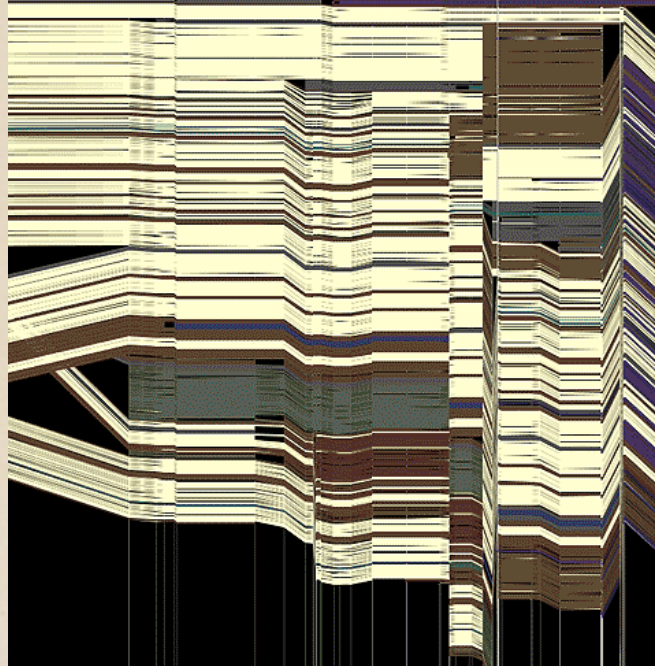
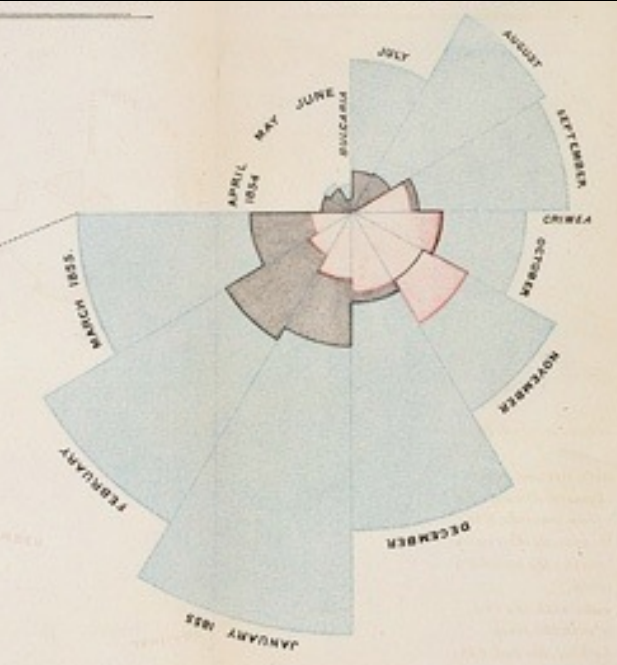


# CSE 442 - Data Visualization

## A1 Review



Matthew Conlen University of Washington

# Review: Image Models & EDA

# The Big Picture

## task

questions, goals  
assumptions

## data

physical data type  
conceptual data type

## domain

metadata  
semantics  
conventions

processing  
algorithms

mapping  
visual encoding

## image

visual channel  
graphical marks

# Nominal, Ordinal & Quantitative

N - Nominal (labels or categories)

- Operations: =, ≠

O - Ordered

- Operations: =, ≠, <, >

Q - Interval (location of zero arbitrary)

- Operations: =, ≠, <, >, -
- Can measure distances or spans

Q - Ratio (zero fixed)

- Operations: =, ≠, <, >, -, %
- Can measure ratios or proportions

# Visual Encoding Variables

Position (x 2)

Size

Value

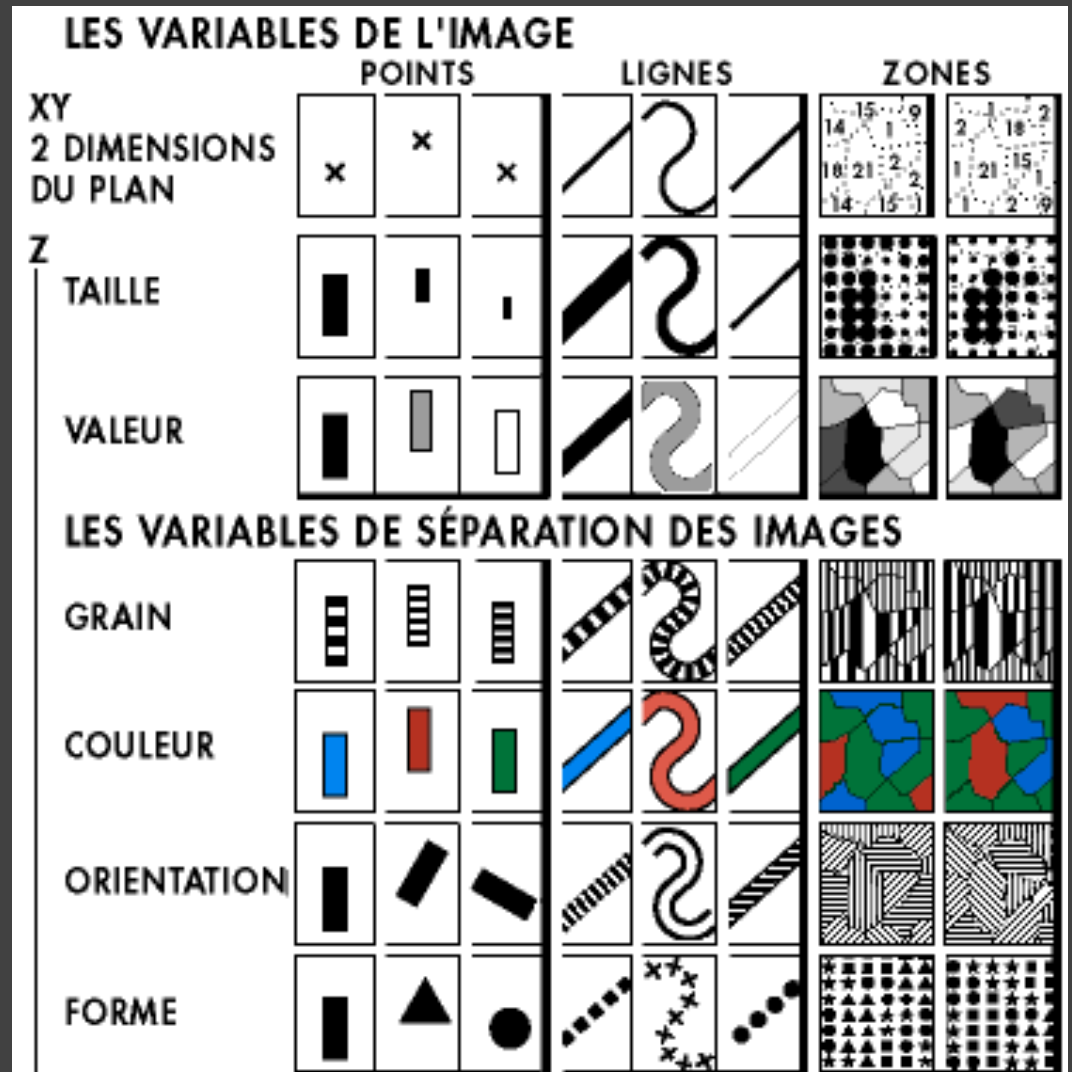
Texture

Color

Orientation

Shape

Others?



# Design Criteria *Translated*

**Tell the truth and nothing but the truth**  
(don't lie, and don't lie by omission)

**Use encodings that people decode better**  
(where better = faster and/or more accurate)

# Effectiveness Rankings [Mackinlay 86]

## QUANTITATIVE

Position  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Density (Value)  
Color Sat  
Color Hue  
Texture  
Connection  
Containment  
Shape

## ORDINAL

Position  
Density (Value)  
Color Sat  
Color Hue  
Texture  
Connection  
Containment  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Shape

## NOMINAL

Position  
Color Hue  
Texture  
Connection  
Containment  
Density (Value)  
Color Sat  
Shape  
Length  
Angle  
Slope  
Area  
Volume

# Effectiveness Rankings [Mackinlay 86]

## QUANTITATIVE

### **Position** .....

Length  
Angle  
Slope  
Area (Size)  
Volume  
Density (Value)  
Color Sat  
Color Hue  
Texture  
Connection  
Containment  
Shape

## ORDINAL

### **Position** .....

Density (Value)  
Color Sat  
Color Hue  
Texture  
Connection  
Containment  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Shape

## NOMINAL

### **Position**

Color Hue  
Texture  
Connection  
Containment  
Density (Value)  
Color Sat  
Shape  
Length  
Angle  
Slope  
Area  
Volume



# Effectiveness Rankings [Mackinlay 86]

## QUANTITATIVE

Position  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Density (Value)  
Color Sat  
**Color Hue**  
Texture  
Connection  
Containment  
Shape

## ORDINAL

Position  
Density (Value)  
Color Sat  
**Color Hue**  
Texture  
Connection  
Containment  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Shape

## NOMINAL

Position  
**Color Hue**  
Texture  
Connection  
Containment  
Density (Value)  
Color Sat  
Shape  
Length  
Angle  
Slope  
Area  
Volume

I spend more than half of my time integrating, cleansing and transforming data without doing any actual analysis. Most of the time I'm lucky if I get to do any "analysis" at all.

Anonymous Data Scientist

[Kandel et al. '12]

# Data Quality Hurdles

Missing Data	no measurements, redacted, ...?
Erroneous Values	misspelling, outliers, ...?
Type Conversion	e.g., zip code to lat-lon
Entity Resolution	diff. values for the same thing?
Data Integration	effort/errors when combining data

*LESSON:* Anticipate problems with your data.  
Many research problems around these issues!

# Lesson: Iterative Exploration

## Exploratory Process

- 1 Construct graphics to address questions
- 2 Inspect “answer” and assess new questions
- 3 Repeat...

**Transform data** appropriately (e.g., invert, log)

**Show data variation, not design variation** [Tufte]

# A1 Review

# A1 Submission Designs

**Measures:** Population count, Gender ratio, Growth rate, Age, Difference between years or genders

**Transforms:** Percentages, Counts, Proportions

**Marks:** Bar, Line/Area, Dot/Scatter, Pie, Other

*Bars:* Stacked, Grouped, Opposing Axes

**Extra Context:** Other countries, other years, mortality data

# Design Considerations

**Title, labels, legend, captions, source!**

## **Expressiveness and Effectiveness**

Avoid unexpressive marks (lines? gradients?)

Use perceptually effective encodings

Don't distract: faint gridlines, pastel highlights/fills

The "elimination diet" approach - start minimal

## **Support comparison and pattern perception**

Between elements, to a reference line, or to totals

Use human-friendly units (10M or 10,000,000?)

# Design Considerations

**Transform data** (e.g., invert, log, normalize)

**Group / sort** data by meaningful dimensions

**Reduce cognitive overhead**

Minimize visual search, minimize ambiguity

Appropriate size, aspect ratio, legible text

Avoid legend lookups if direct labeling works

Avoid color mappings with indiscernible colors

**Be consistent!** Visual inferences should consistently support data inferences.



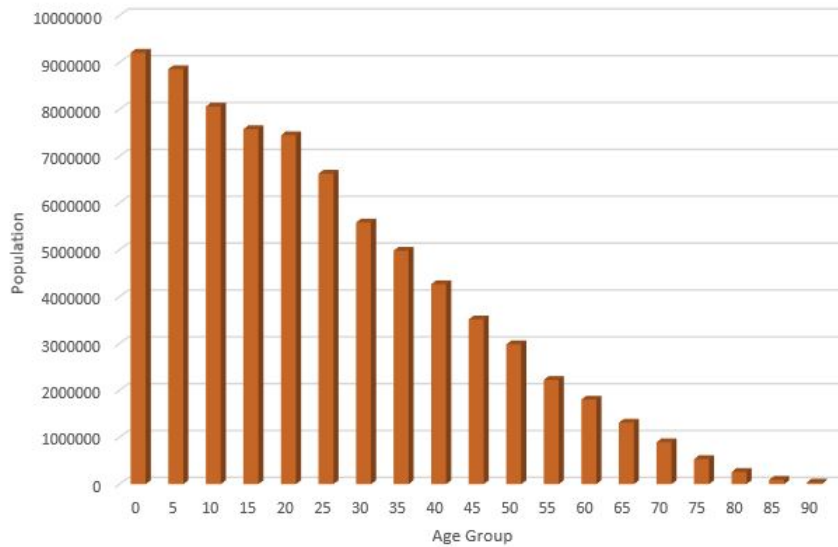
# Bar Charts

**Age, Year**

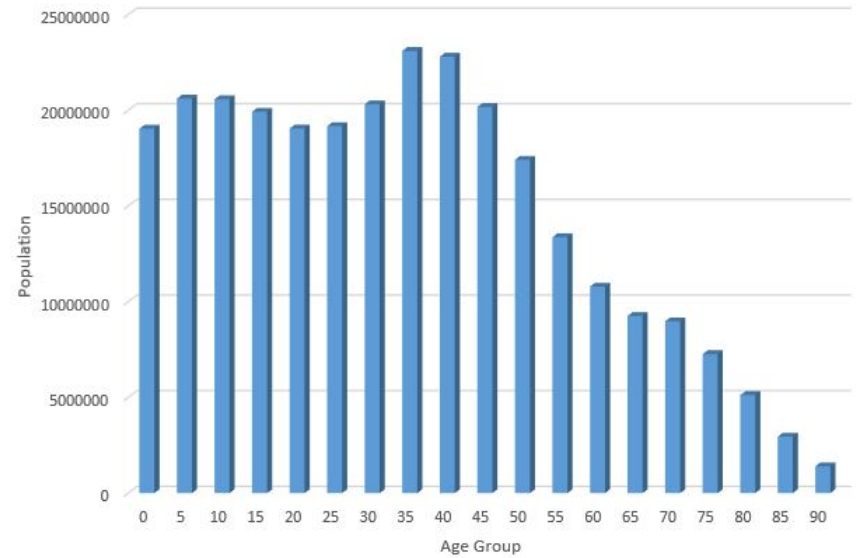
# Population Count

## How has America's population distribution changed over the last century?

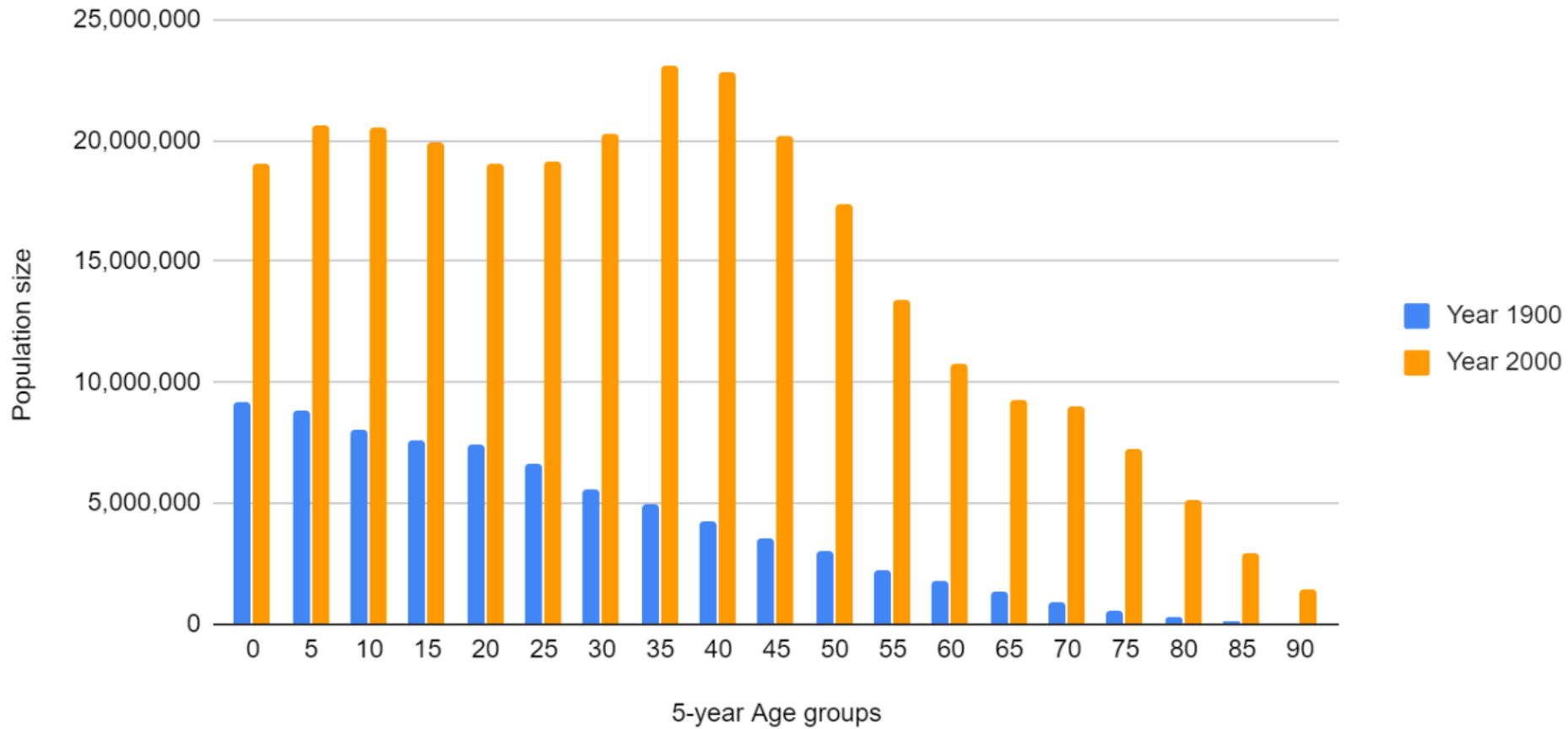
Population by Age Group: 1900



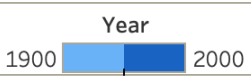
Population by Age Group: 2000



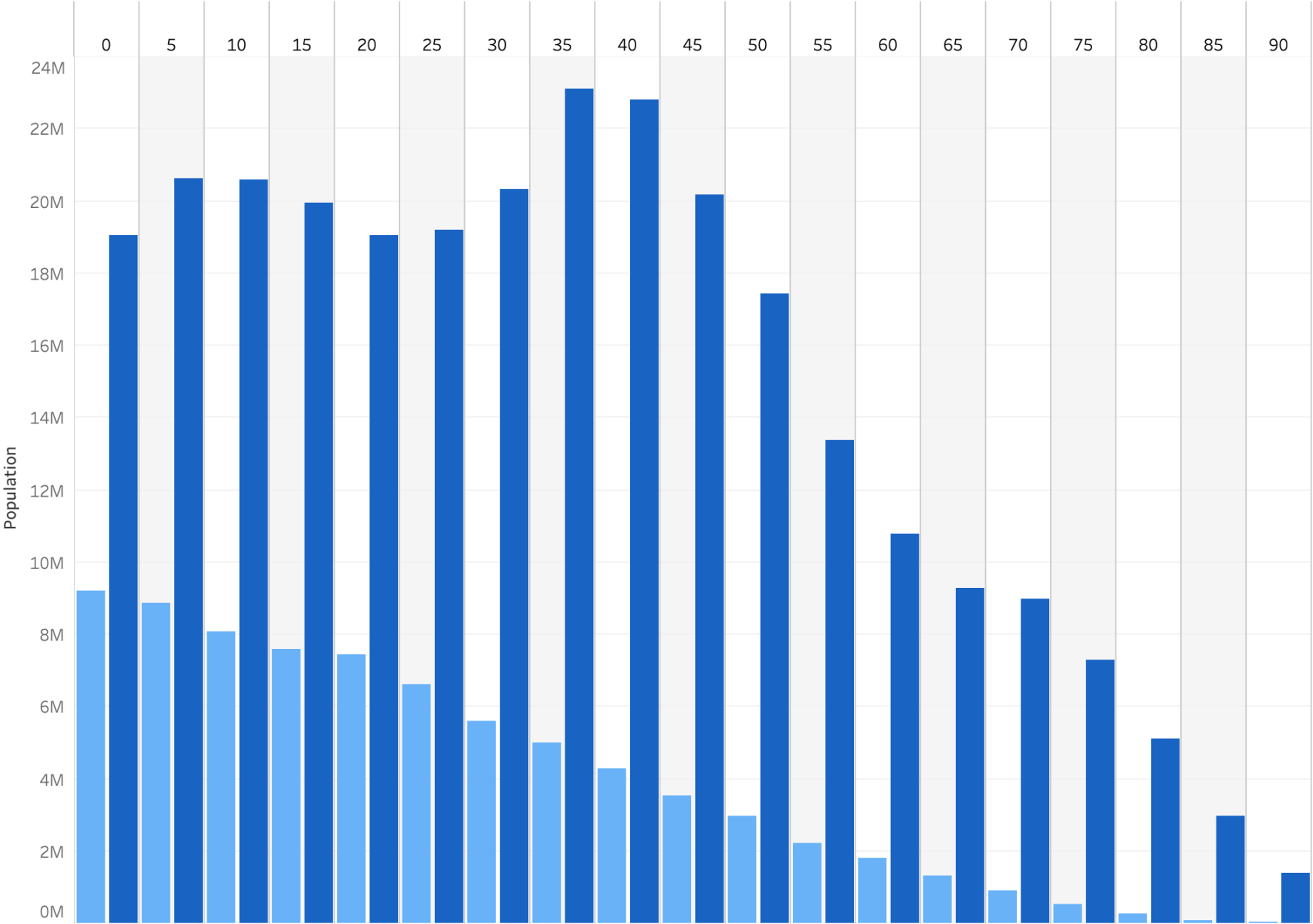
## Population size of Age groups in 1900 and 2000



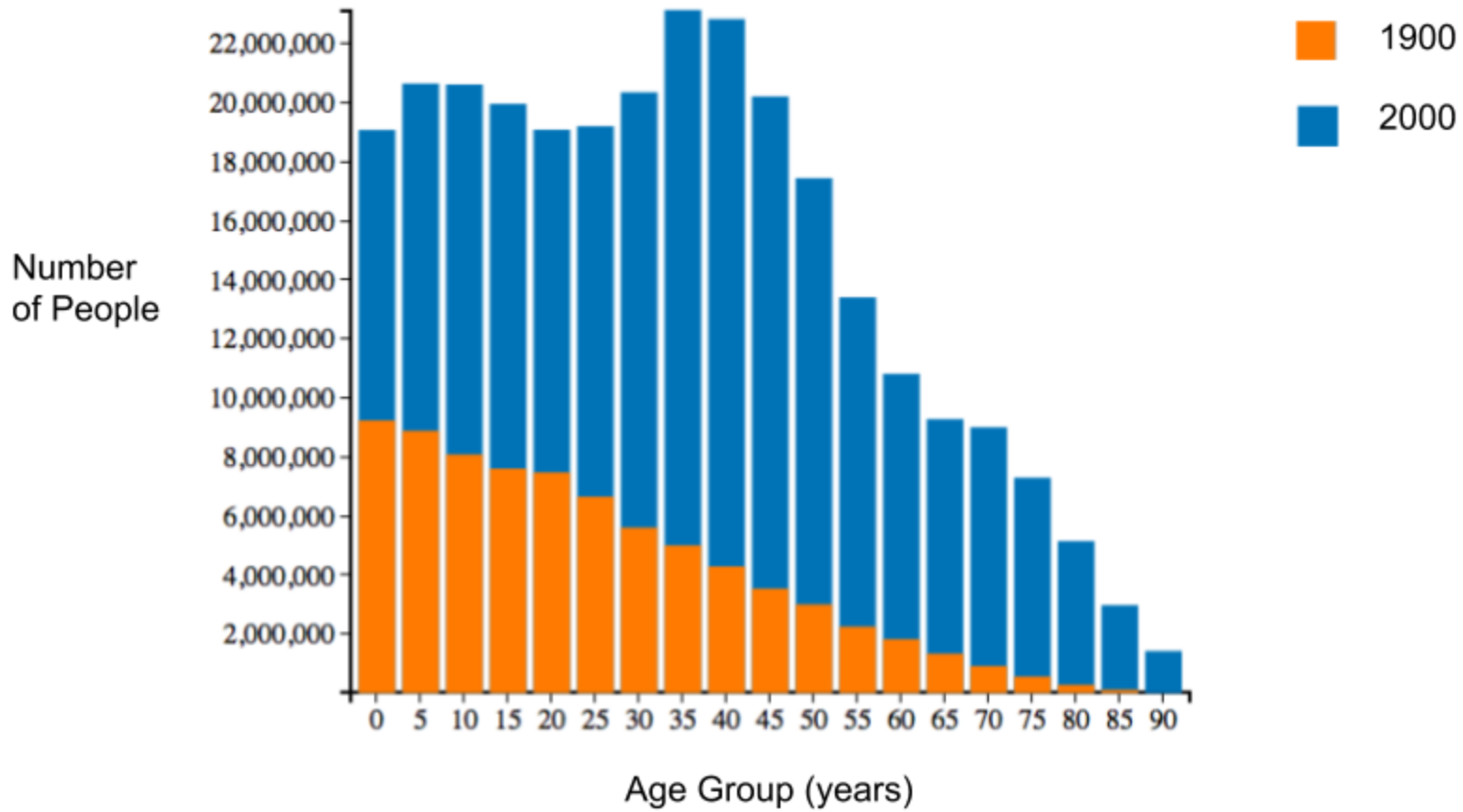
U.S. Population change in different age groups from 1900 vs 2000



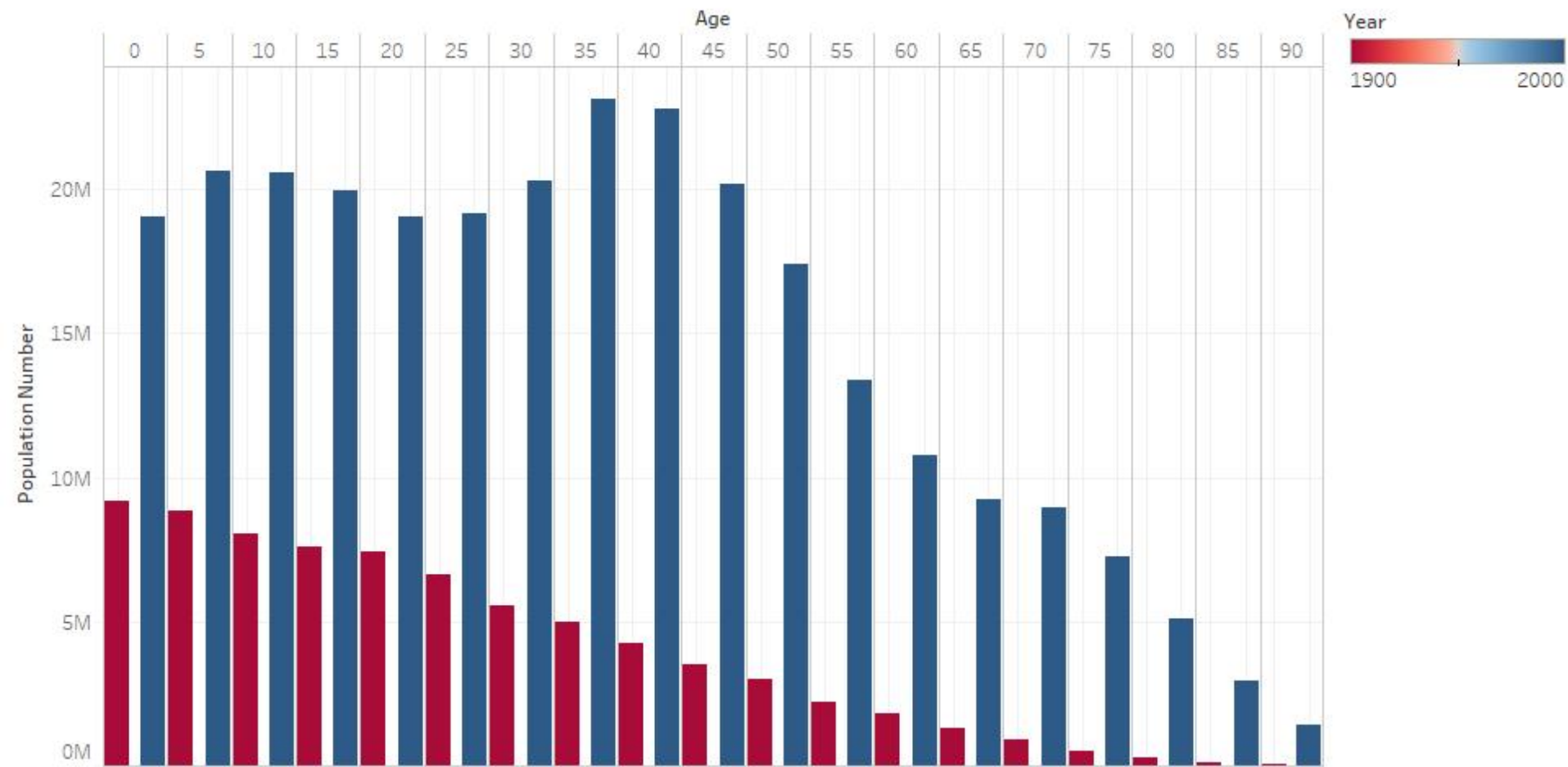
Age (bin)



How does age distribution within the U.S. population compare between the years 1900 and 2000?



