metric", "year", "mean", "upper",
               "lower")
colnames(df) <- col_names
```

I then removed any data that was not relevant to the visualisation.

```
cf <- df %>%
  filter(measure != 'Any contraceptive prevalence',
         measure != 'Modern contraceptive prevalence',
         measure != 'Demand satisfied with modern methods',
         measure != 'Female sterilization prevalence',
         measure != 'Male sterilization prevalence',
         measure != 'Injections prevalence',
         measure != 'IUD prevalence',
         measure != 'Implants prevalence',
         measure != 'Pill prevalence',
         measure != 'Condom prevalence',
         measure != 'Diaphragm prevalence',
         measure != 'Emergency contraception prevalence',
         measure != 'Other modern methods prevalence',
         measure != 'Lactional amenorrhea method prevalence',
         measure != 'Rhythm prevalence',
         measure != 'Withdrawal prevalence',
         measure != 'Other traditional methods prevalence') %>%
  #removed unneeded measures
  filter(age_group != '15-19 years', age_group != '20-24 years',
         age_group != '25-29 years', age_group != '30-34 years',
         age_group != '35-39 years', age_group != '40-44 years',
         age_group != '45-49 years',
         age_group != 'Age-standardized (15-49 years)') %>%
  #removed unneeded age ranges
  mutate(age_group=str_sub(age_group, start = 10, end = 20)) %>%
  #tidied row
  subset(select = -c(location_id, sex_id, sex, metric, age_group_id, upper,
                     lower))
  #removed unneeded columns
head(cf)
```

```
## # A tibble: 6 x 5
##   measure                                 location age_group     year   mean
##   <chr>                                   <chr>    <chr>        <dbl>  <dbl>
## 1 Unmet need for any contraceptive method China    15-49 years  1990 0.0885
## 2 Unmet need for any contraceptive method China    15-49 years  1991 0.0854
## 3 Unmet need for any contraceptive method China    15-49 years  1992 0.0825
```

```
## 4 Unmet need for any contraceptive method China      15-49 years  1993 0.0794
## 5 Unmet need for any contraceptive method China      15-49 years  1994 0.0767
## 6 Unmet need for any contraceptive method China      15-49 years  1995 0.0738
```

In order to provide a tidier visualisation, countries were grouped into world super regions. The regions used
in this report were in accordance with literature from Haakenstad et al., (2022), an article which described
the Global Burden of Disease Study Contraceptive Prevalence Estimates data. This method of grouping was
also recognised as standard in Global Burden of Disease studies (https://www.healthdata.org/sites/default/
files/files/Projects/GBD/GBDRegions_countries.pdf), and so provided a reliable format.

```r
# creating data frames for regions, assigning to new column
central_europe_eastern_europe_central_asia <- cf %>%
  filter(location == "Armenia"| location == "Azerbaijan"| location == "Georgia"|
           location == "Kazakhstan"| location == "Kyrgyzstan"|
           location == "Mongolia"| location == "Tajiikistan"|
           location == "Turkmenistan"| location =="Uzbekistan"|
           location == "Albania"| location == "Bosnia and Herzegovina"|
           location == "Bulgaria"| location == "Croatia"| location == "Hungary"|
           location == "Montenegro"| location == "North Macedonia"|
           location == "Poland"| location == "Romania"| location == "Serbia"|
           location == "Slovakia"| location == "Slovenia"|
           location == "Belarus"| location == "Estnoia"| location == "Latvia"|
           location == "Lithuania"| location == "Moldova"| location == "Russia"|
           location == "Ukraine")
central_europe_eastern_europe_central_asia$region <- "central europe, eastern
europe and central asia"

high_income <- cf %>%
  filter(location == "Australia"| location == "New Zealand"|
           location == "Brunei"| location == "Japan"| location == "Singapore"|
           location == "South Korea"| location == "Canada"|
           location == "Greenland"| location == "United States of America"|
           location == "Argentina"| location == "Chile"| location == "Uruguay"|
           location == "Andorra"| location == "Austria"| location == "Belgium"|
           location == "Cyprus"| location == "Denmark"| location == "Finland"|
           location == "France"| location == "Germany"| location == "Greece"|
           location == "Iceland"| location == "Ireland"| location == "Israel"|
           location == "Italy"| location == "Luxembourg"| location == "Malta"|
           location == "Monaco"| location == "Netherlands"|
           location == "Norway"| location == "Portugal"|
           location == "San Marino"| location == "Spain"| location == "Sweden"|
           location == "Switzerland"| location == "United Kingdom")
high_income$region <- "high income"

latin_america_caribbean <- cf %>%
  filter(location == "Bolivia"| location == "Ecuador"| location == "Peru"|
           location == "Caribbean"| location == "Antigua and Barbuda"|
           location == "Bahamas"| location == "Barbados"| location == "Belize"|
           location == "Bermuda"| location == "Cuba"| location == "Dominica"|
           location == "Dominican Republic"| location == "Grenada"|
           location == "Guyana"| location == "Haiti"| location == "Jamaica"|
           location == "Puerto Rico"| location == "Saint Kitts and Nevis"|
           location == "Saint Lucia"|
           location == "Saint Vicent and the Grenadines"|
```