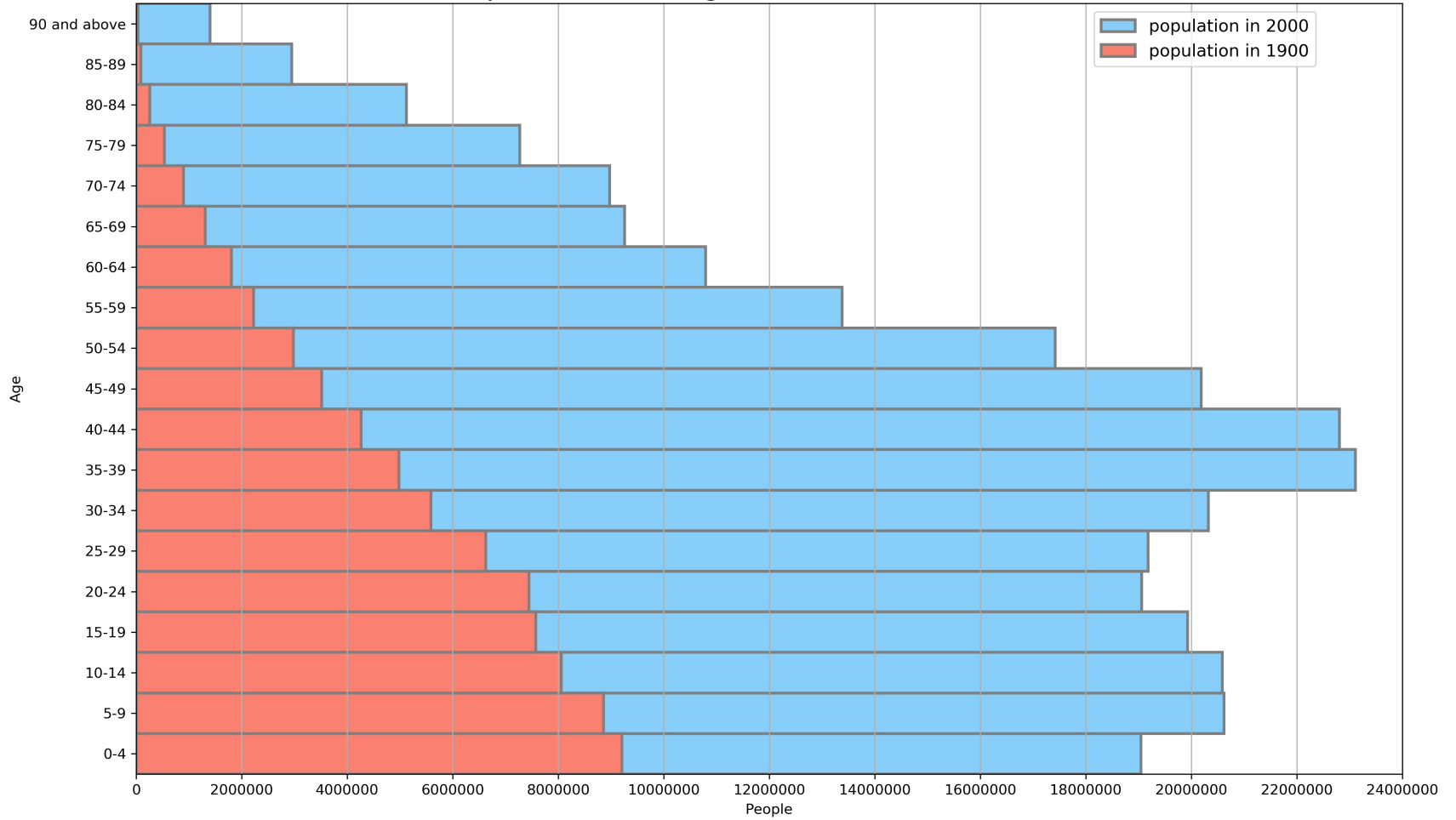
# U.S Population by age a century apart



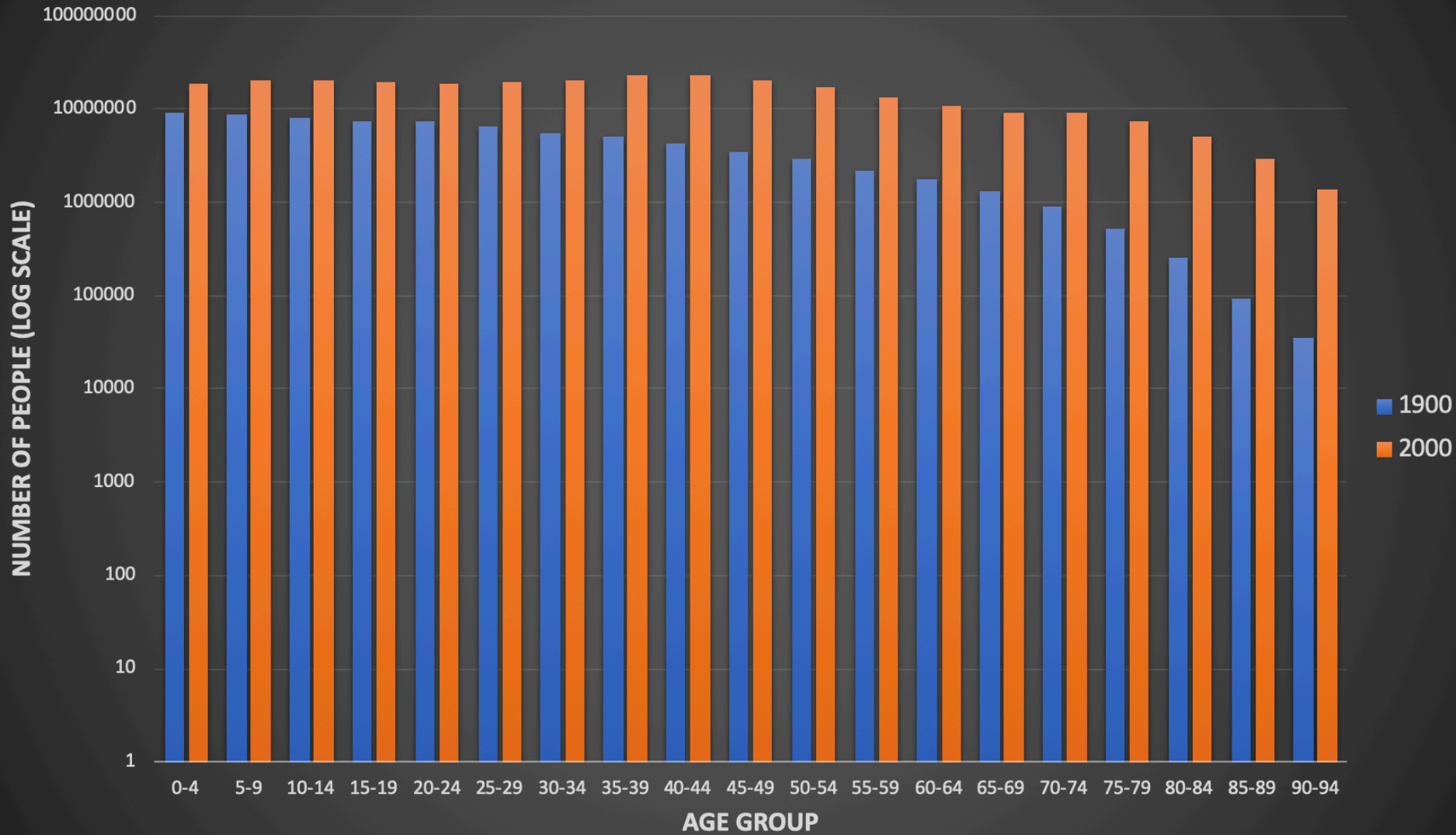
The plot of Population Number for Year broken down by Age. Color shows details about Year.



# US Population over Age Distribution: 1900 vs. 2000



# Is the Average Age of Americans Increasing?

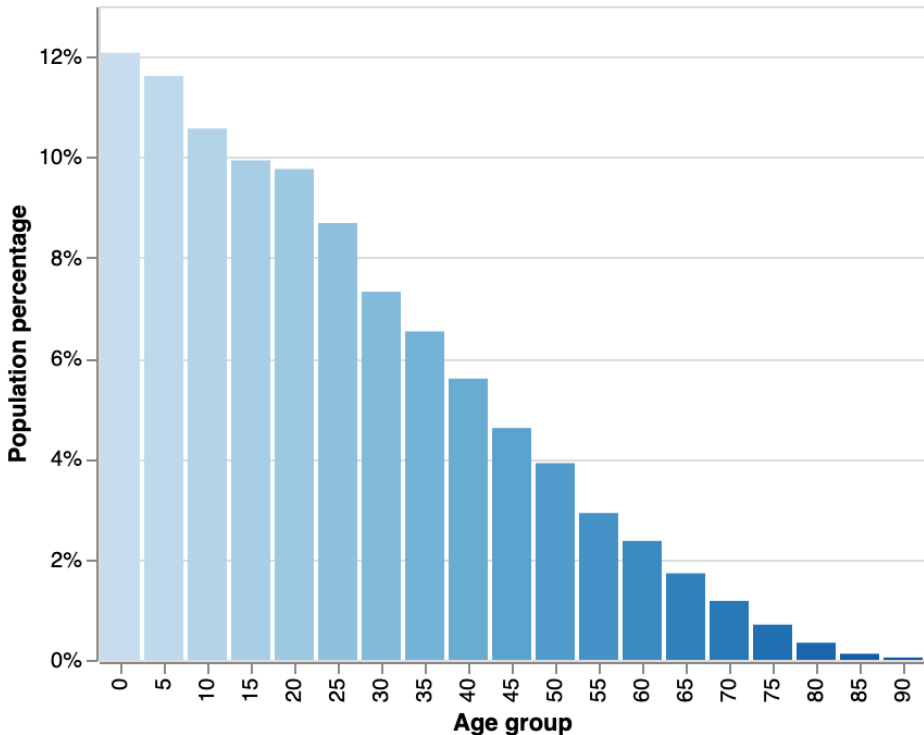


# Population Percentage

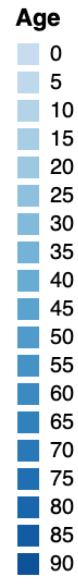
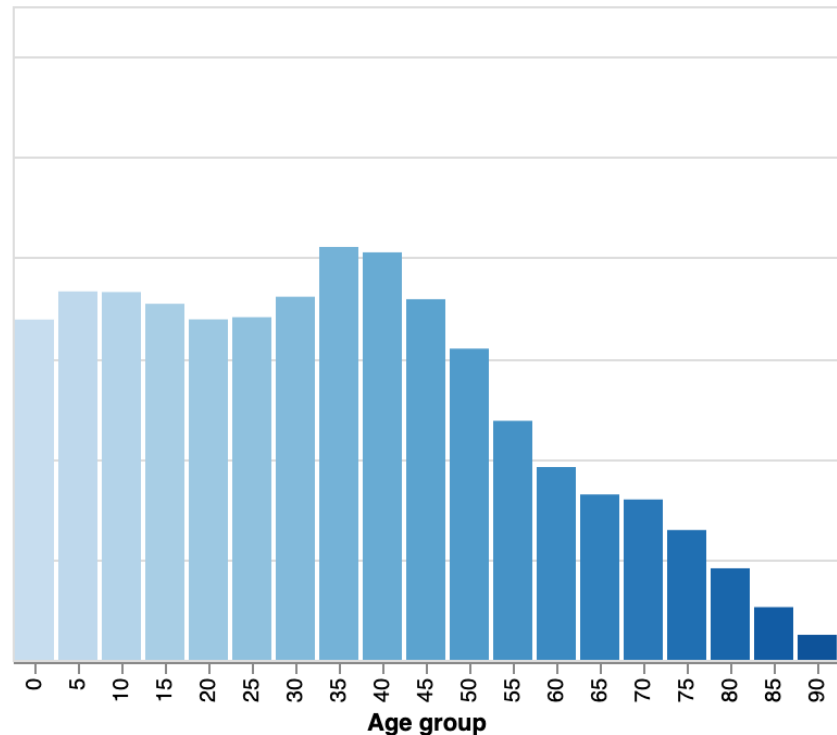
# How has population distribution across age groups changed in the U.S. between years 2000 and 1900?

Year

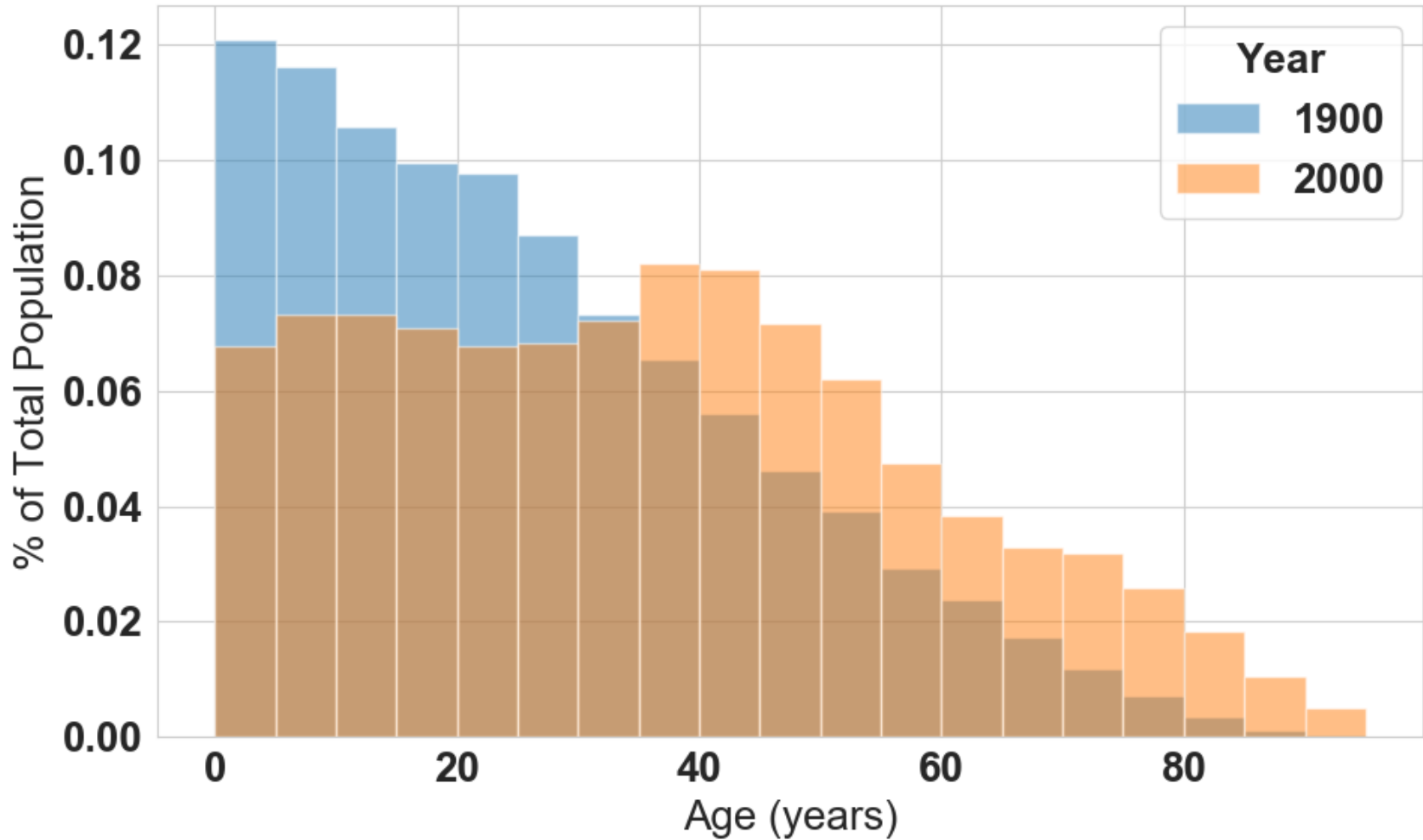
1900



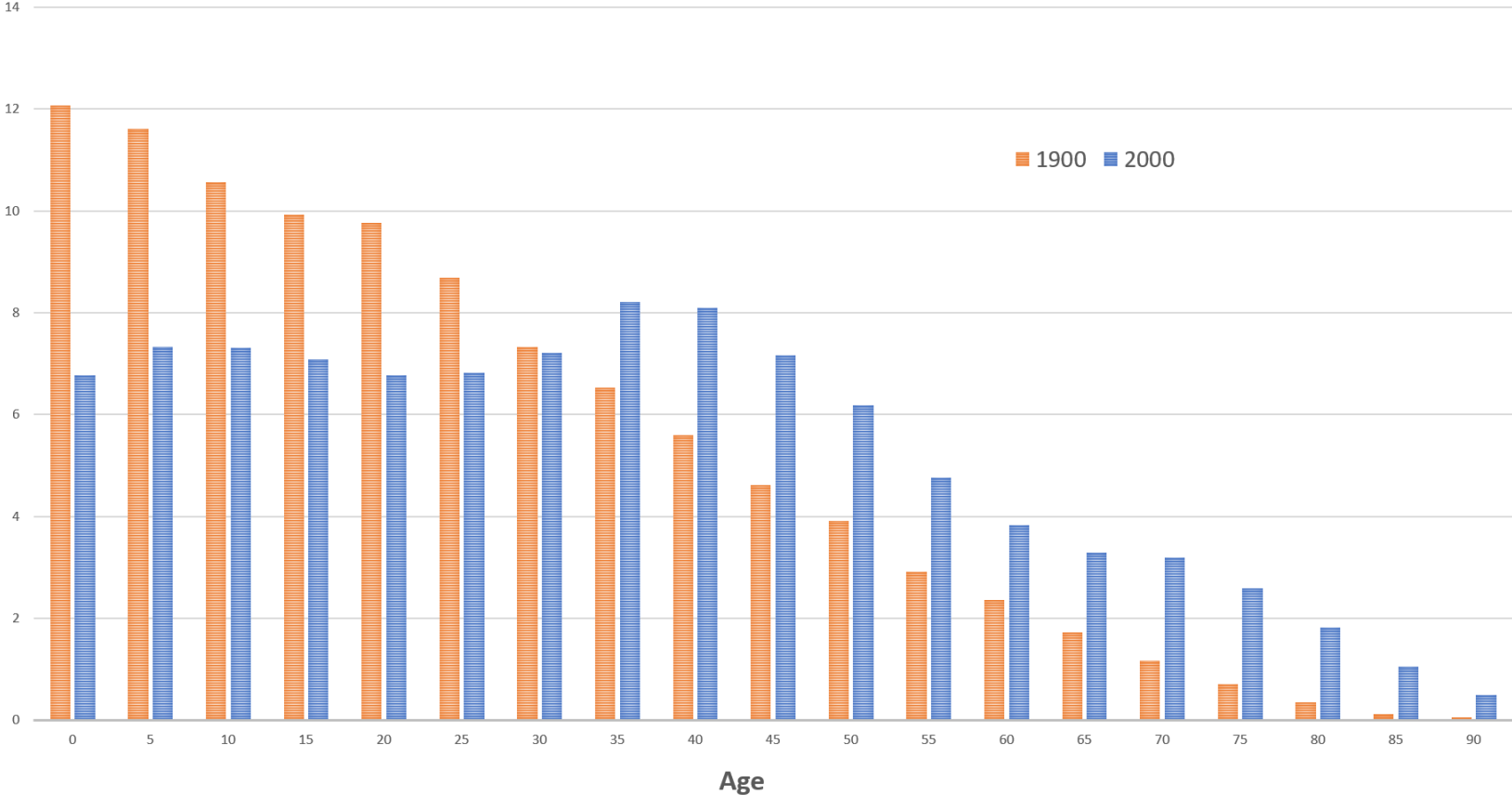
2000



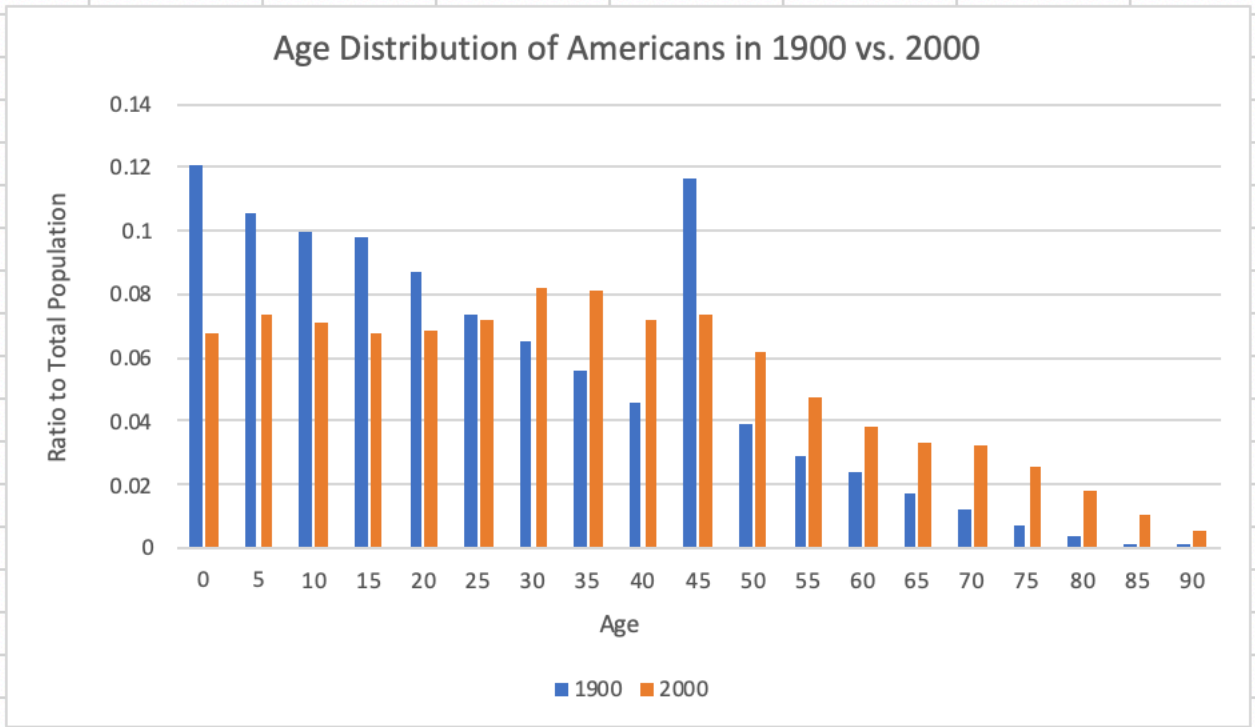
## How Has Age Distribution Changed in the US?



# AGE DISTRIBUTION OVER TIME (1900 V 2000)

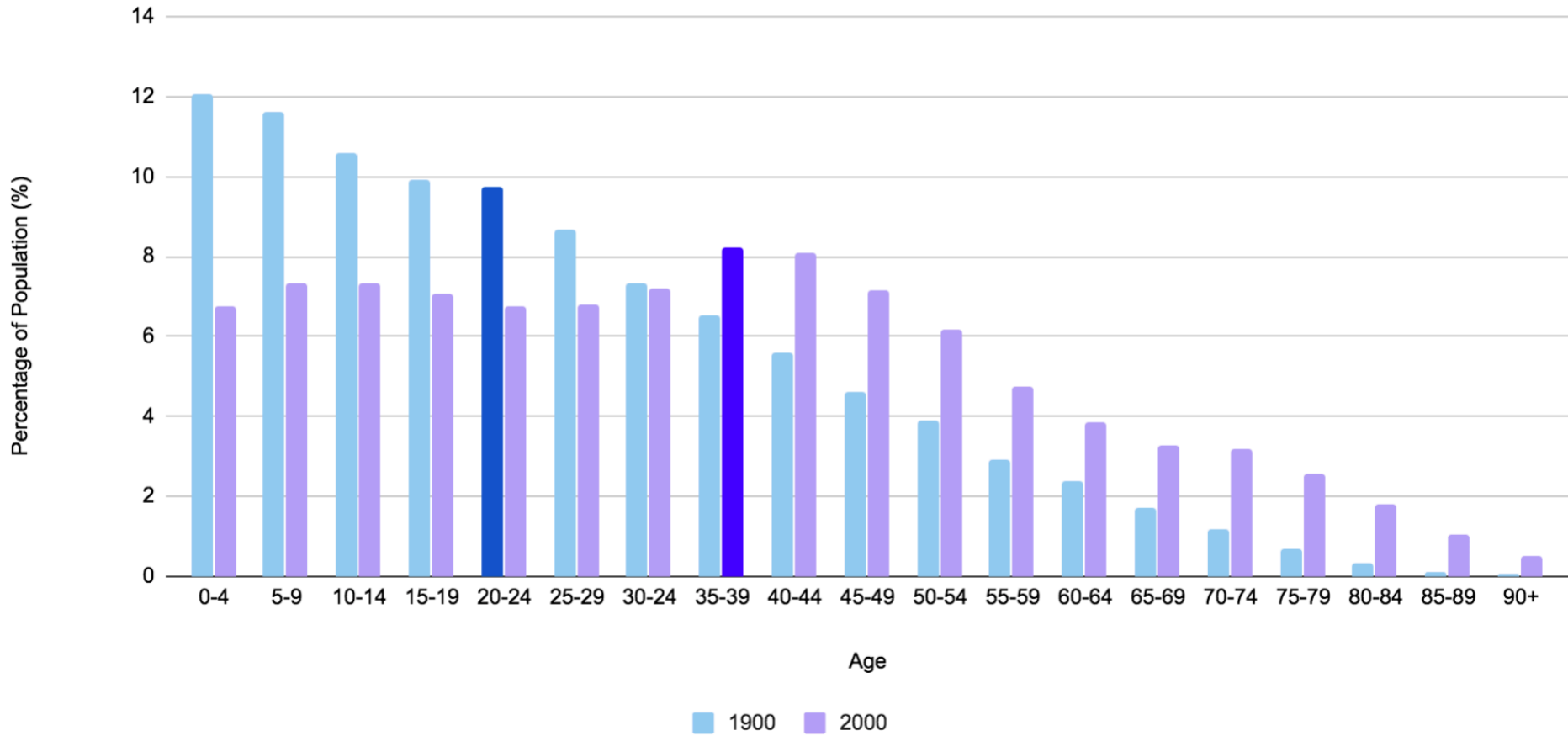


### Age Distribution of Americans in 1900 vs. 2000



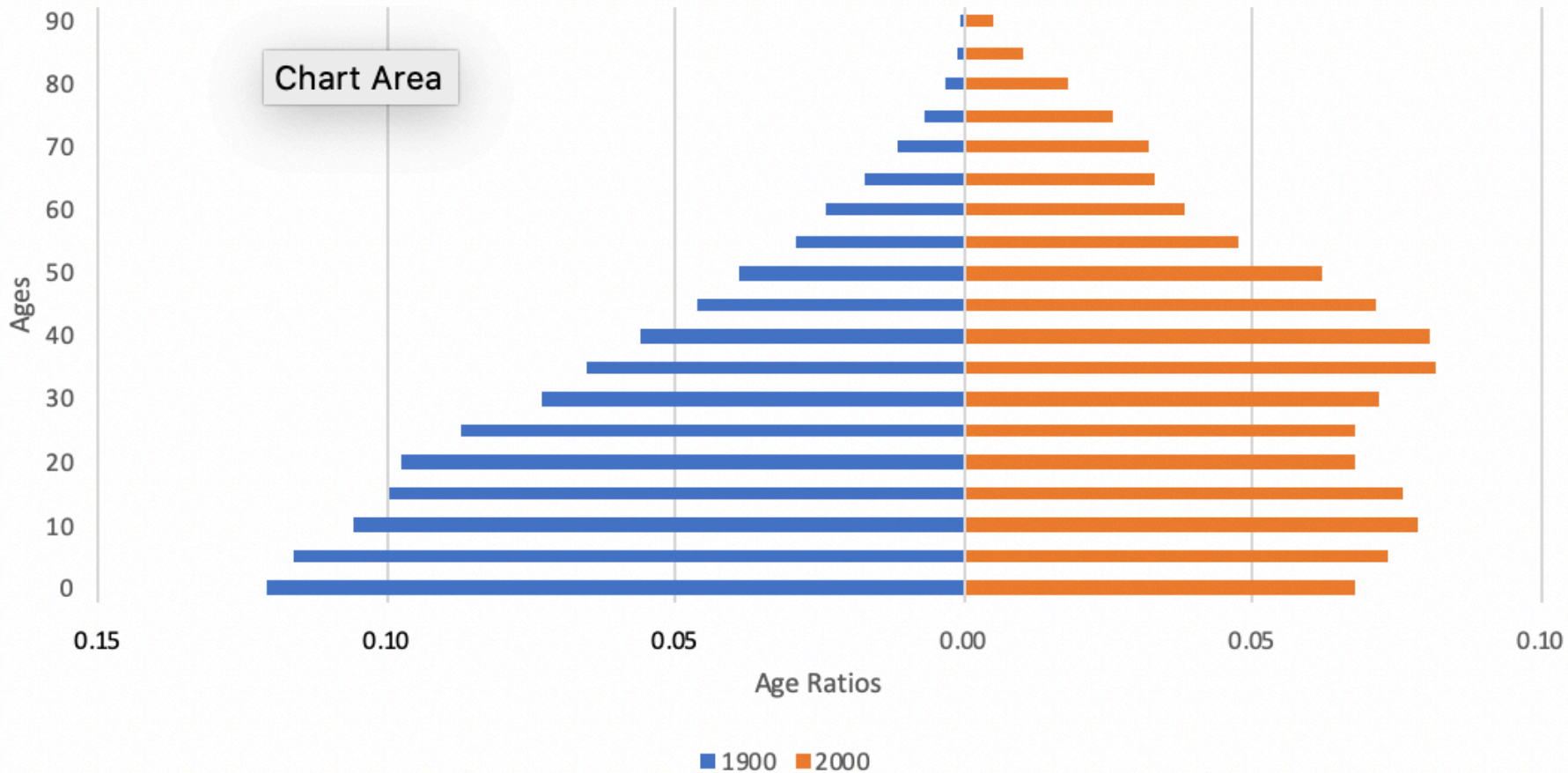
# How has the population distribution changed from 1900 to 2000?

Population Distribution by Age Group (1900 vs 2000)





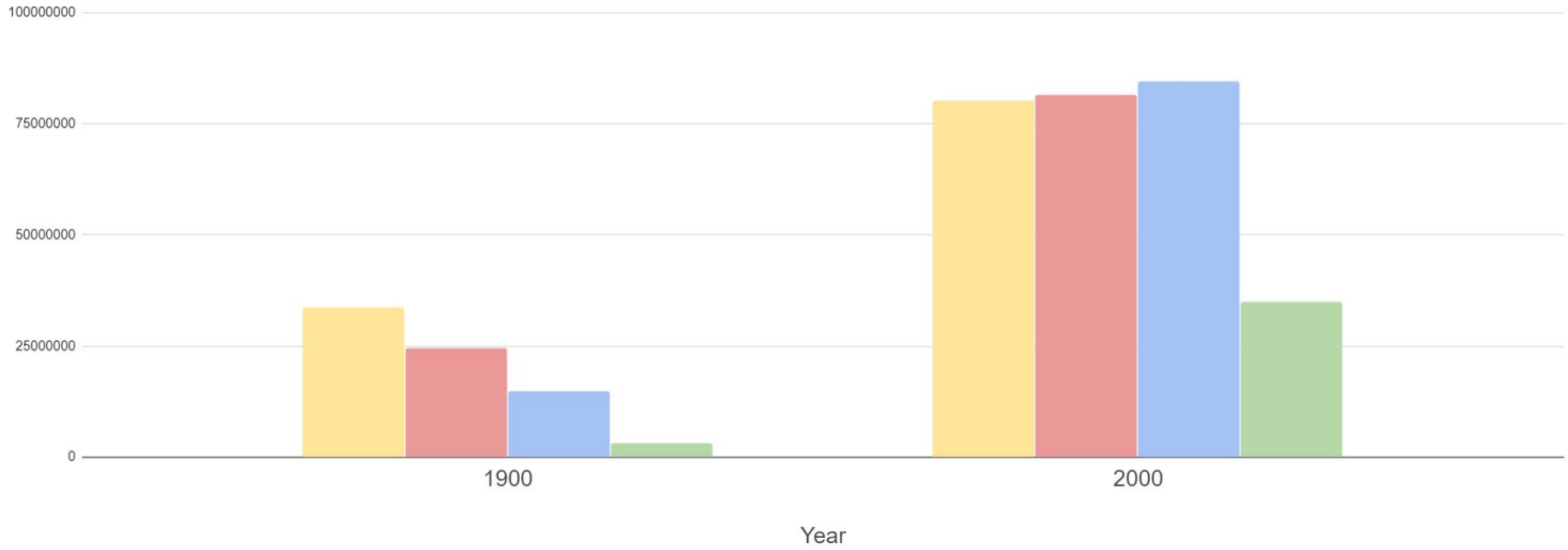
# How Have The Ages of Americans Changed From 1900 to 2000



# Age Binning

## Adjustment of Age Group Proportions in the U.S. Population over Time

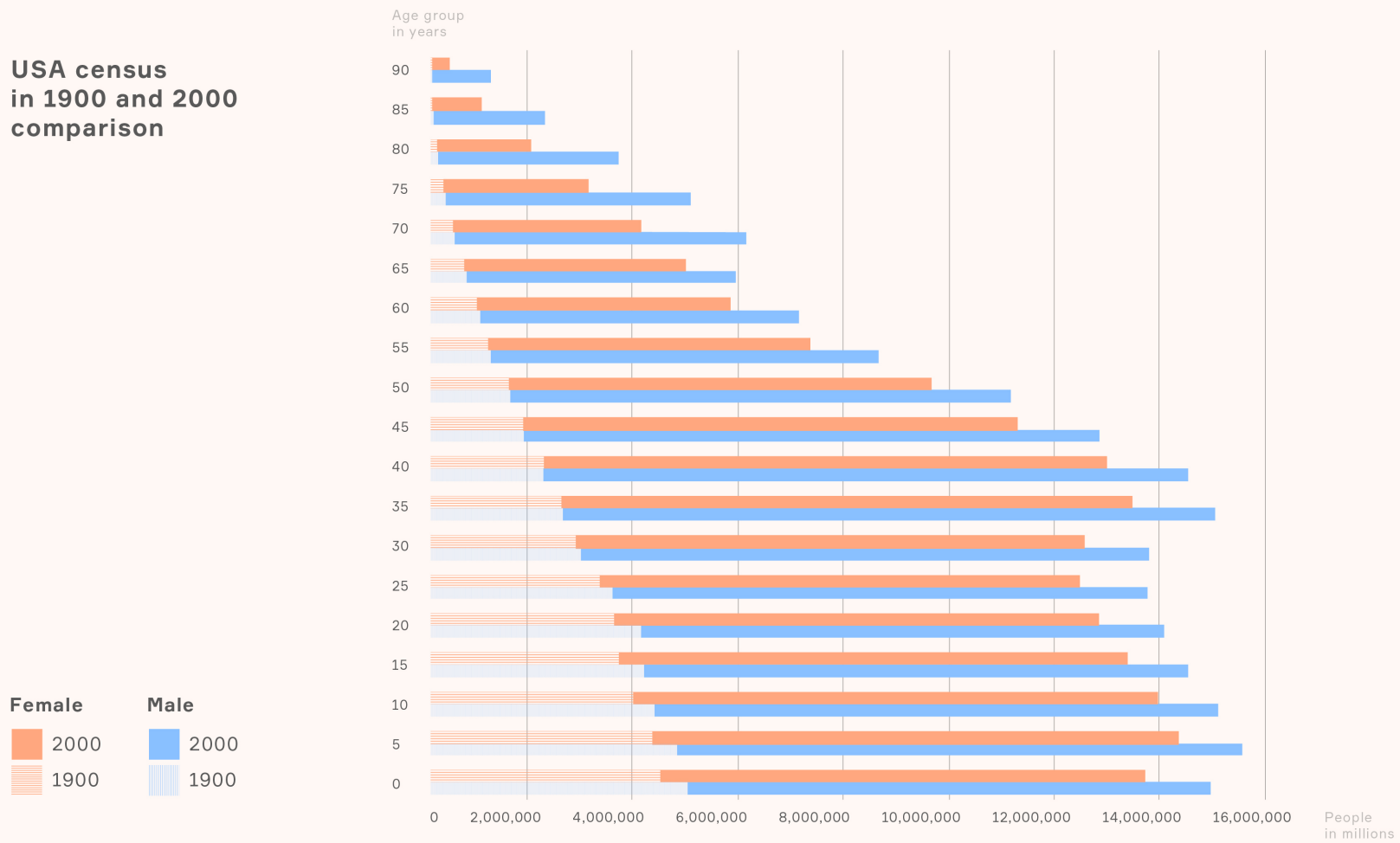
youth (0-20)   early adulthood (20-40)   middle age (40-65)   elderly (65+)