```r
            location == "Suriname"| location == "Trinidad and Tobago"|
            location == "Virgin Islands"| location == "Colombia"|
            location == "Costa Rica"| location == "El Salvador"|
            location == "Guatemala"| location == "Mexico"|
            location == "Nicaragua"| location == "Panama"|
            location == "Venezeula"| location == "Brazil"|
            location == "Paraguay")
latin_america_caribbean$region <- "latin america and caribbean"

north_africa_middle_east <- cf %>%
  filter(location == "Afghanistan"| location == "Algeria"|
            location == "Bahrain"| location == "Egypt"| location == "Iran"|
            location == "Jordan"| location == "Kuwait"| location == "Lebanon"|
            location == "Libya"| location == "Morocco"| location == "Oman"|
            location == "Palestine"| location == "Qatar"|
            location == "Saudi Arabia"| location == "Sudan"|
            location == "Syria"| location == "Tunisia"| location == "Turkey"|
            location == "United Arab Emirates"| location == "Yemen")
north_africa_middle_east$region <- "north africa and middle east"

south_asia <- cf %>%
  filter(location == "Bangladesh"| location == "Bhutan"| location == "India"|
            location == "Nepal"| location == "Pakistan")
south_asia$region <- "south asia"

southeast_asia_east_asia_oceania <- cf %>%
  filter(location == "China"| location == "North Korea"| location == "Taiwan"|
            location == "American Samoa"| location == "Cook Islands"|
            location == "Micronesia"| location == "Fiji"| location == "Guam"|
            location == "Kiribati"| location == "Marshall Islands"|
            location == "Nauru"| location == "Niue"|
            location == "Northen Mariana Islands"| location == "Palau"|
            location == "Papua New Guinea"| location == "Samoa"|
            location == "Solomon Islands"| location == "Tokelau"|
            location == "Tonga"| location == "Tuvalu"| location == "Vanuatu"|
            location == "Cambodia"| location == "Indonesia"| location == "Laos"|
            location == "Malaysia"| location == "Maldives"|
            location == "Mauritius"| location == "Myanmar"|
            location == "Philippines"| location == "Seychelles"|
            location == "Sri Lanka"| location == "Thailand"|
            location == "Timor-Leste"| location == "Vietnam")
southeast_asia_east_asia_oceania$region <- "southest asia, east asia and
oceania"

subsaharan_africa <- cf %>%
  filter(location == "Congo"| location == "Central African Republic"|
            location == "Congo"| location == "Democratic Republic of the Congo"|
            location == "Equatorial Guinea"| location == "Gabon"|
            location == "Burundi"| location == "Comoros"| location == "Djibouti"|
            location == "Eritrea"| location == "Ethiopia"| location == "Kenya"|
            location == "Madagascar"| location == "Malawi"|
            location == "Mozambique"| location == "Rwanda"|
            location == "Somalia"| location == "South Sudan"|
```

```
              location == "Tanzania"| location == "Uganda"| location == "Zambia"|
              location == "Botswana"| location == "Eswatini"|
              location == "Lesotho"| location == "Namibia"|
              location == "South Africa"| location == "Zimbabwe"|
              location == "Benin"| location == "Burkina Faso"|
              location == "Cameroon"| location == "Cape Verde"| location == "Chad"|
              location == "Côte d'Ivoire"| location == "Gambia"|
              location == "Ghana"| location == "Guinea"|
              location == "Guinea-Bissau"| location == "Liberia"|
              location == "Mali"| location == "Mauritania"| location == "Niger"|
              location == "Nigeria"| location == "Sao Tome and Principe"|
              location == "Senegal"| location == "Sierra Leone"|
              location == "Toga")
subsaharan_africa$region <- "subsaharan africa"
```

I then combined all the super region data frames into one data frame.

```
# joining data frames
cf1 <- rbind(central_europe_eastern_europe_central_asia, high_income,
             latin_america_caribbean, north_africa_middle_east, south_asia,
             southeast_asia_east_asia_oceania, subsaharan_africa)
```

Visualisation

To create my visualisation, i first had to calculate the mean of all the countries in each region for each year.
This was assigned to a new column in a new data frame.