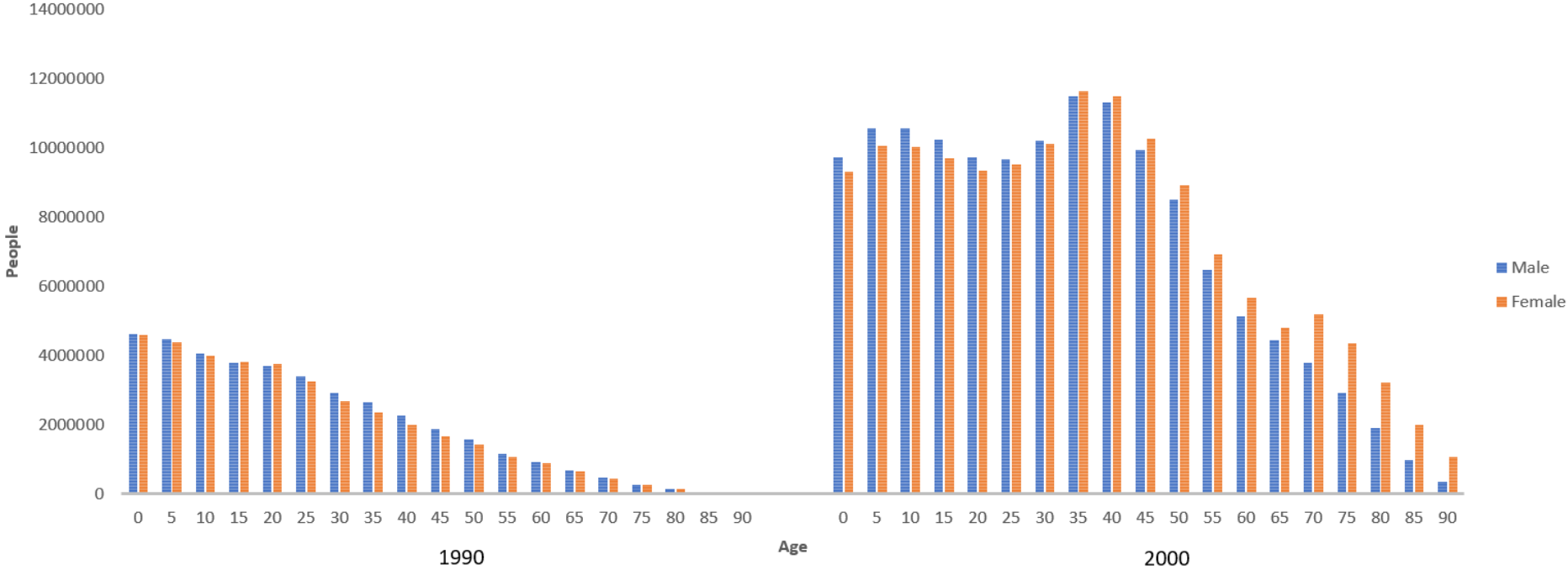
**Age, Sex, Year**

# Population Count

# USA census in 1900 and 2000 comparison

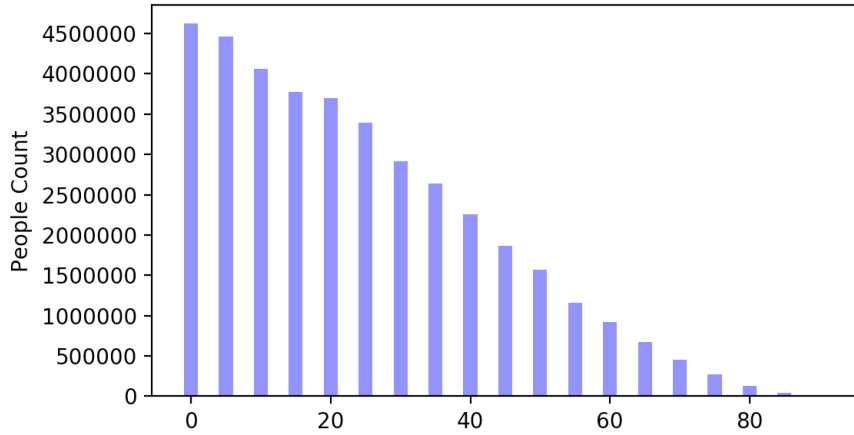


# DEMOGRAPHIC MAKEUP OF THE UNITED STATES 1990 VS 2000

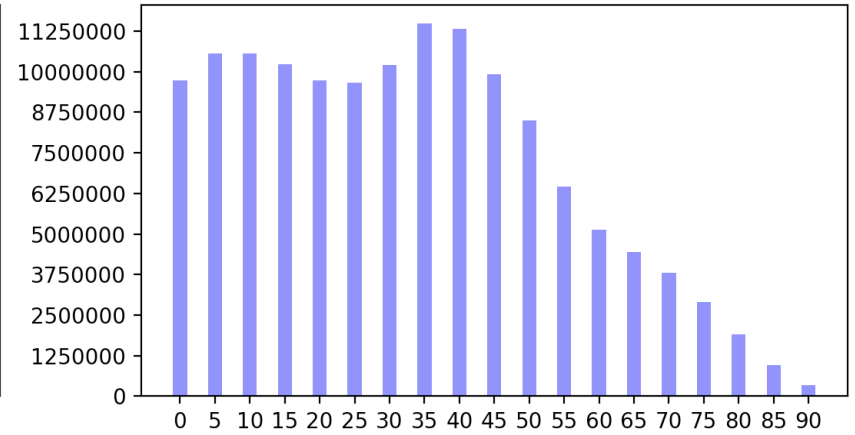


# How Has The General Demographic Changed Over The Century?

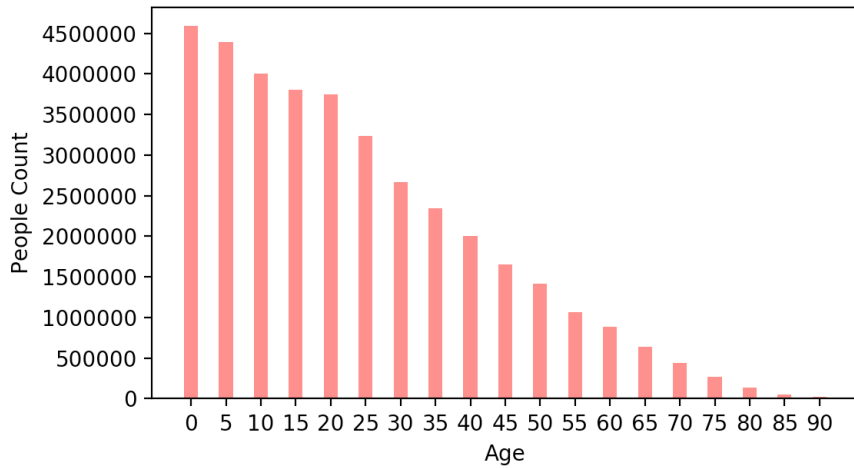
## 1900 Male vs Age



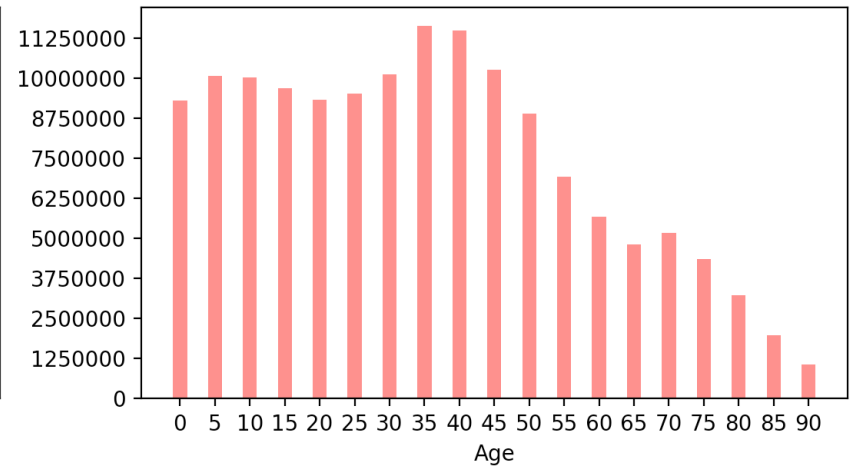
## 2000 Male vs Age



## 1900 Female vs Age



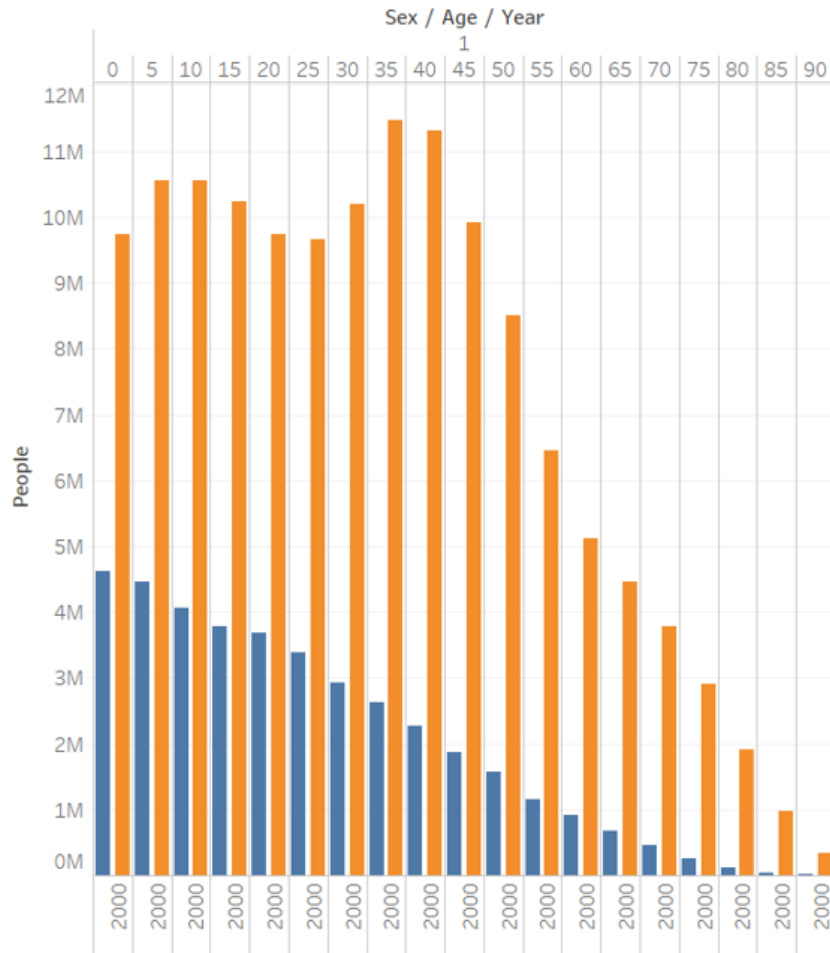
## 2000 Female vs Age



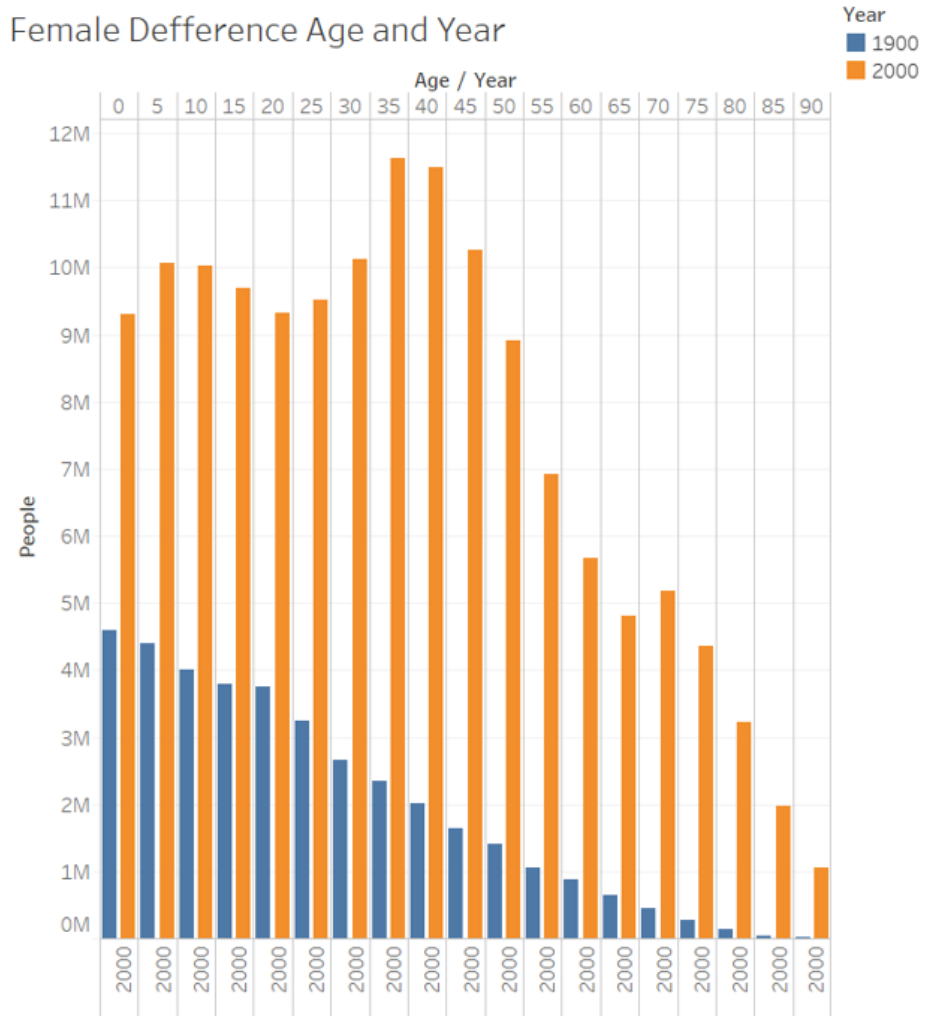


# What is the difference between males and females by year and age?

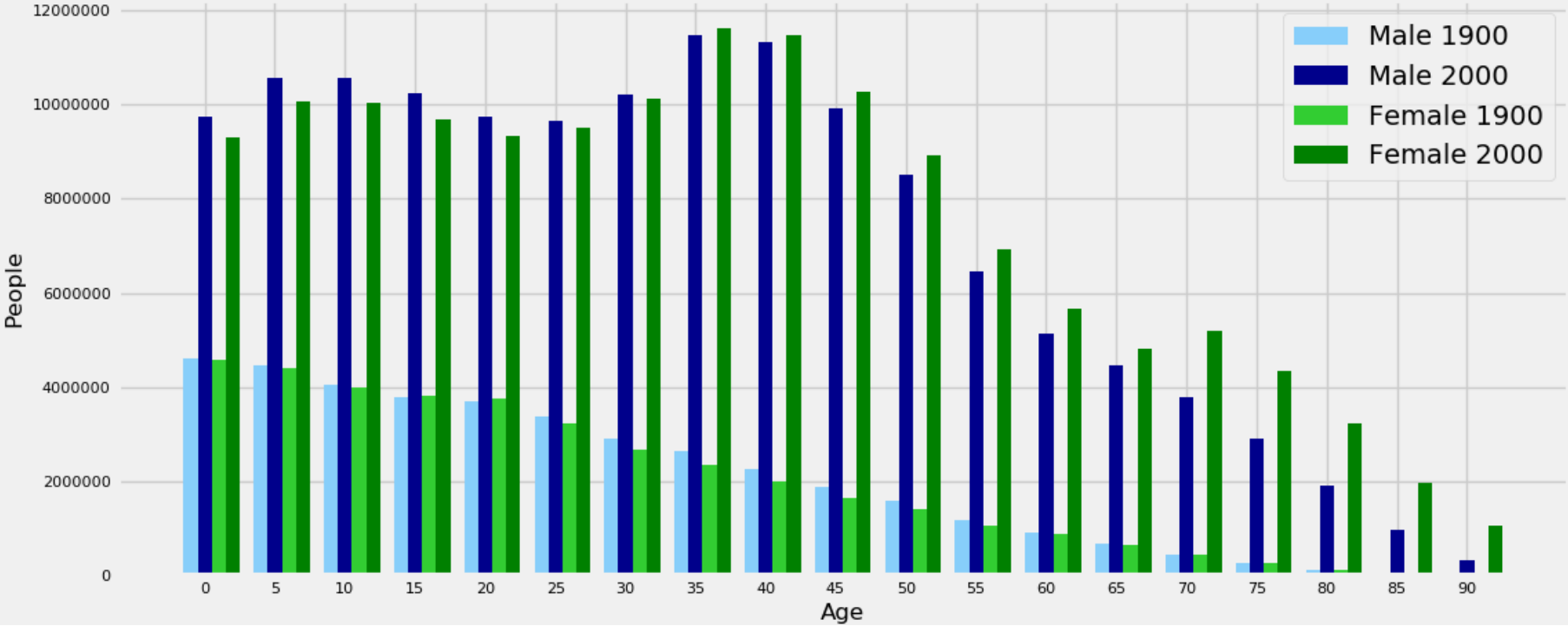
## Male Defference Age and Year



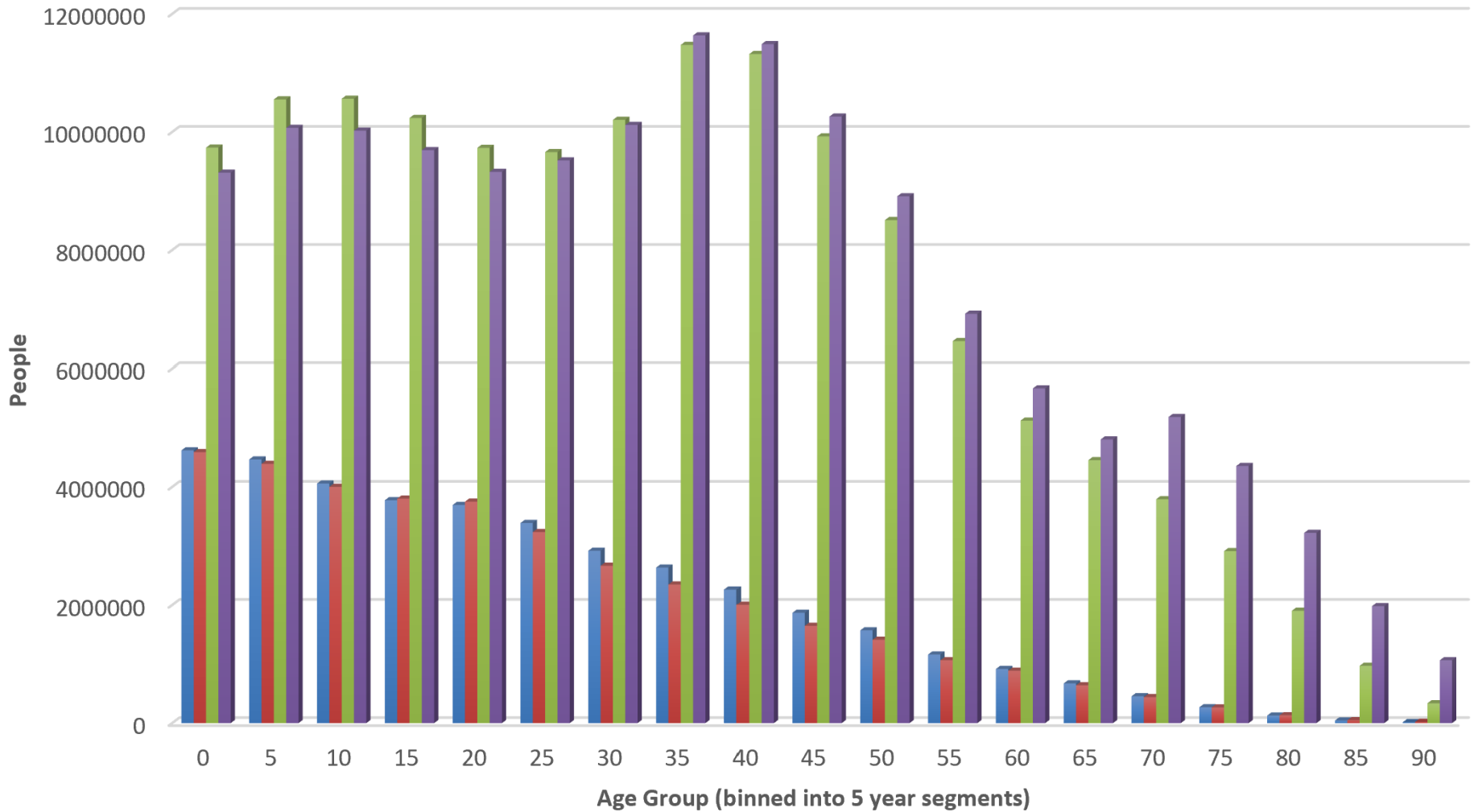
## Female Defference Age and Year



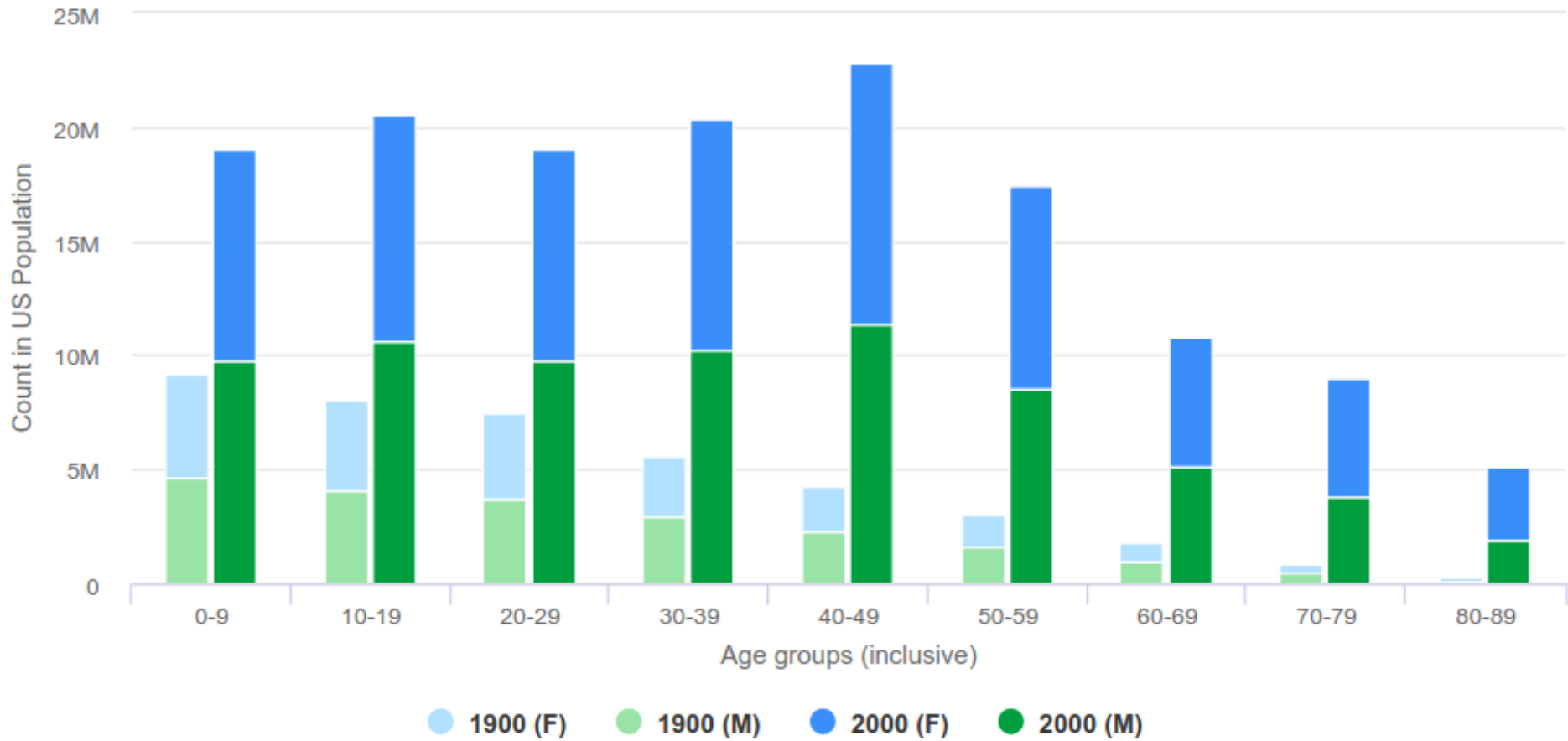
Is there a trend change for the number of people in each age group between 1900 and 2000?



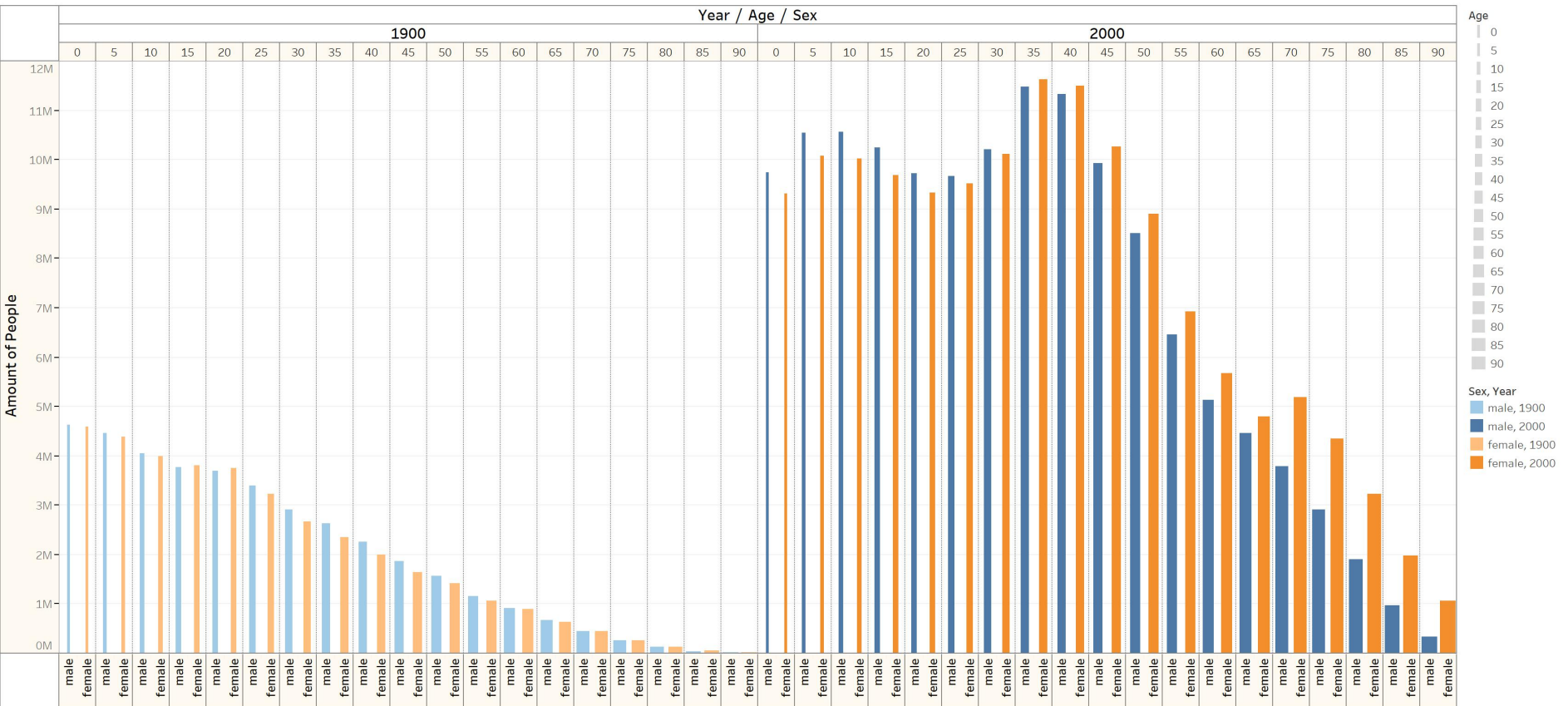
## How 20th century wars affect the U.S. population trend



# How has US gender population changed in different age groups from 1900 to 2000? ☰

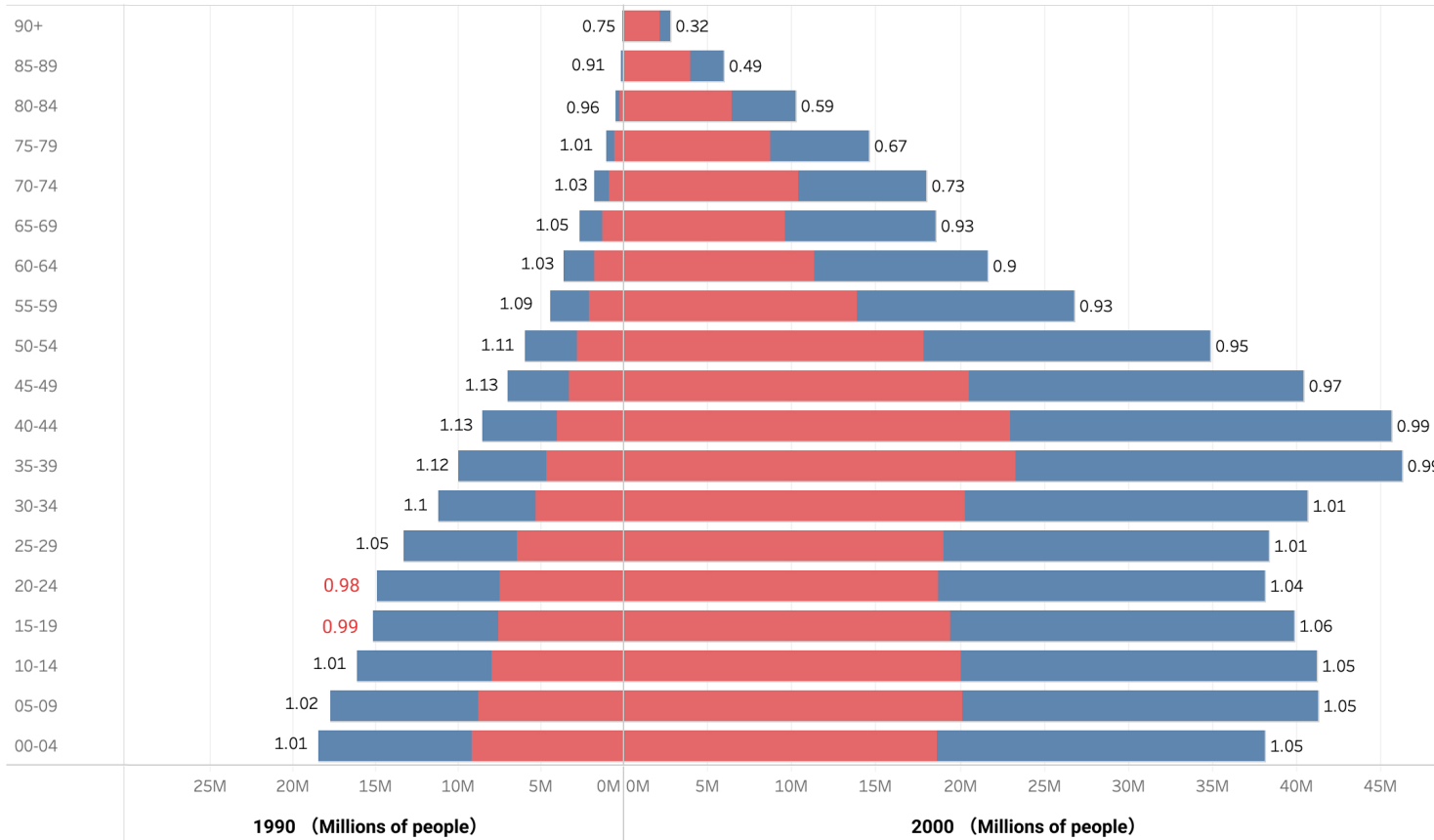


Why women had higher life expectancy than men during 2000?



## The United States population and sex ratio by age (1990 vs. 2000)

Age

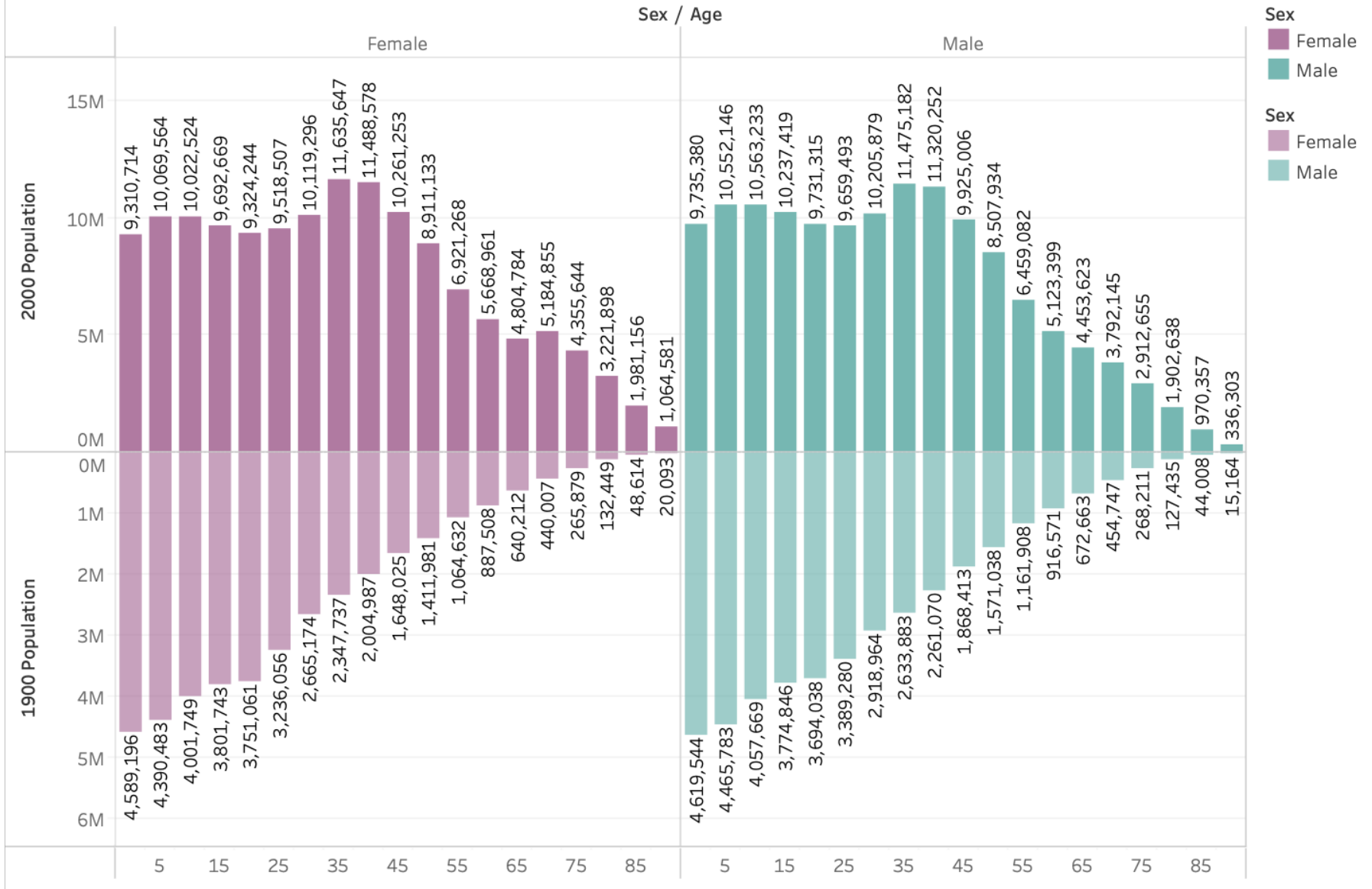


Sex

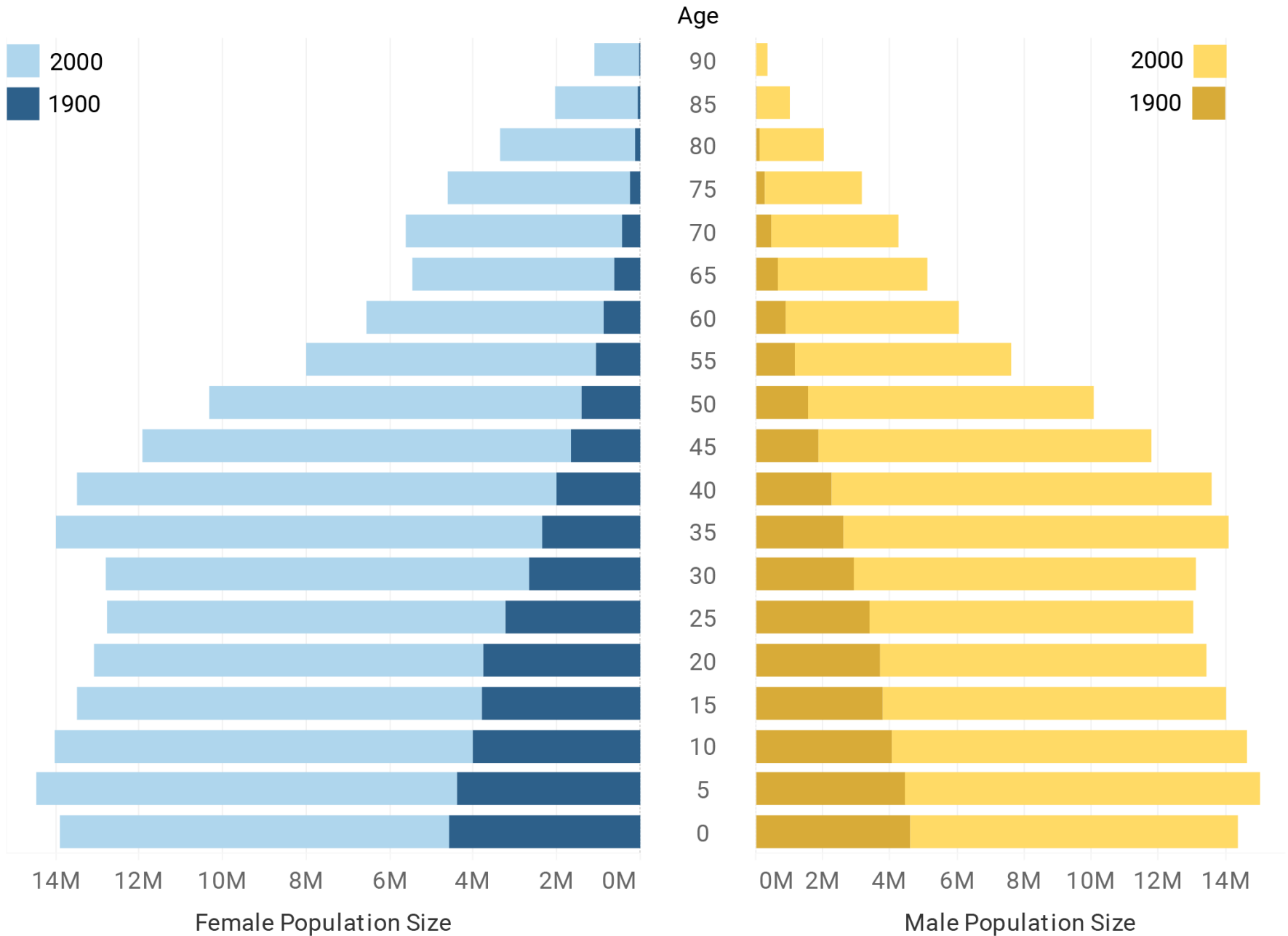
- Male
- Female

Ratio = Male/Female population

# How did the female and male population evolve respectively from 1900 to 2000?

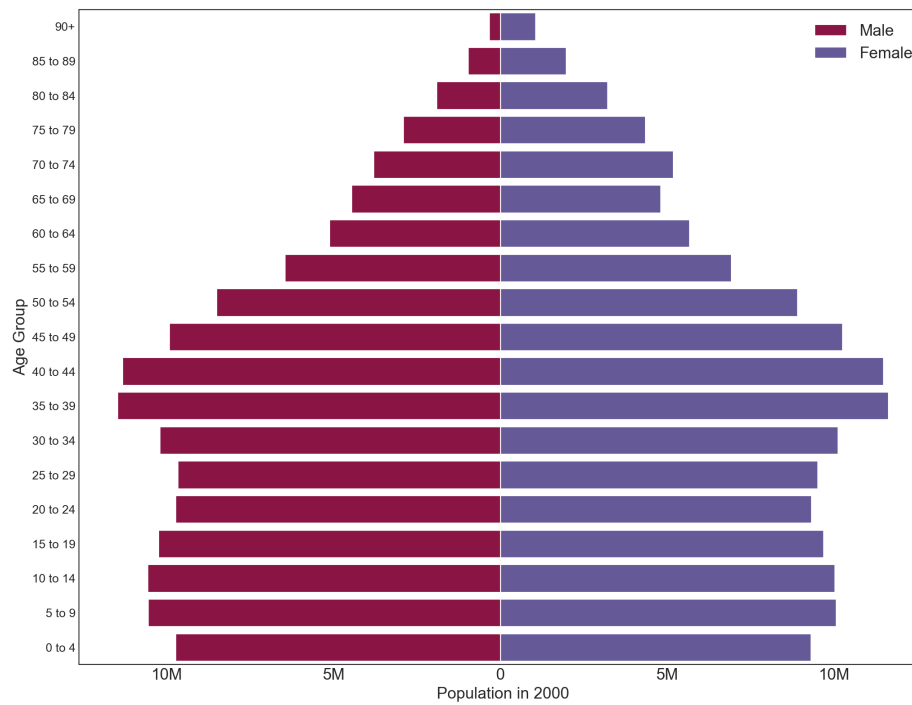
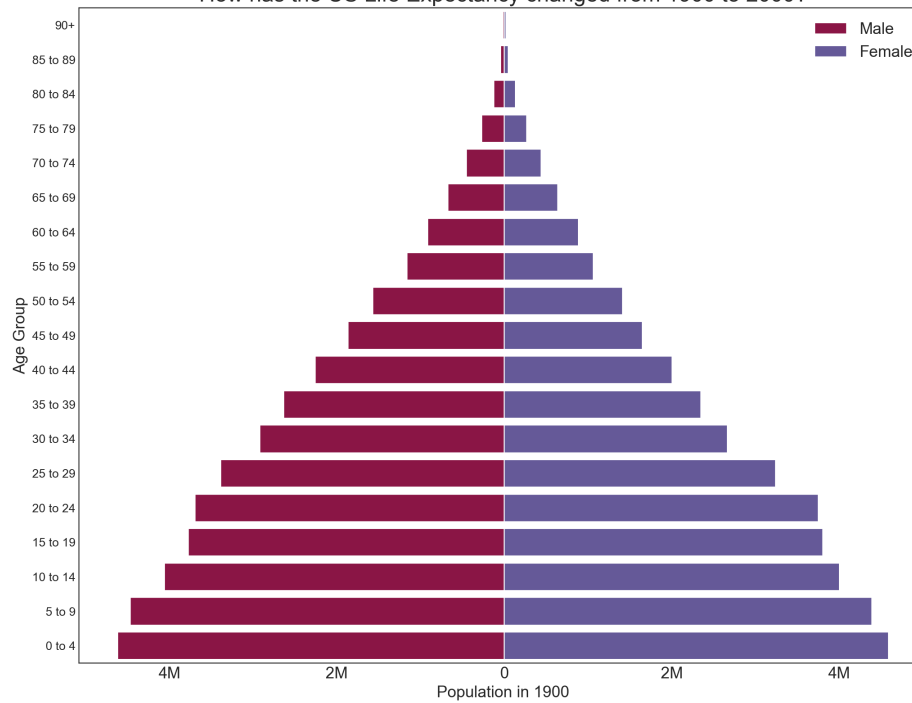


# How did the U.S. population growth rate change between 1900 and 2000?

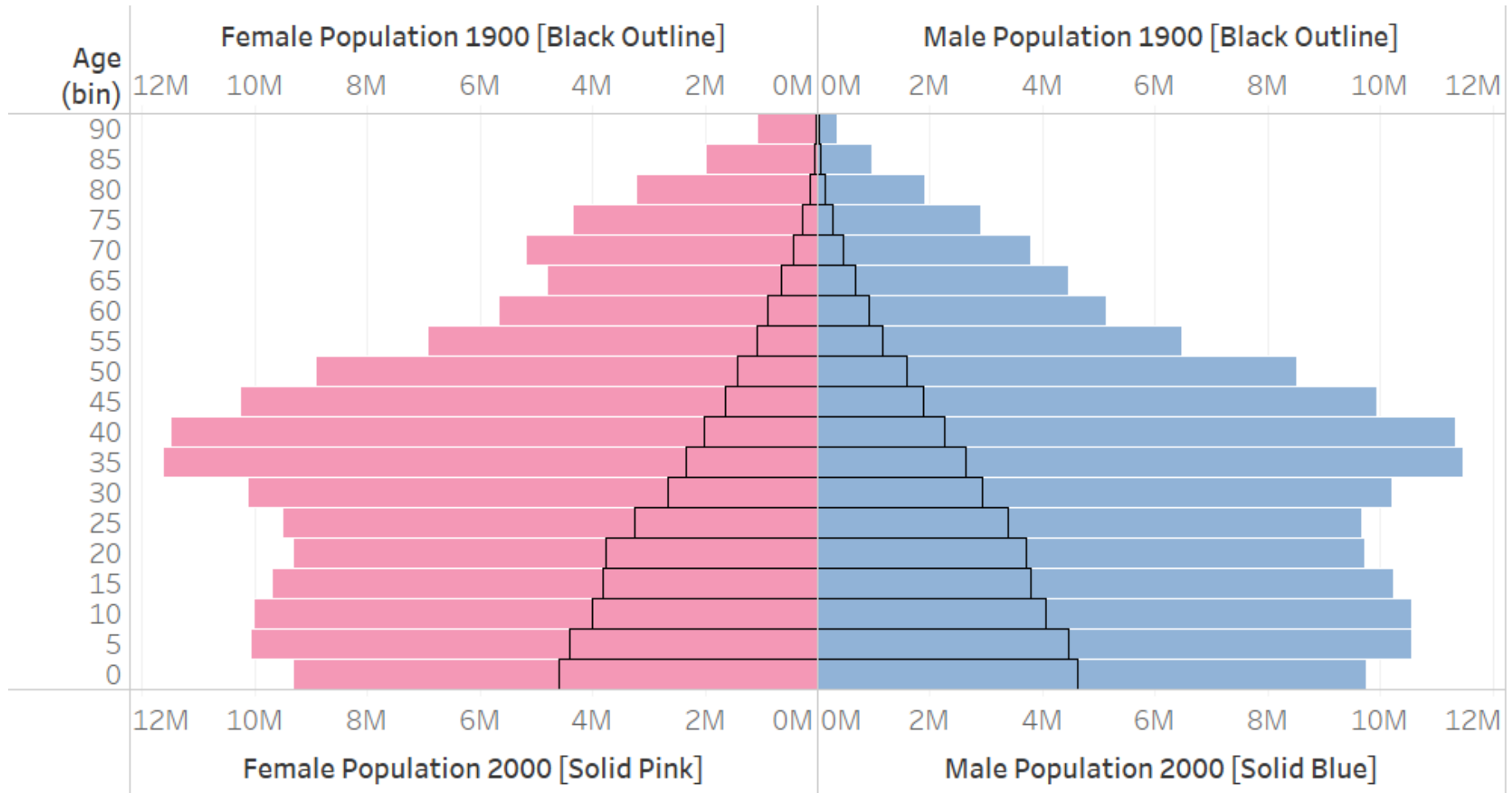




How has the US Life Expectancy changed from 1900 to 2000?

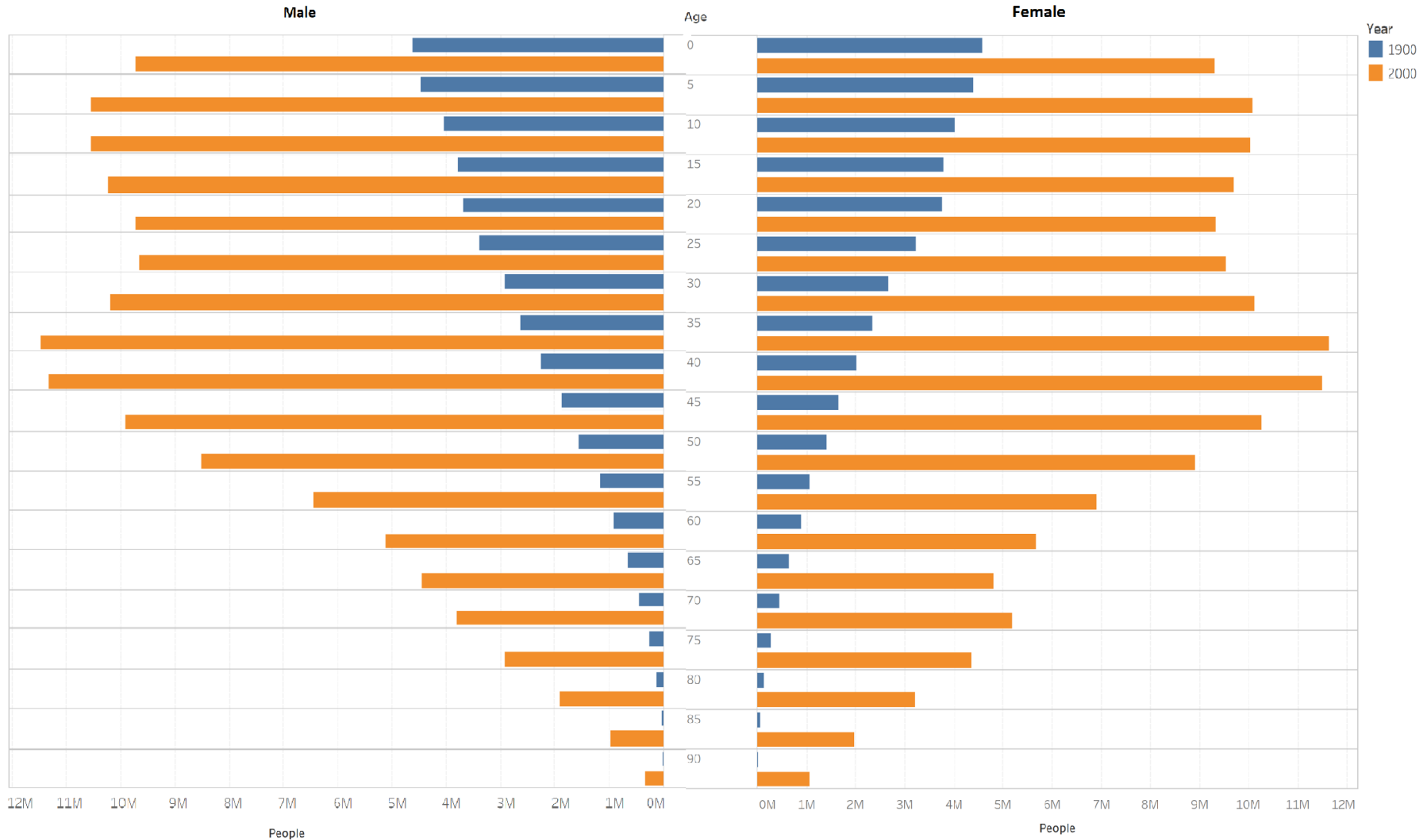


# How did U.S. Demographics (Population by Age/Sex) Change from 1900 to 2000?



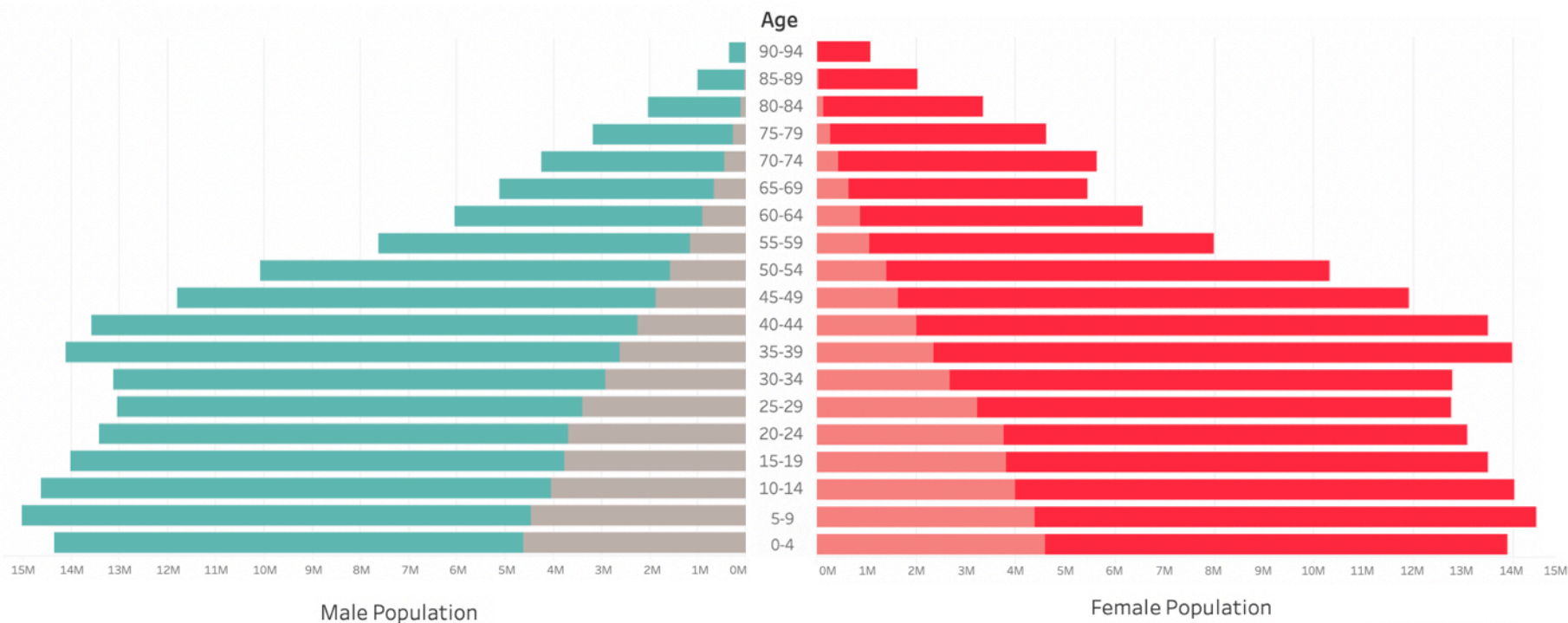
# What Are the Differences in Population Distribution in the U.S. in 1900 vs 2000?

Shown is the age distribution of the U.S.'s population—by gender—in 1900 and 2000.



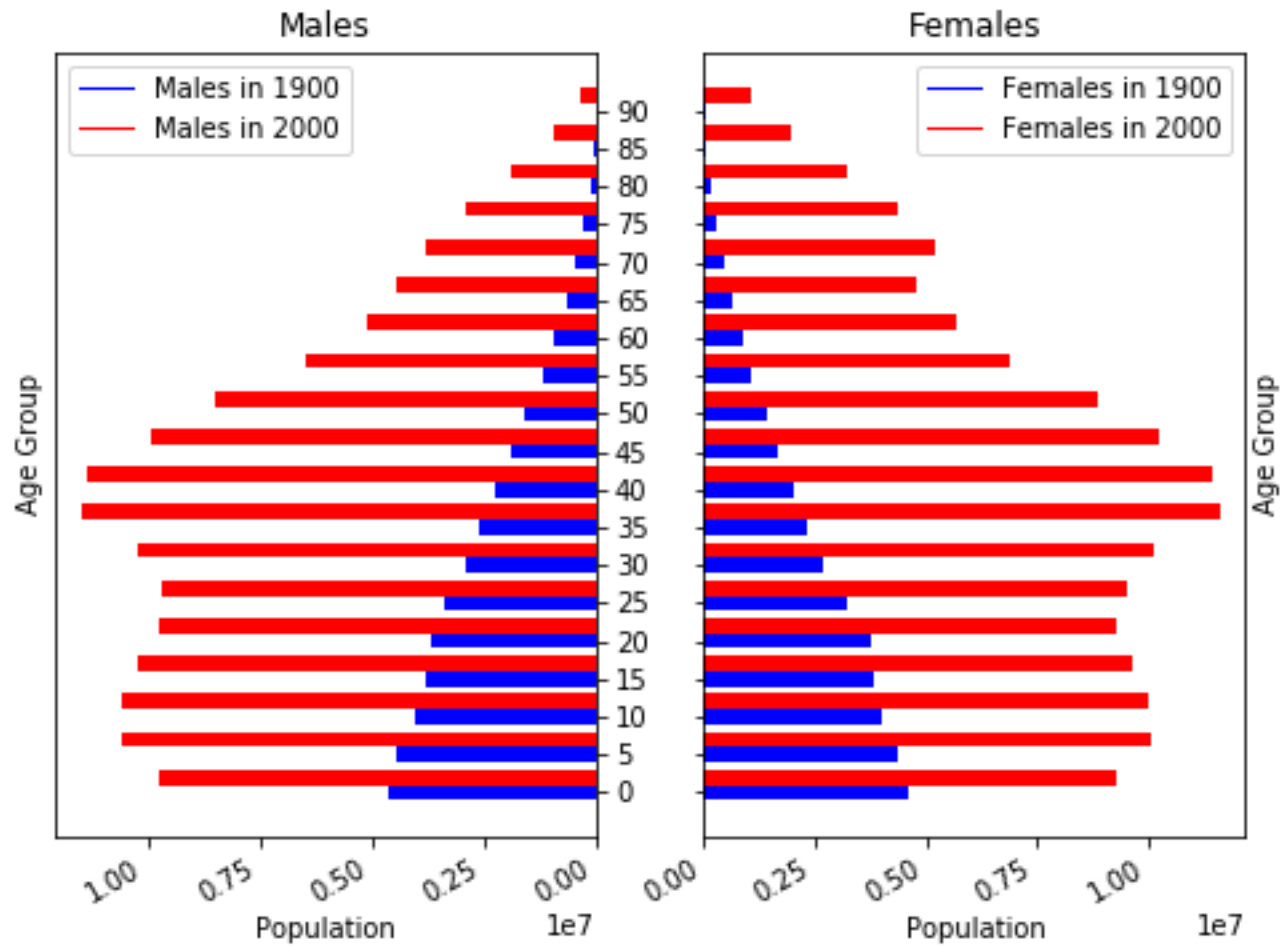
## How Have Population Distributions between Males and Females Changed from 1900 to 2000?

- 2000 Female Population
- 1900 Female Population
- 1900 Male Population
- 2000 Male Population

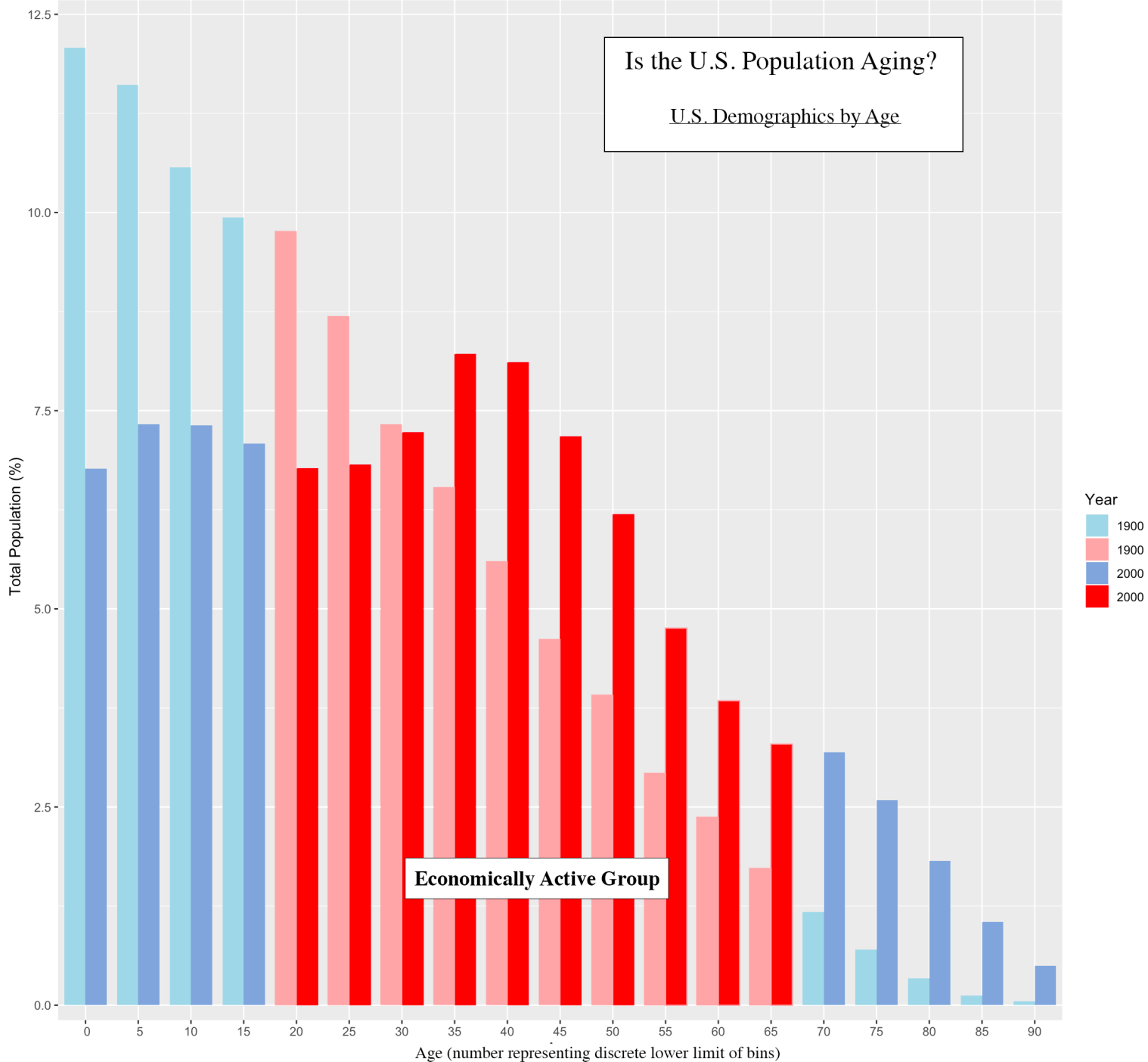


(Source: US Census)

Comparison of Increase in population between Male and Female in from 1900 to 2000



Is the U.S. Population Aging?  
U.S. Demographics by Age



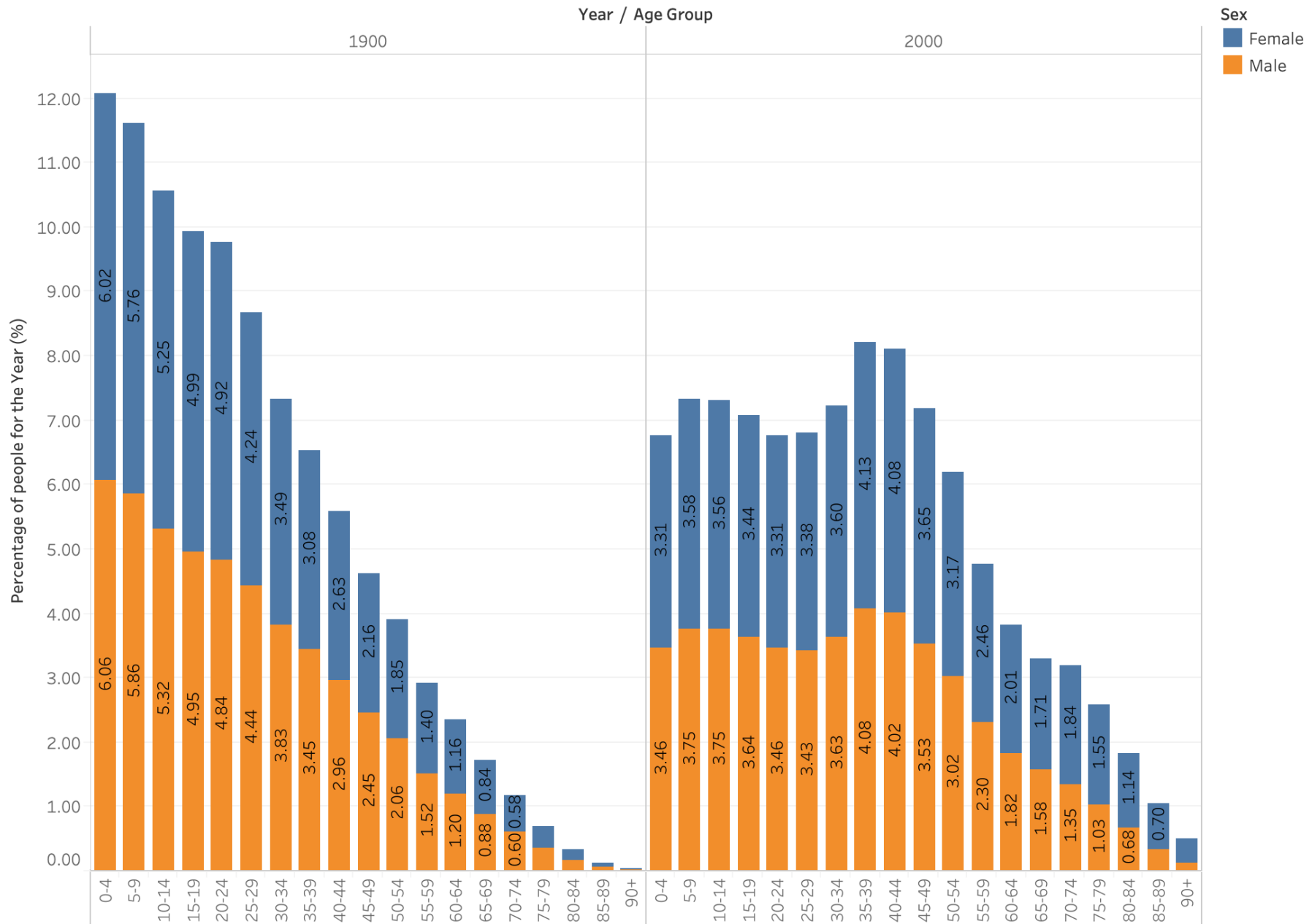
Year  
1900  
1900  
2000  
2000

Economically Active Group

Age (number representing discrete lower limit of bins)

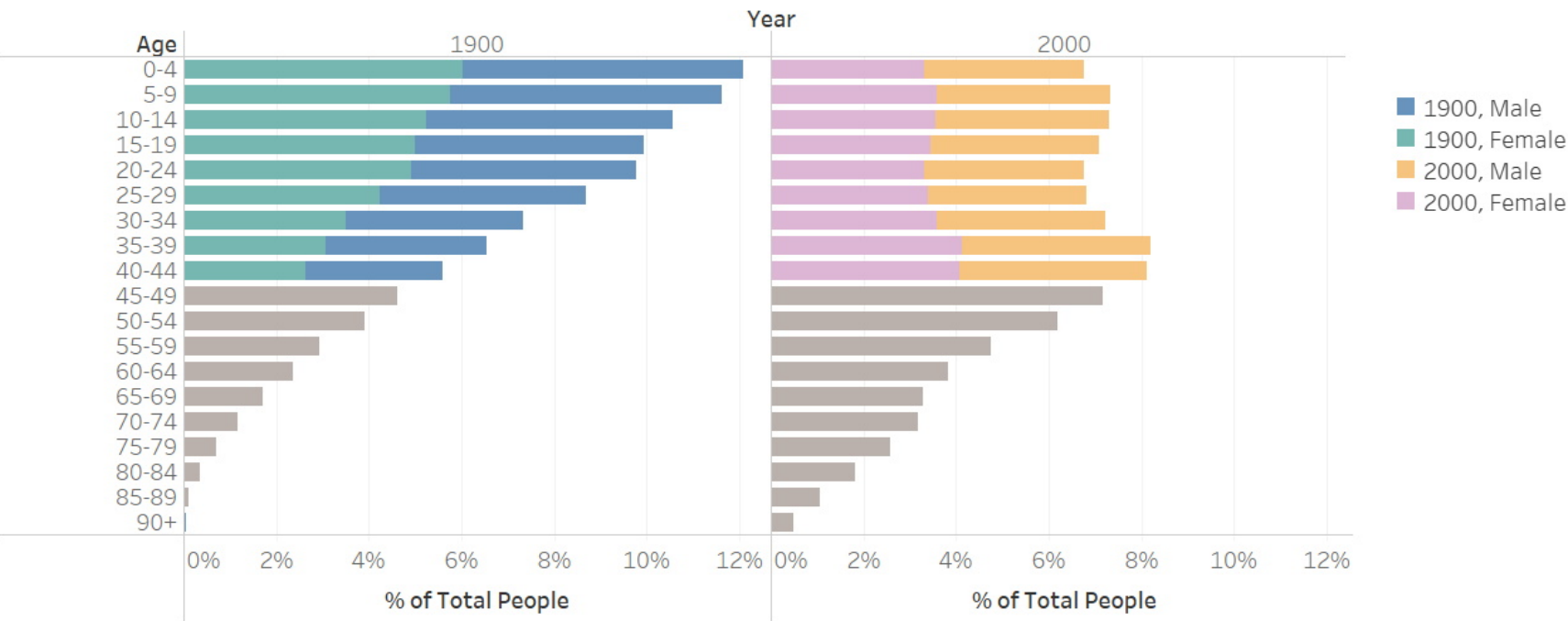
# Population Percentage

# How have the Age and Sex distribution of population changed between 1900 and 2000?



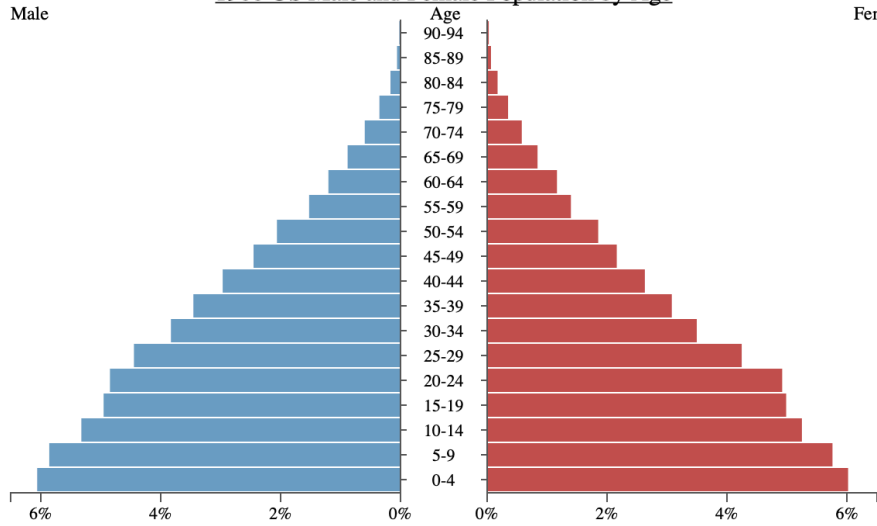


How has the percentage of young people in the United States changed from 1900 to 2000?