```
# assigning mean to data frame
average <- cf1 %>%
  group_by(year, region) %>%
  summarise(mean_yr_region = mean(mean))
```

My final visualisation shows an animated line plot of the global unmet for contraception over time. This
type of chart was chosen to demonstrate any fluctuations or trends that could be present in the data.

There is a notable trend in all regions of the world towards a decrease in the unmet need for contraception.
However, the difference between regions is obvious, with subsaharan Africa showing a much larger unmet
need than other regions, especially compared to high income countries. There are also many regions of the
world that display a similar unmet need for contraception. The improvement of south Asia to meet the
level of these other regions, provides a new insight into how this region is implementing more contraception
methods that are reaching women.

```
p <- ggplot(average, aes(x=year, y=mean_yr_region, col=region)) + geom_line() +
  labs(title = "Global Unmet Need for Contraception Over Time", x = "Year"
       , y = "Mean Unmet Need for Any Contraceptive Method",
       color = "World Super Regions" ) +
  ylim(0, 0.25) +
  theme(plot.title = element_text(size = 14, face = "bold"),
        axis.title.x = element_text(size = 13),
        axis.title.y = element_text(size = 13),
        legend.title = element_text(size = 13),
```

```
        legend.text = element_text(size = 11)) +
  scale_color_brewer(palette = "Set1")
p
```

Global Unmet Need for Contraception Over Time
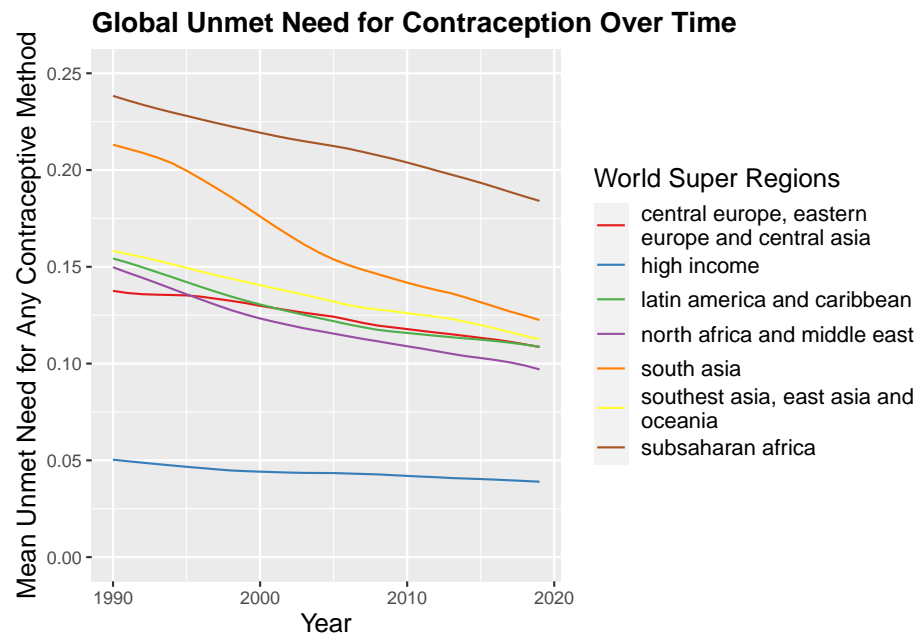

```
#anim <- p + geom_point(size=2.5) + transition_reveal(year)
#animate(anim, renderer=gifski_renderer())

#save output as gif
# anim_save(here("figs", "contraception_year_region.gif"),anim, renderer=gifski_renderer())
```

Summary

This visualisation confirms that there is global disparity in the contraception needs of women being met. As some regions appear to be more exposed to this issue than others, it questions why this could be. An interesting further visualisation could correlate this data with a global inequality index, to discover if there is an association between regions with a higher unmet need for contraception and higher inequality. Nevertheless, a positive message from this visualisation is that the problem of unmet need for contraception is improving, and from the direction of data, should continue to improve in years to come.

Completing this project has allowed me to learn how to transform a large data set into a specific visualisation that represents an important global problem. The ability to animate this visualisation provides further dimension into how this issue transpires over time. Overall, i have acquired a new skill that i am confident in and will be able to further improve to perform bolder visualisations.

References

Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Contraceptive Prevalence Estimates 1970-2019. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME), 2022.https://doi.org/10.6069/WZHR-V063

Haakenstad, A., Angelino, O., Irvine, C. M., Bhutta, Z. A., Bienhoff, K., Bintz, C., . . . & Lozano, R. (2022). Measuring contraceptive method mix, prevalence, and demand satisfied by age and marital status in 204 countries and territories, 1970–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet, 400(10348), 295-327.https://doi.org/10.1016/S0140-6736(22)00936-9

Klima, C. S. (1998). Unintended pregnancy: consequences and solutions for a worldwide problem. Journal of Nurse-Midwifery, 43(6), 483-491.https://doi.org/10.1016/S0091-2182(98)00063-9