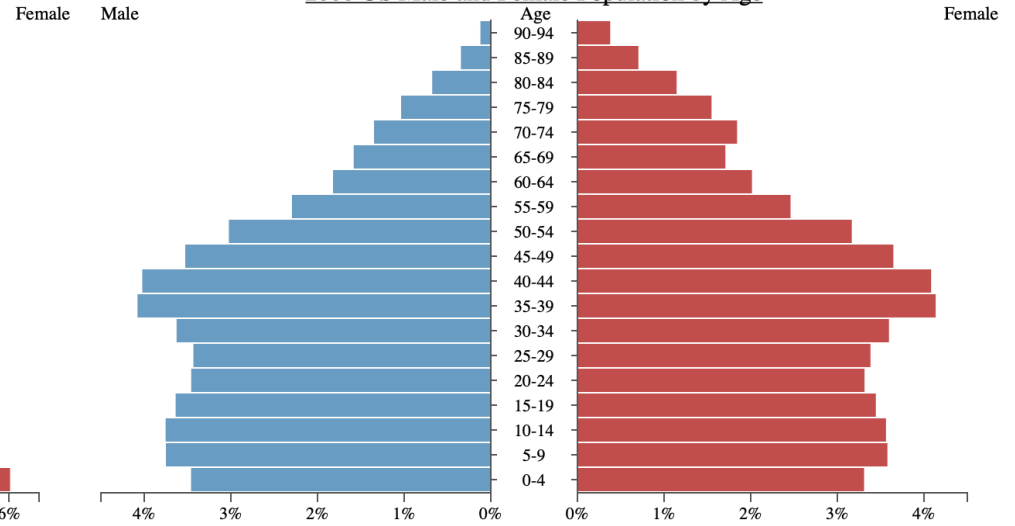


## How Has the Male and Female US Age Distribution Changed From 1900 to 2000?

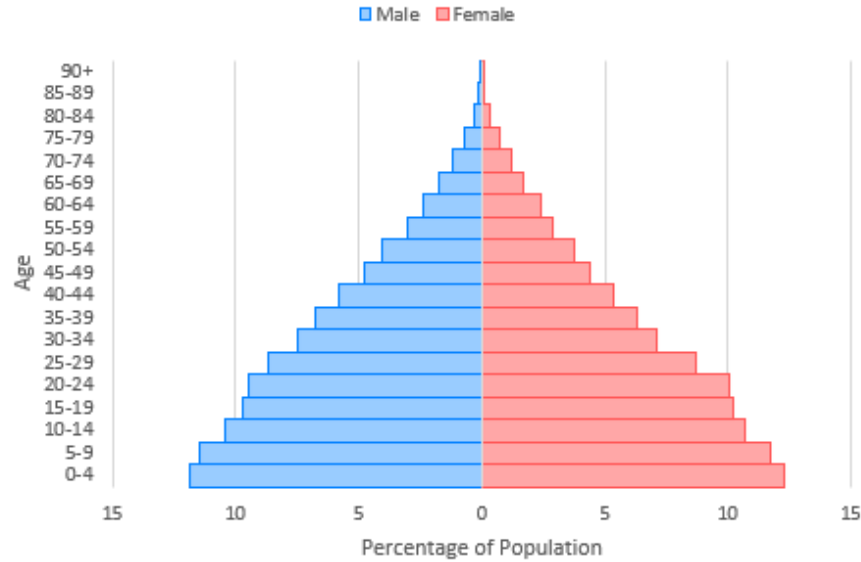
### 1900 US Male and Female Population by Age



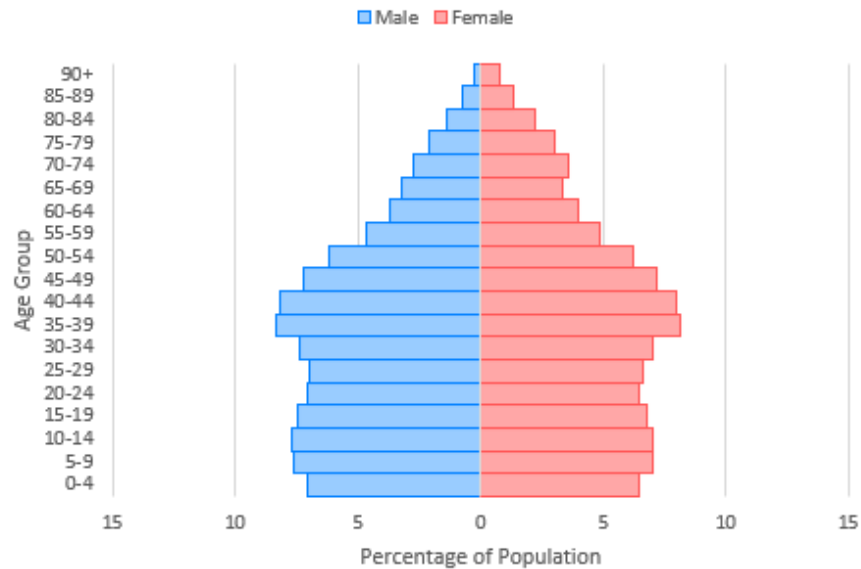
### 2000 US Male and Female Population by Age



### What is the Breakdown of the U.S. Population with Respect to Age & Sex According to the 1900 Census?



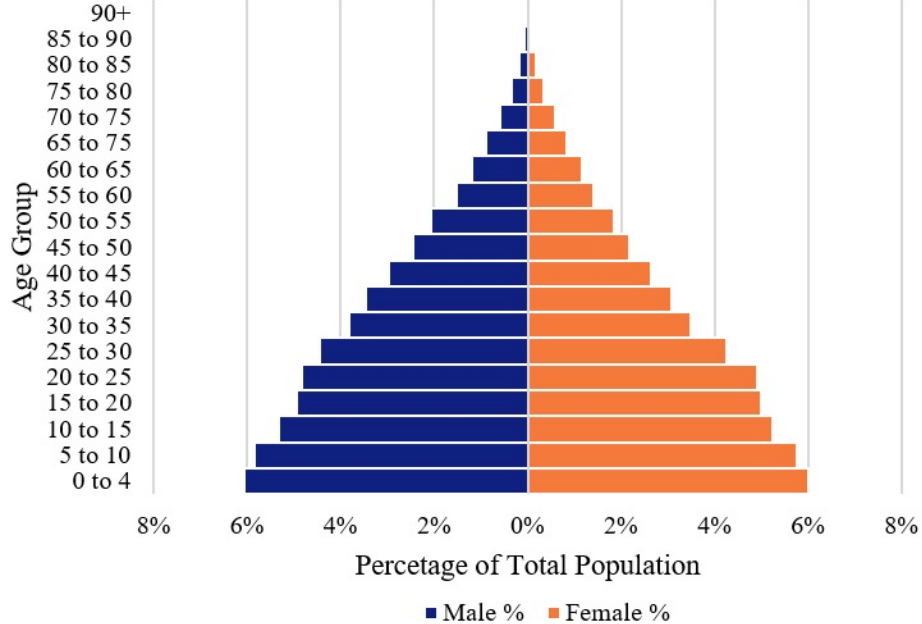
### What is the Breakdown of the U.S. Population with Respect to Age & Sex According to the 2000 Census?



# Comparing Age-Sex Distributions in the U.S. for 1900 and 2000

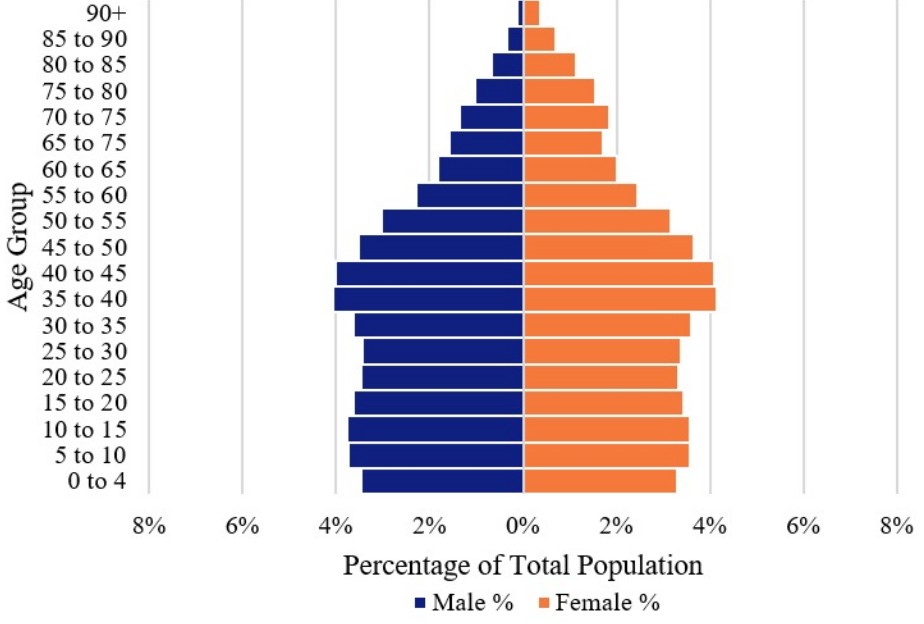
**1900**

(Total Population: 76,262,821)

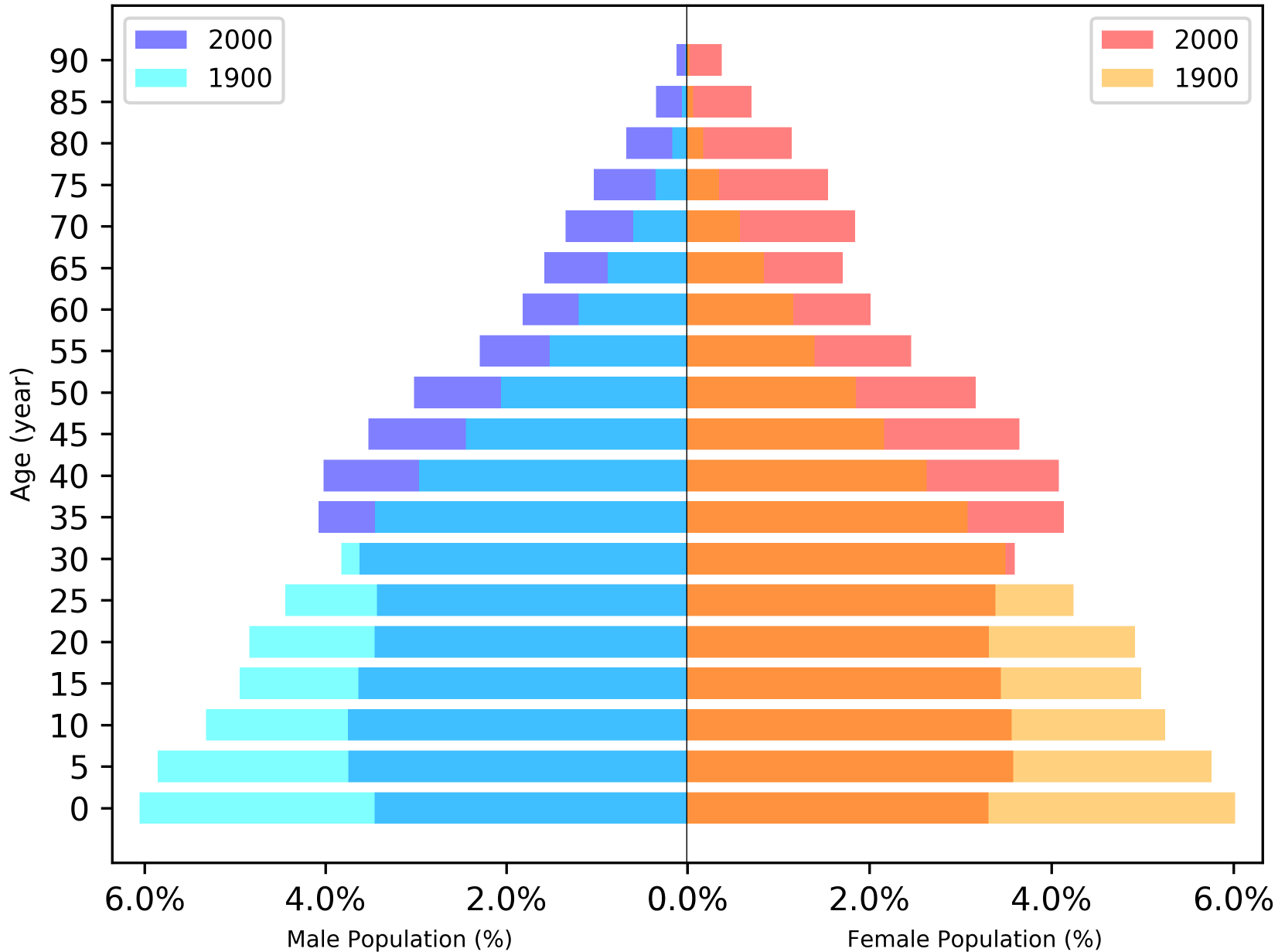


**2000**

(Total Population: 281,420,717)

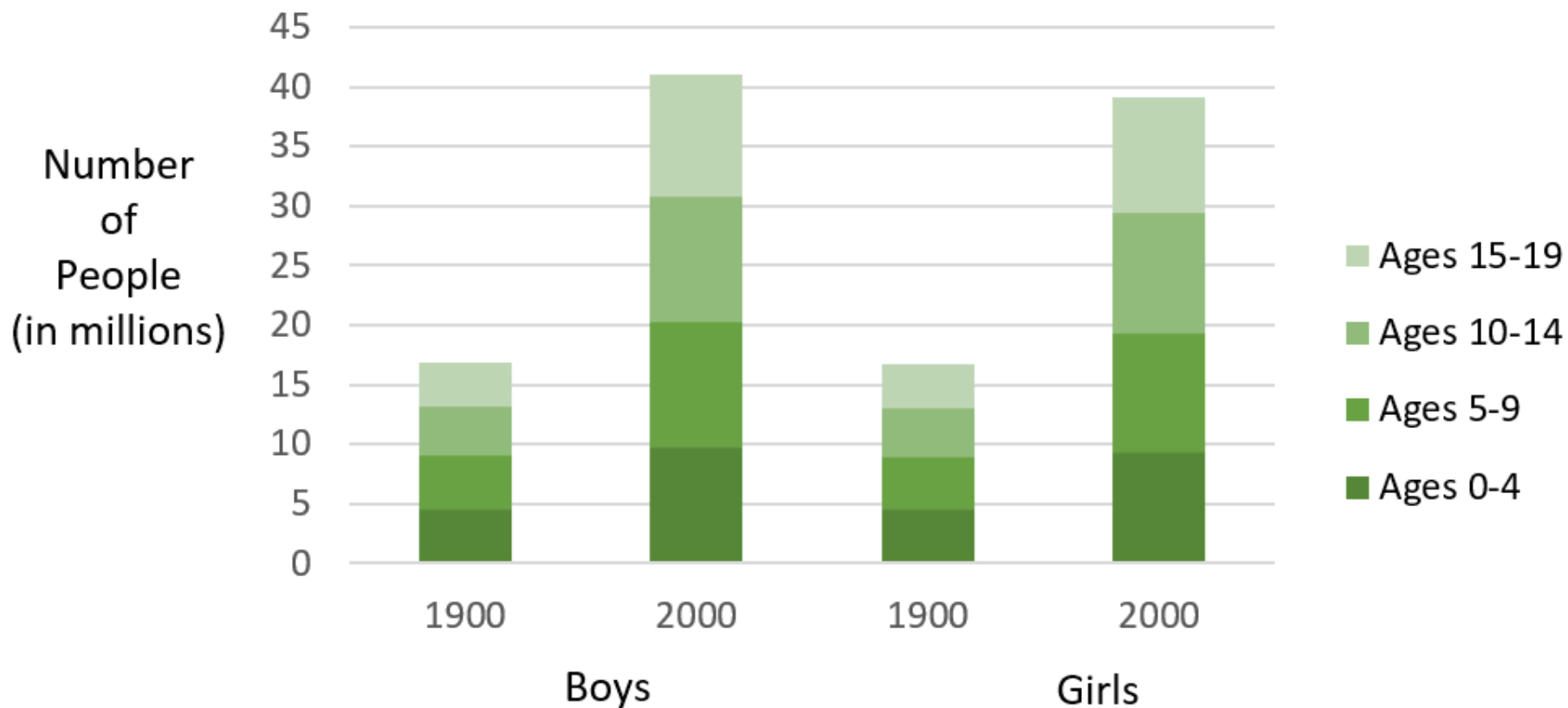


# How did the population of each age group proportionally change from 1900 to 2000?

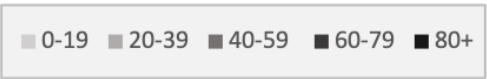


# Age Binning

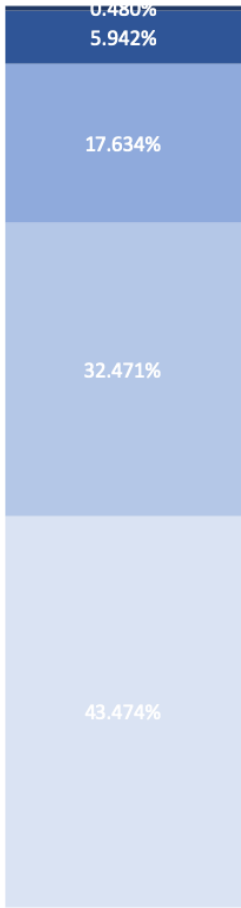
## How Does the Number of Boys and Girls (under age 20) in 1900 Compare to that in 2000?



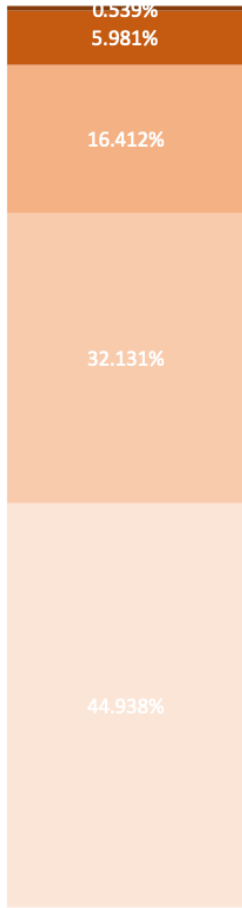
# CHANGE IN LONGEVITY DURING THE 20TH CENTURY IN THE U.S. BY SEX



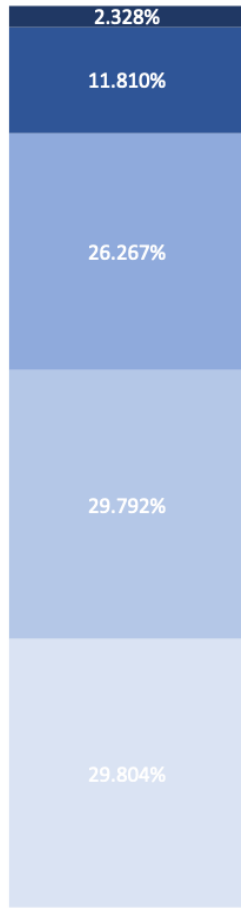
DISTRIBUTION OF FIVE AGE GROUPS ACROSS EACH POPULATION



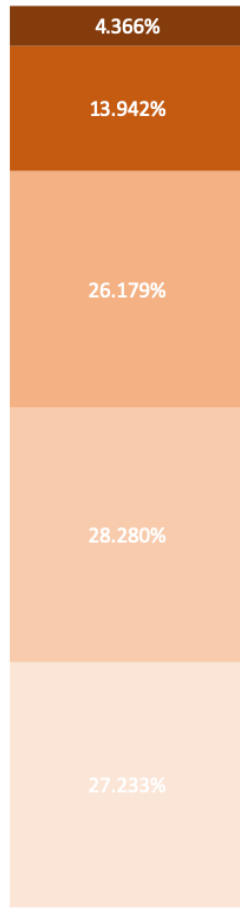
**MALE POPULATION  
IN 1900: 38.9 MILLION**



**FEMALE POPULATION  
IN 1900: 37.3 MILLION**



**MALE POPULATION  
IN 2000: 137.9 MILLION**



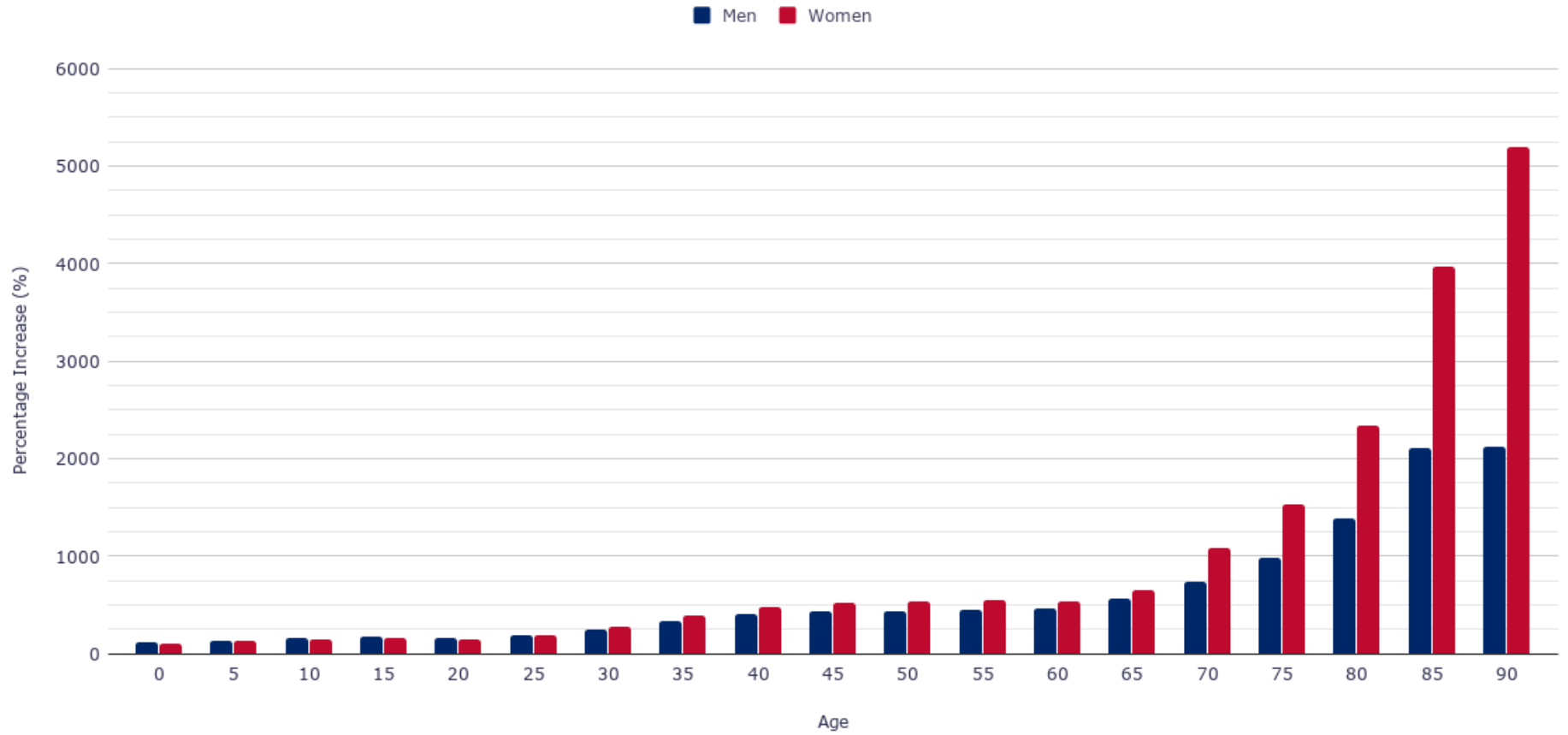
**FEMALE POPULATION  
IN 2000: 143.6 MILLION**



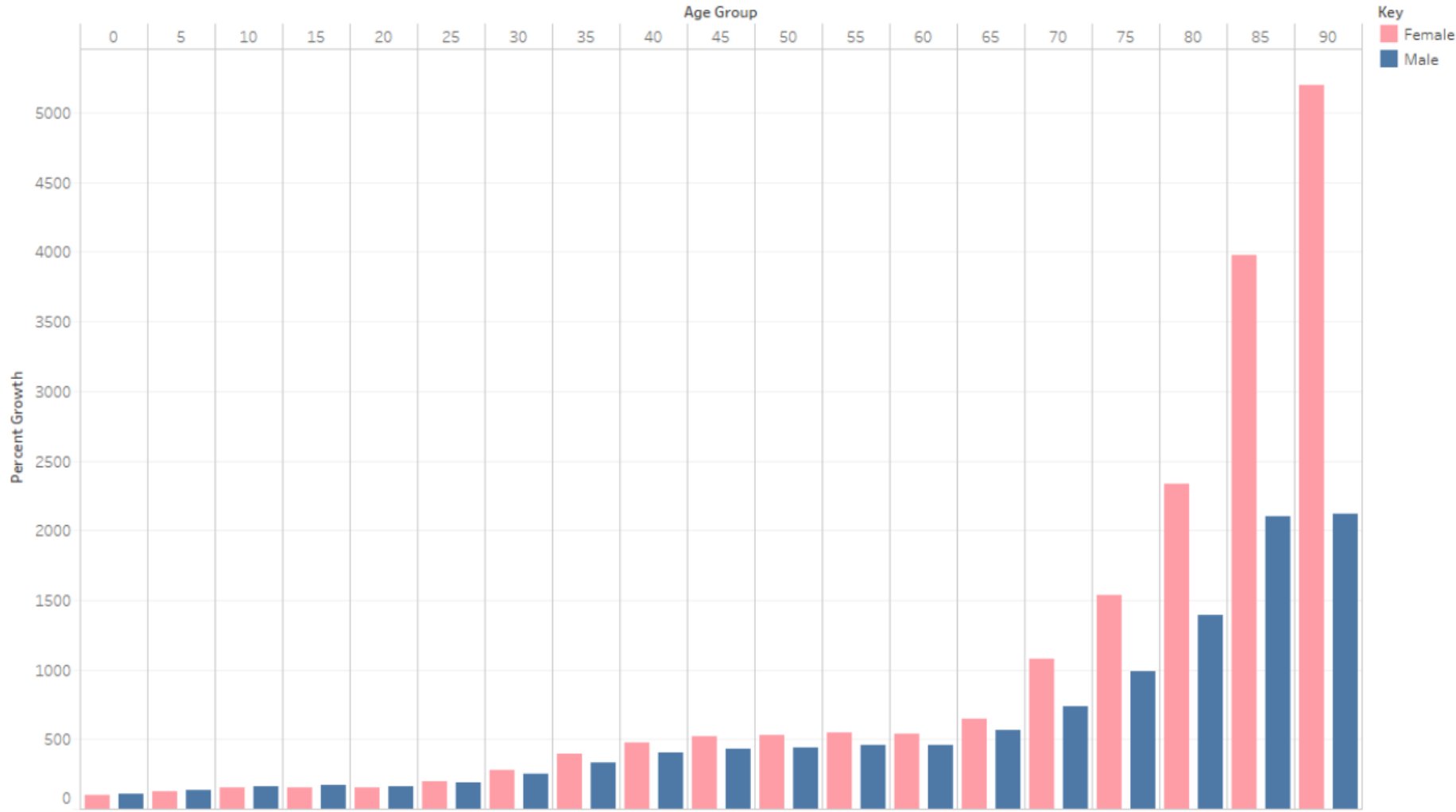
# Growth Rates

# Which age group and sex combination had the most percentage increase from 1900 to 2000?

Source: U.S. Census Bureau via IPUMS

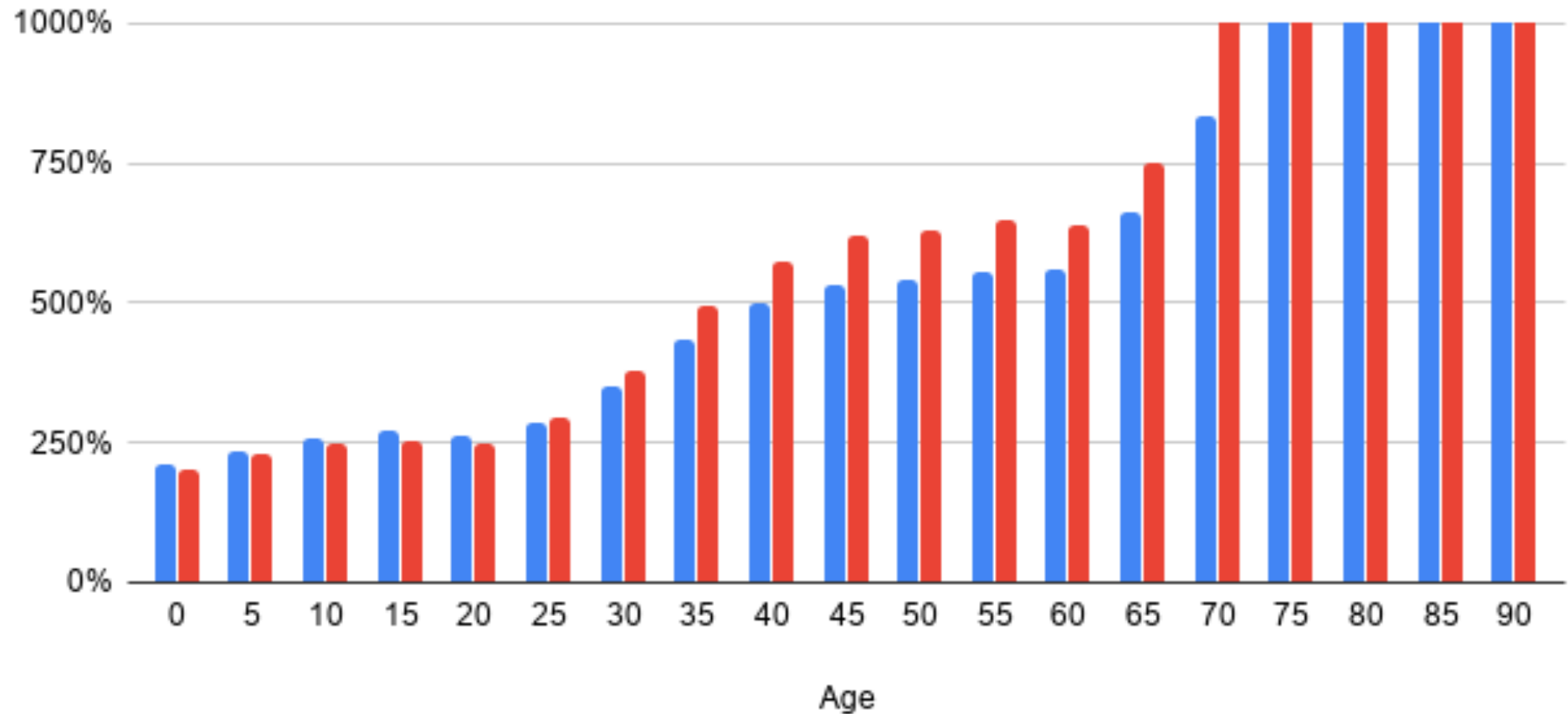


How does the population percent growth compare between male and females by age group?

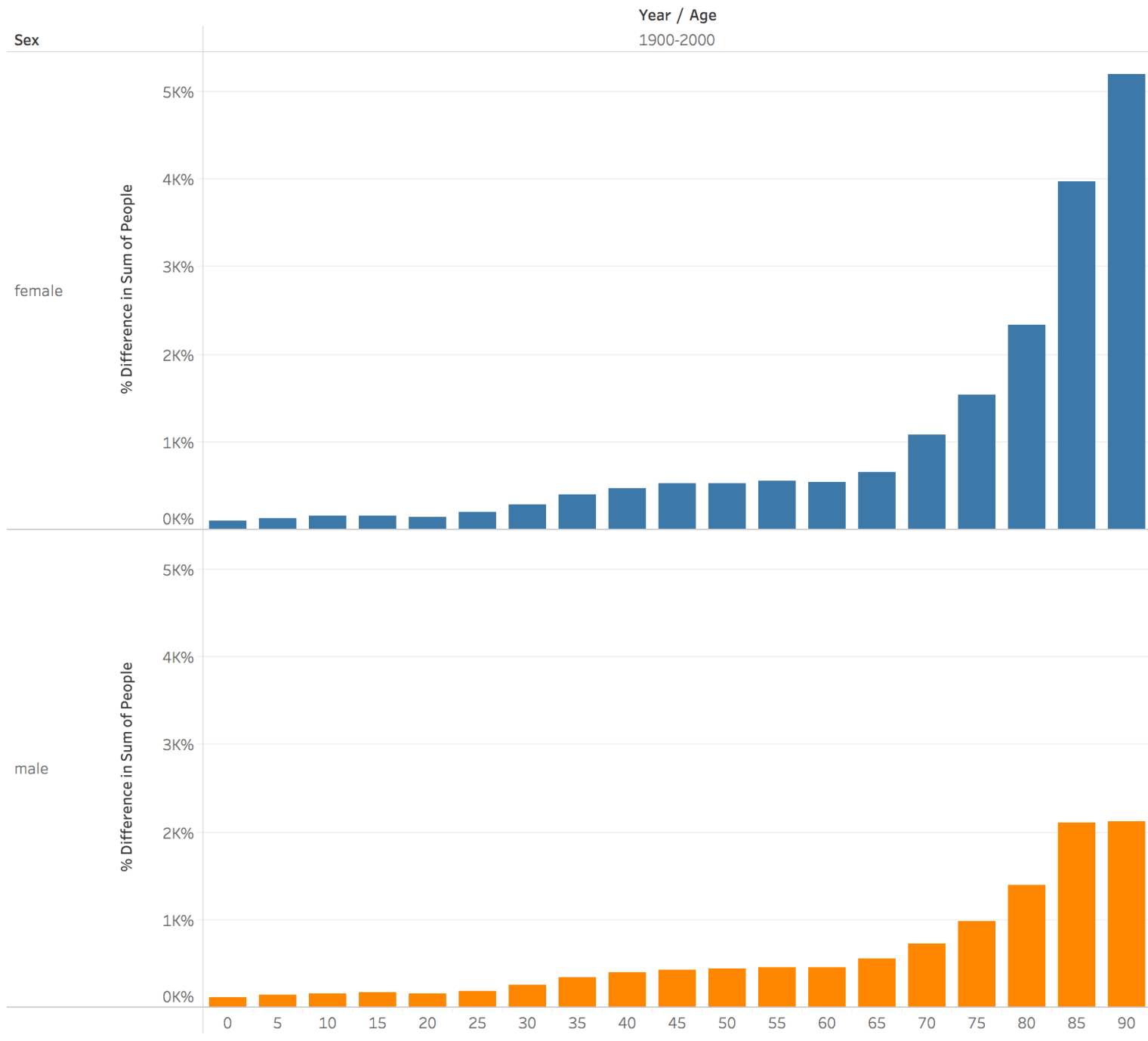


# Population Growth Percentage in each age group from 1900 to 2000

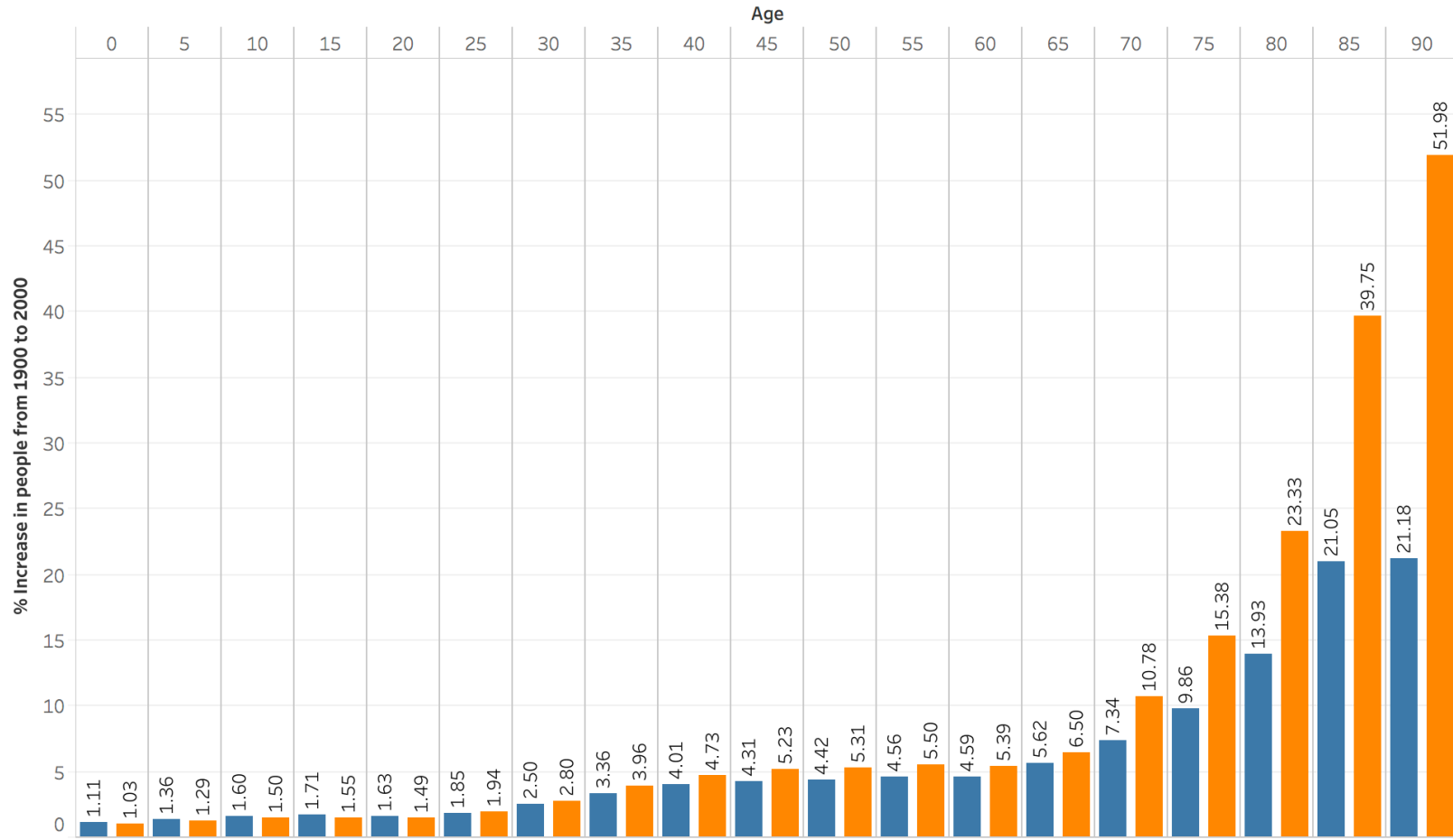
Male Grow Percentage Female Grow Percentage



# male & female population change from 1900 to 2000



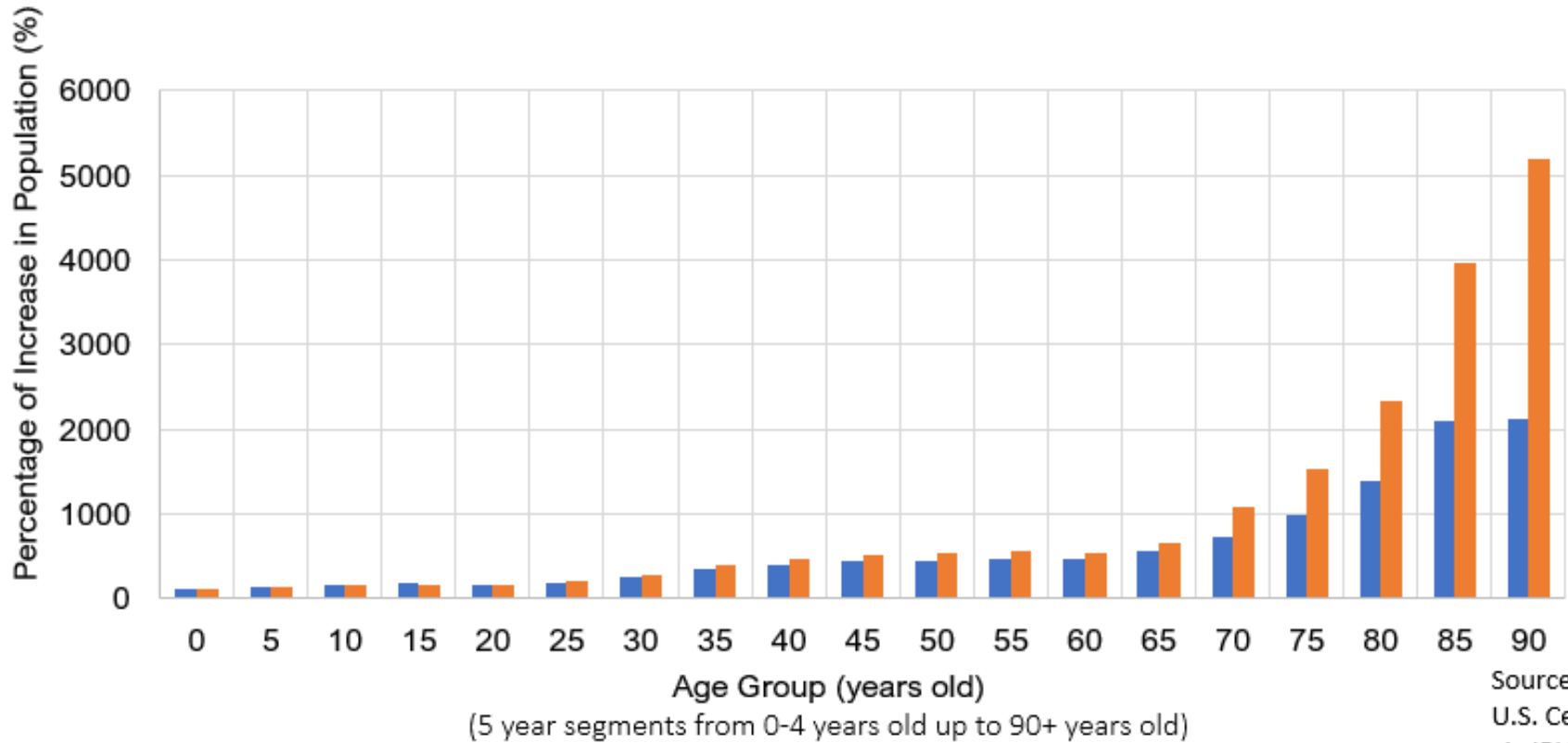
# 1900-2000 Population Growth Rate between male and female across ages



Sex  
Male  
Female

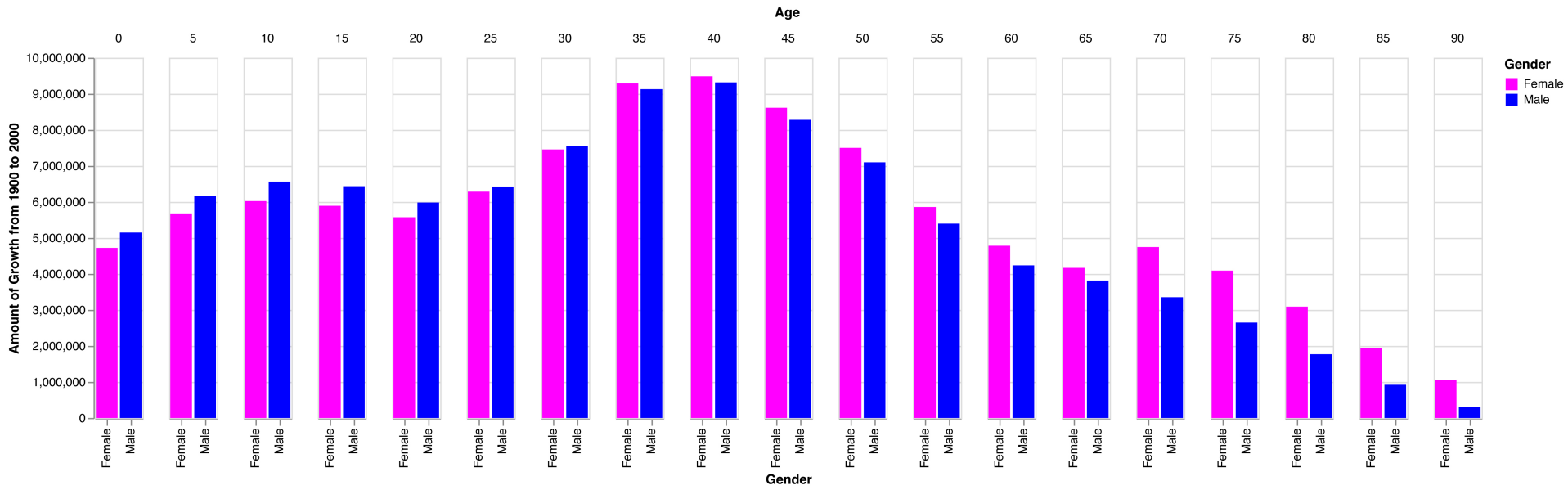
## Which Sex Group's Population Grew Faster in Year 1900-2000

■ Male  
■ Female



Source:  
U.S. Census Bureau  
via IPUMS ([ipums.org](http://ipums.org))

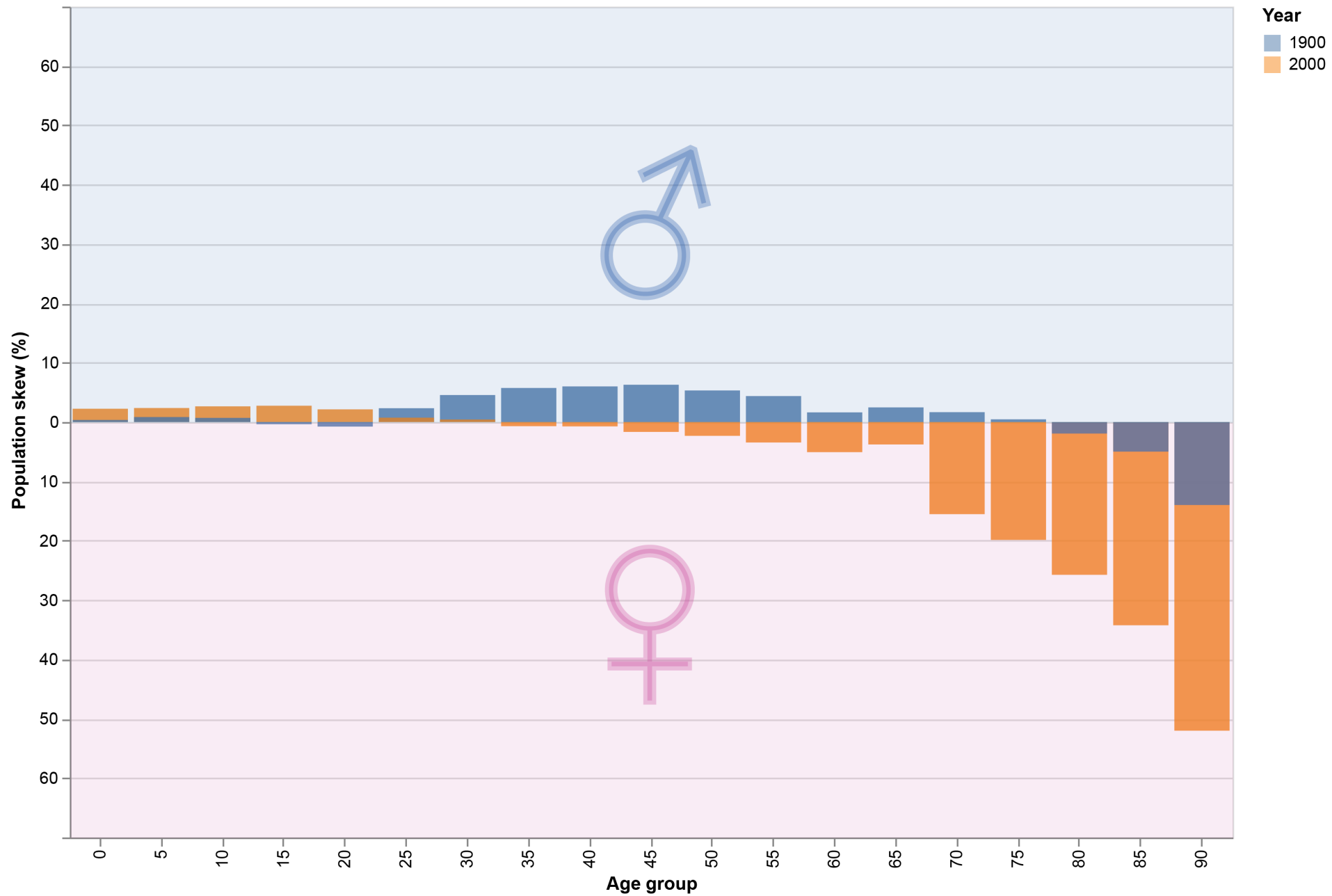
How much did the population of the United States change between 1900 and 2000?

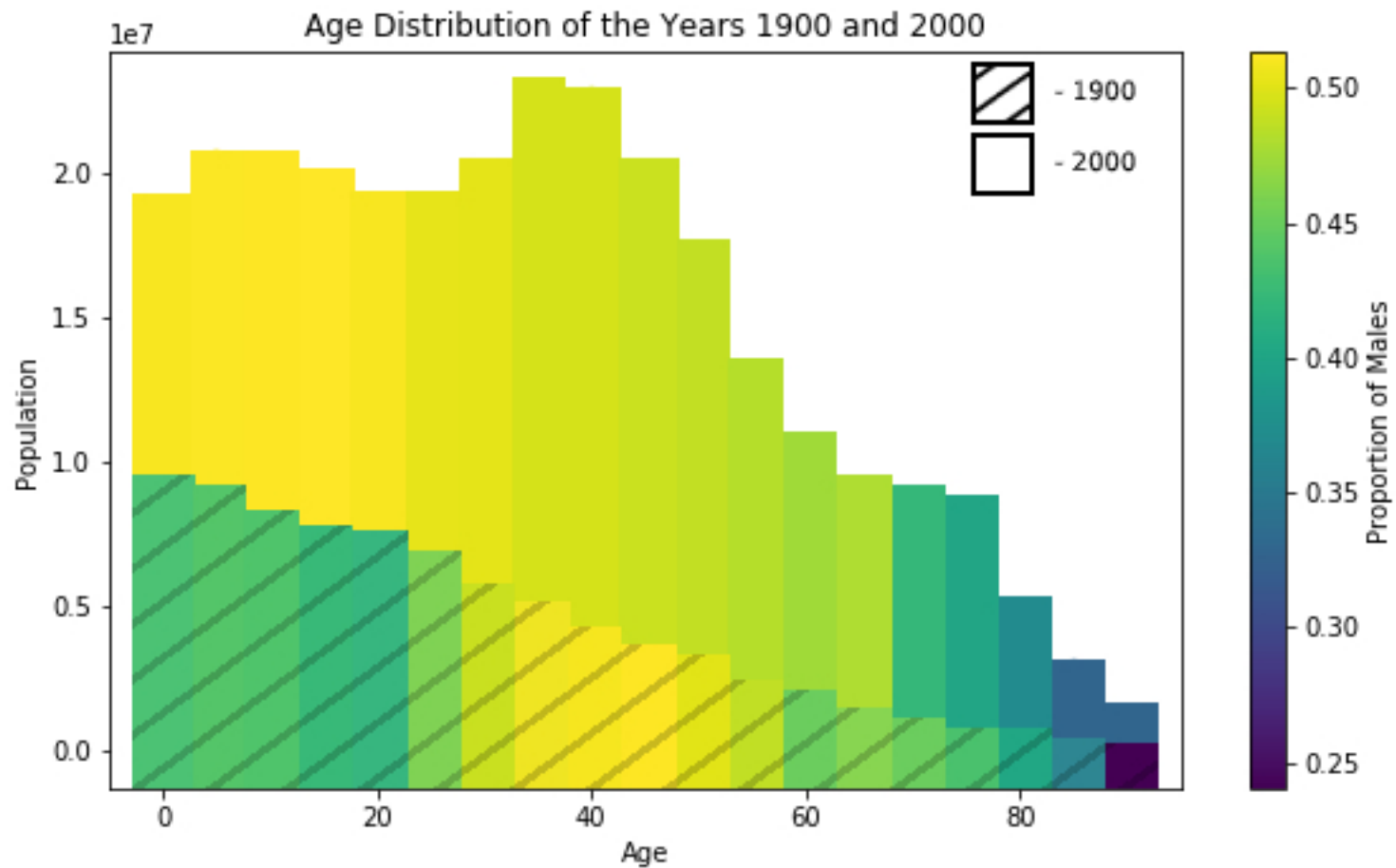




# Sex Ratios

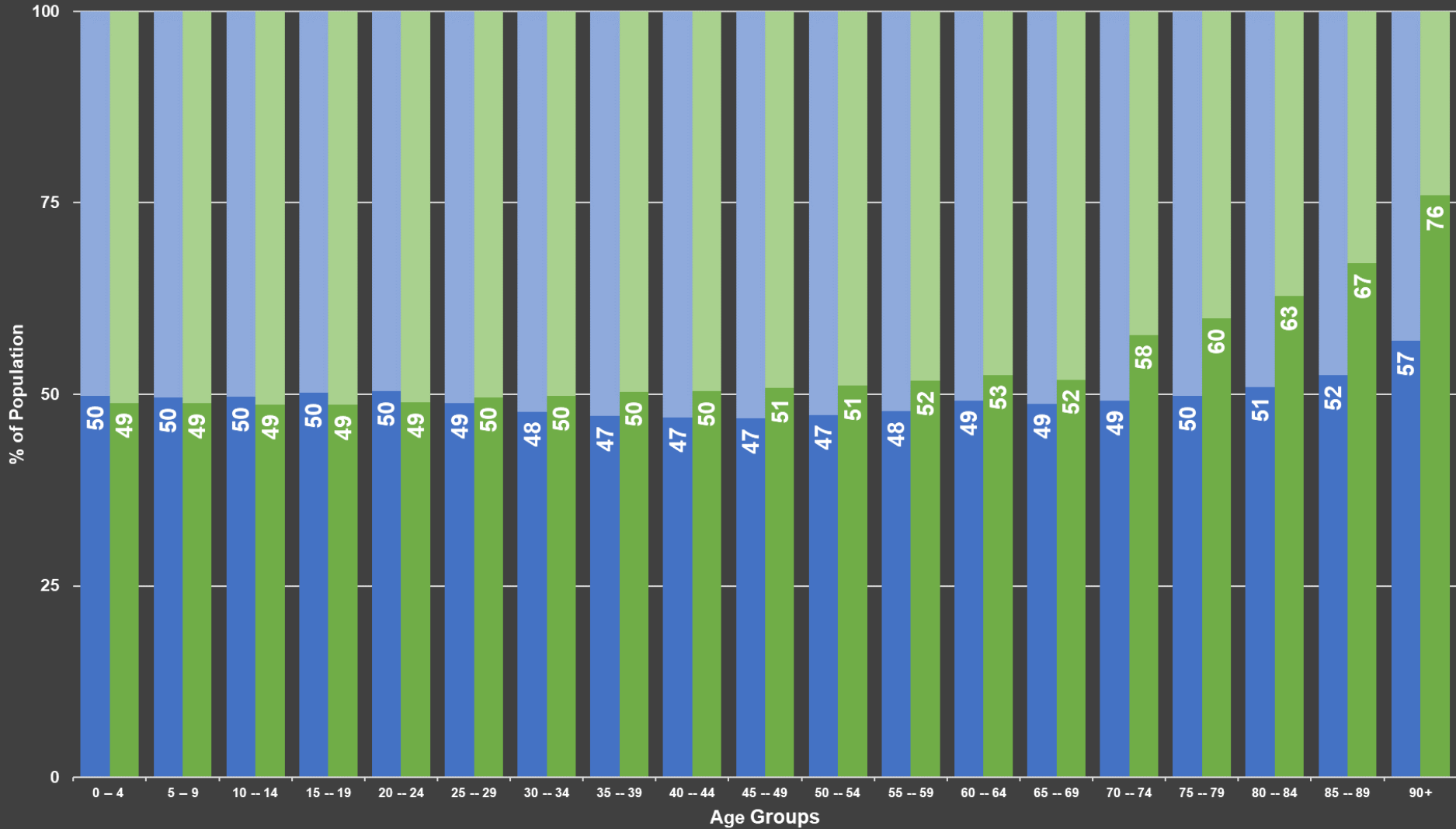
# How has the Population Gender Distribution Changed per Age Group in the U.S. over the Past Century?



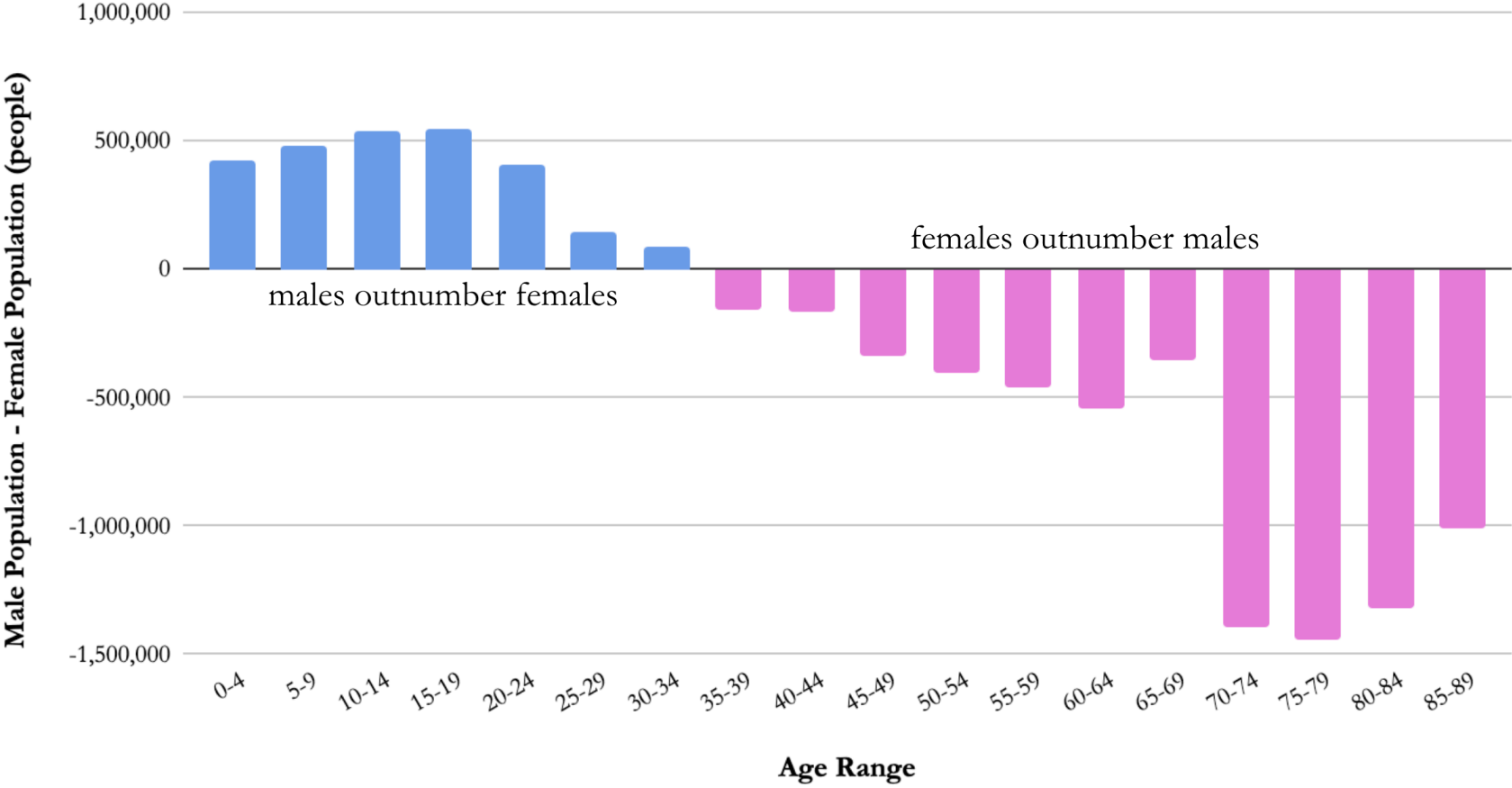


# Does Gender Affect Life Expectancy? (1900 vs 2000)

■ 1900 Population   ■ 2000 Population   ■ Female % of 1900 Population   ■ Female % of 2000 Population

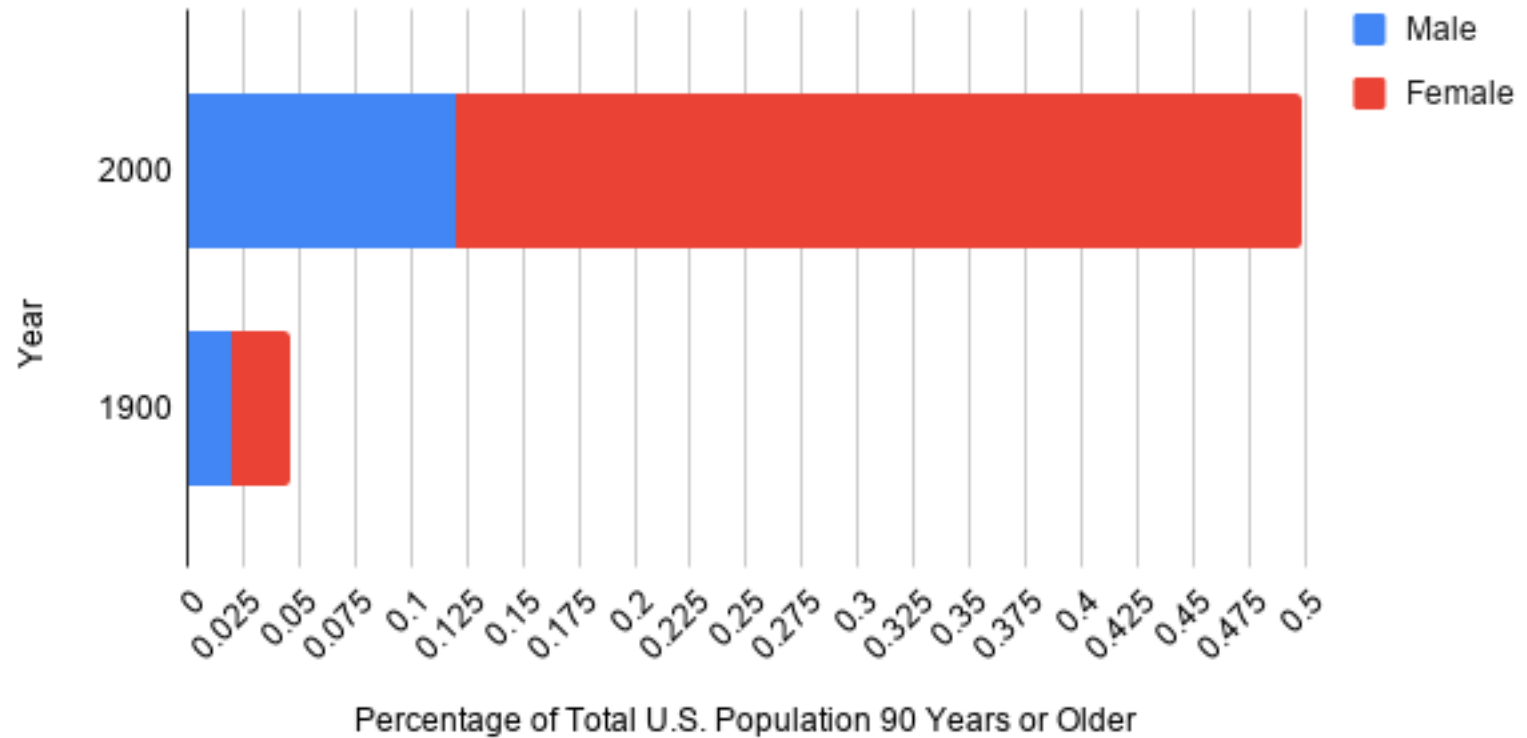


# How Does the Difference Between Male and Female Populations in 2000 Vary by Age?

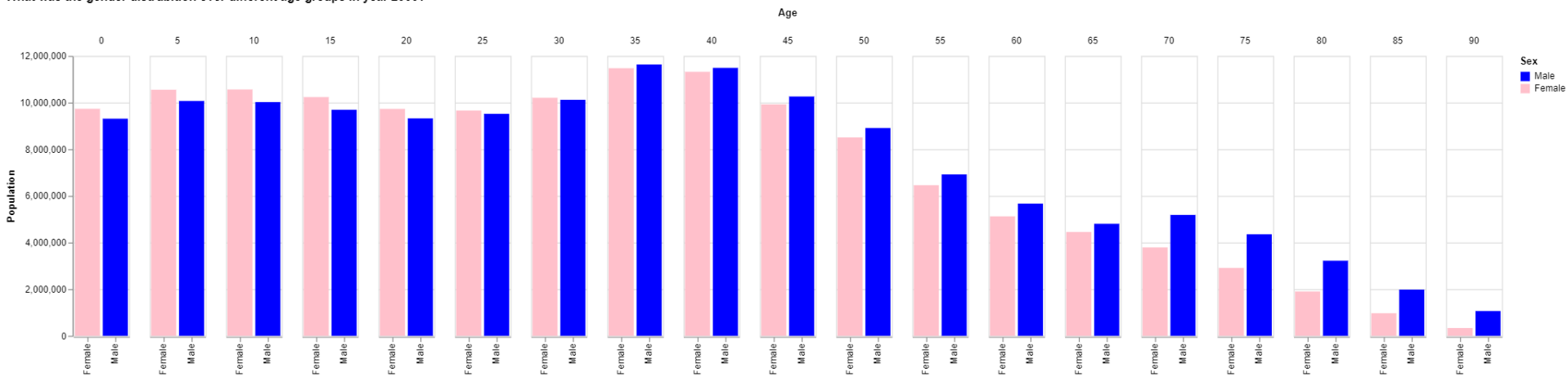


# Simplification

# How Has the Gender Makeup of the 90+ Year Old Population Changed as Life Expectancy Has Increased?



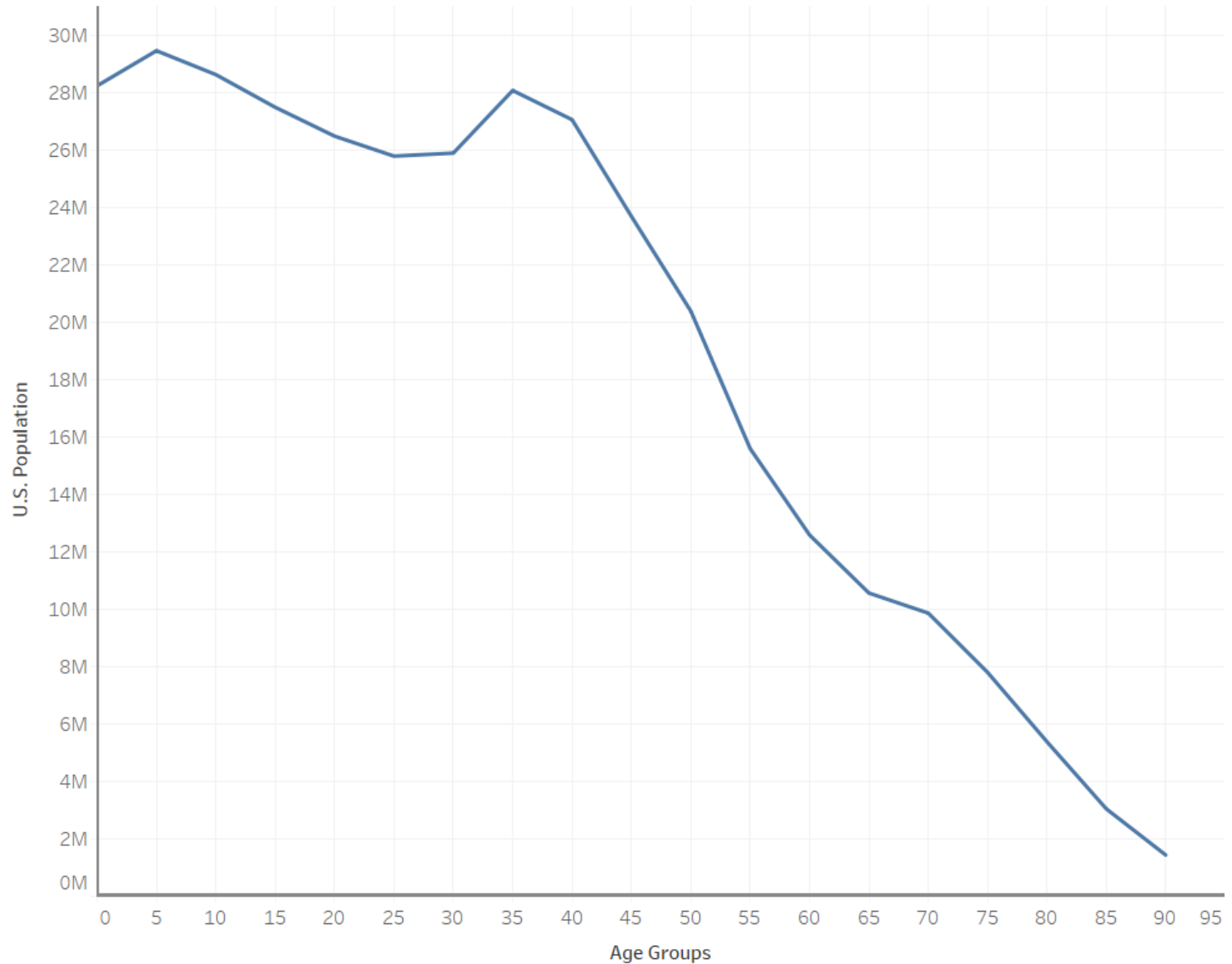
What was the gender distribution over different age groups in year 2000?





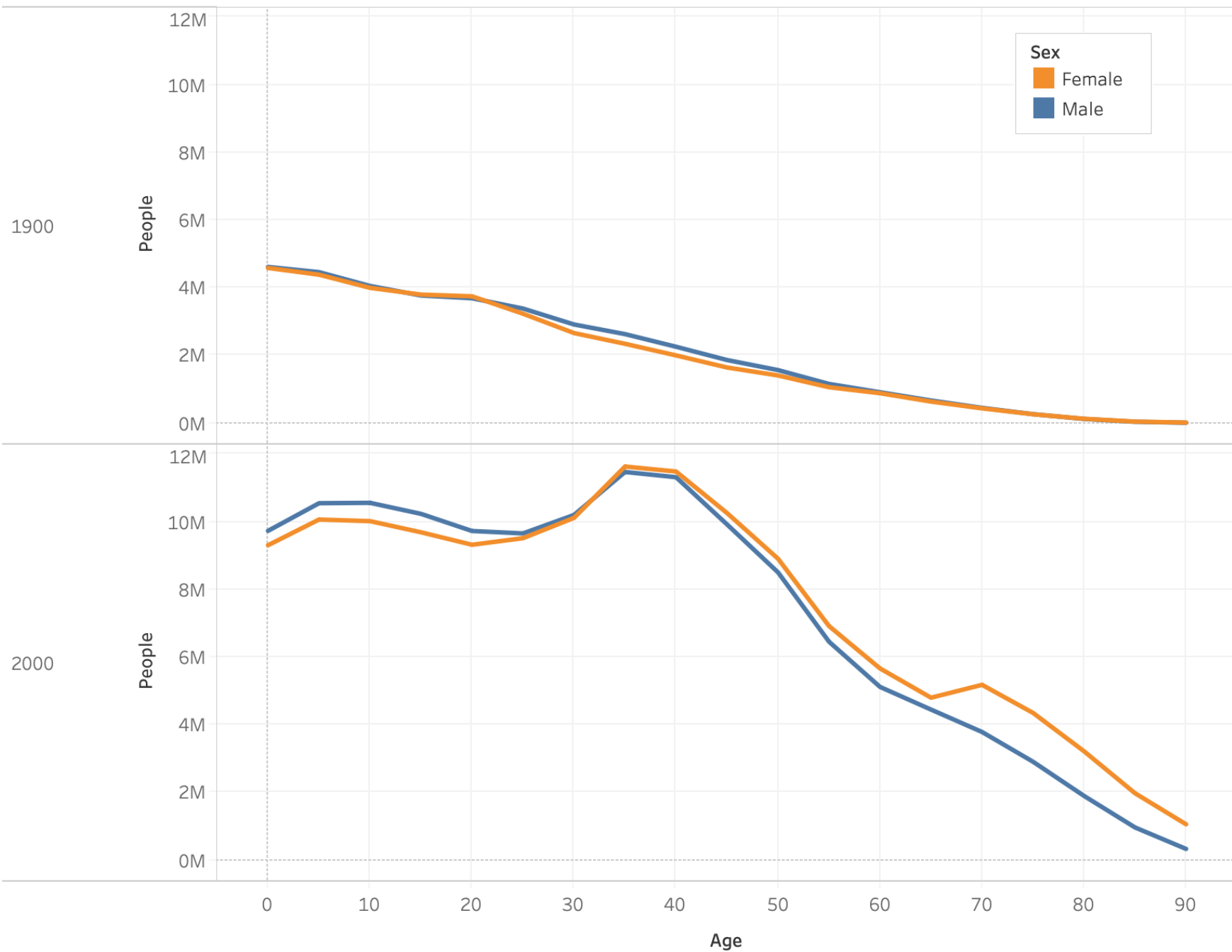
**Lines / Area**

# What is the Trend of the U.S. population for Increasing Age Groups?

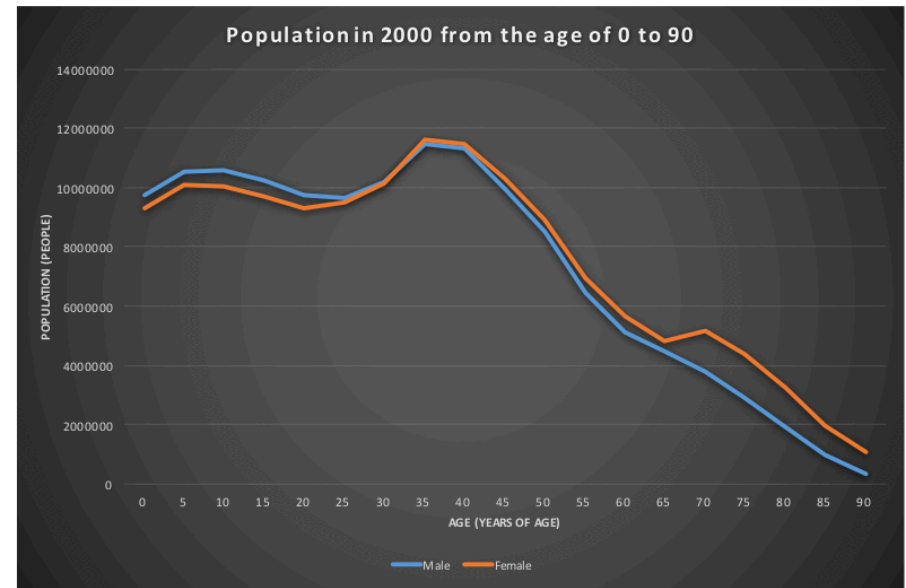
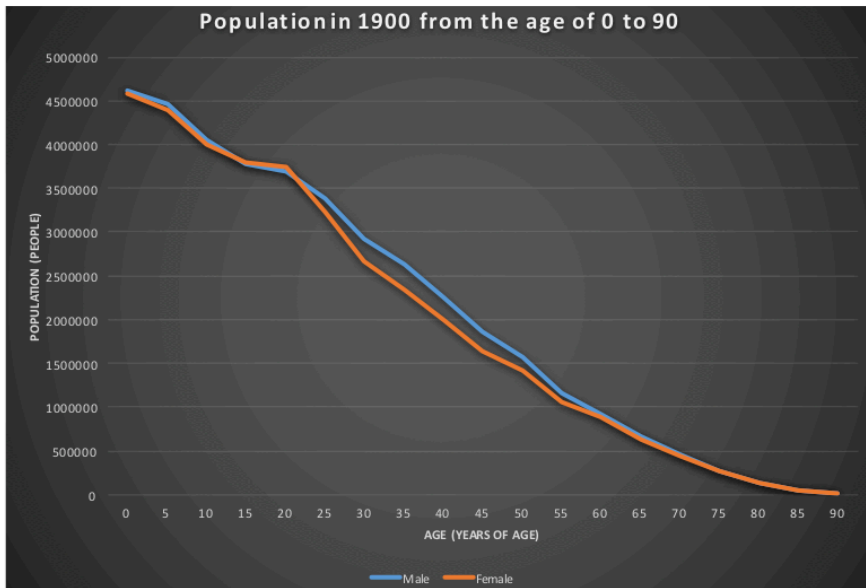


The trend of sum of People for Age.

# How did the age distribution change from 1900 to 2000?

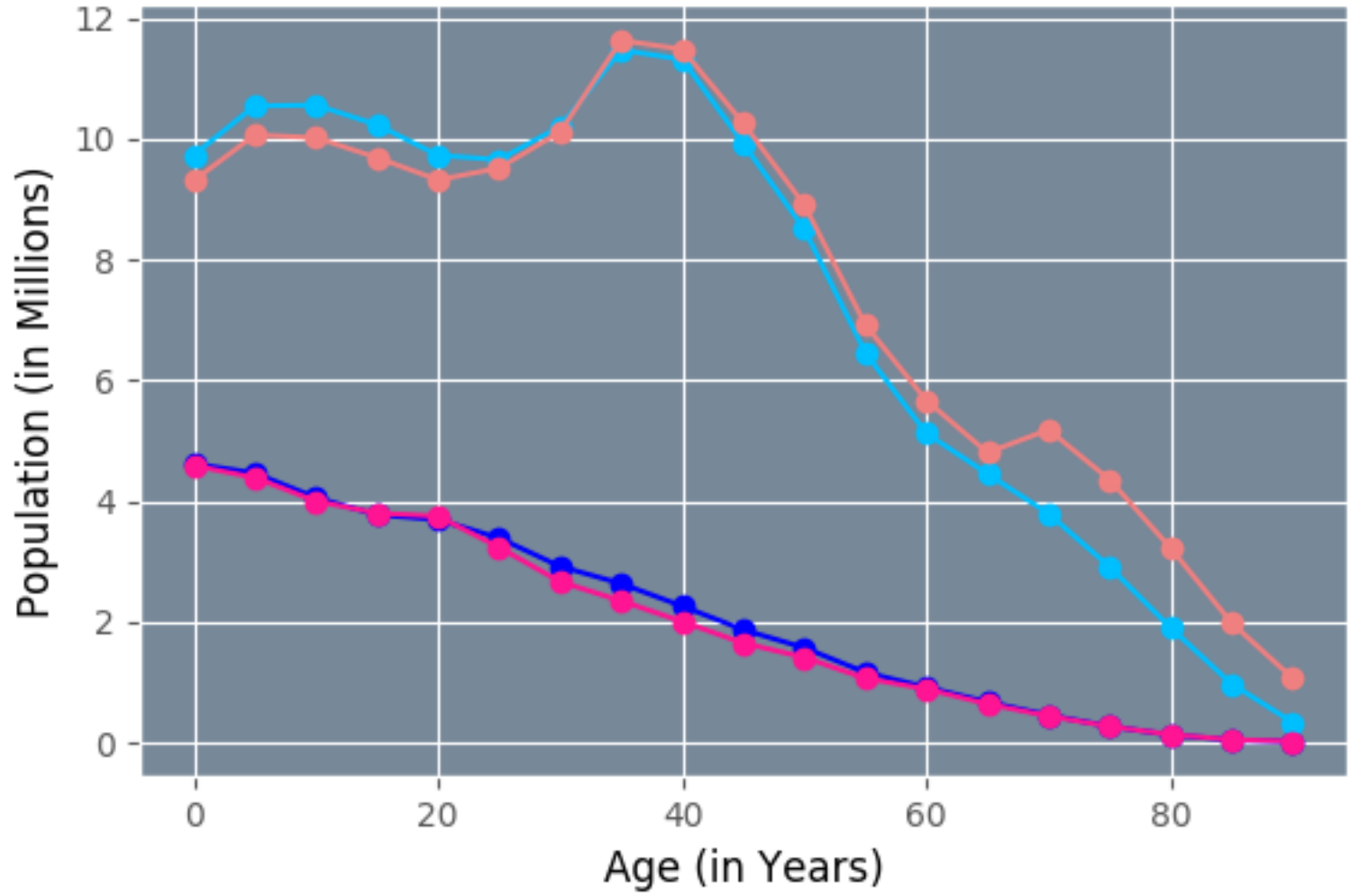


## How has the gender distribution between different ages changed in a century from 1900 to 2000?



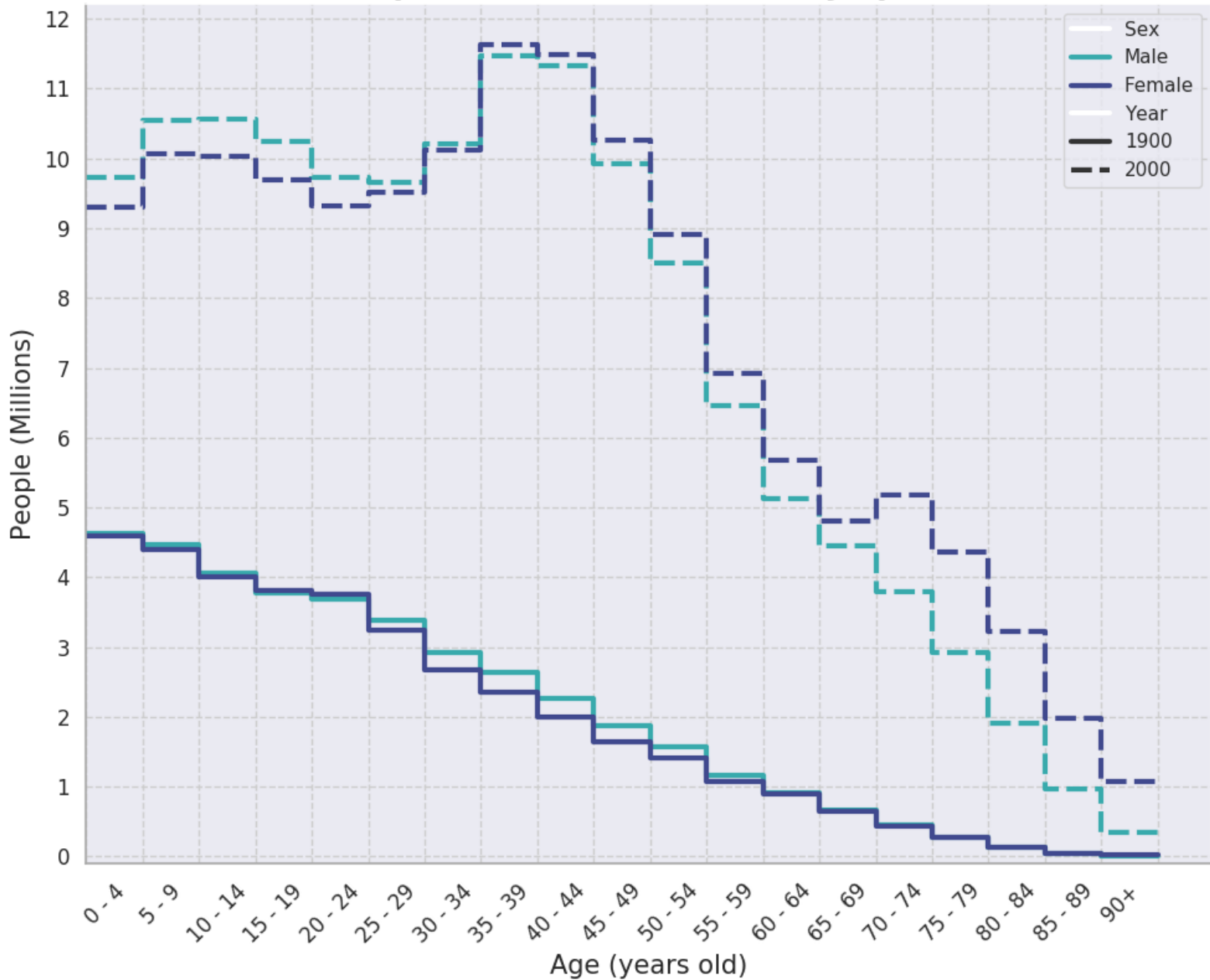
The population between males and females in various age groups from 0 to 90 in 1900 (left figure) and in 2000 (right figure).

# Population Growth of Men and Women in 1900 vs. 2000

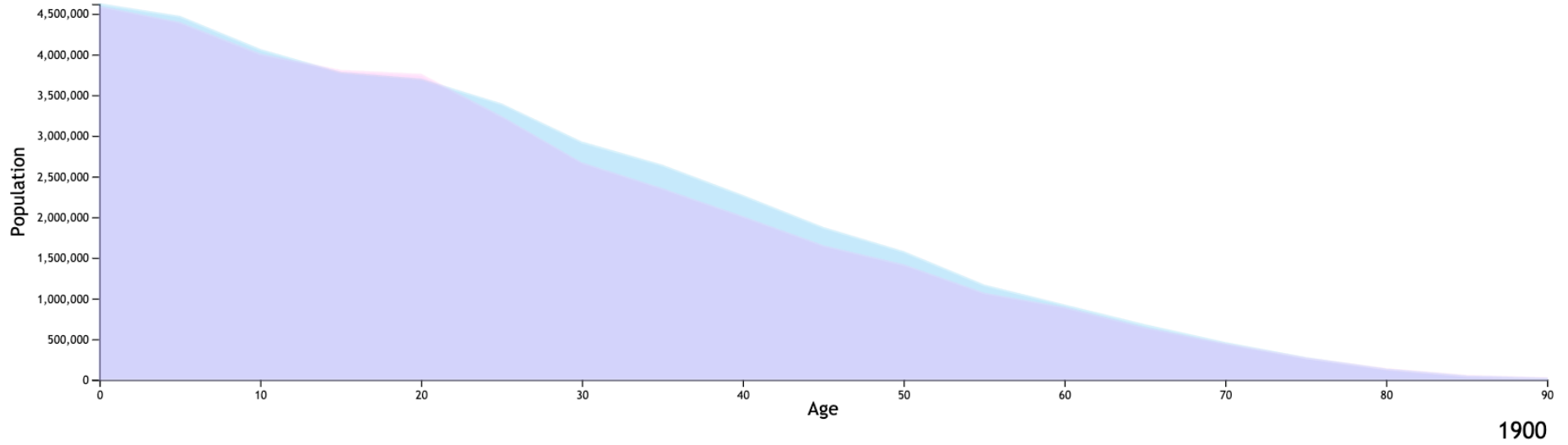


- Population Rate for Men in 1900
- Population Rate for Women in 1900
- Population Rate for Men in 2000
- Population Rate for Women in 2000

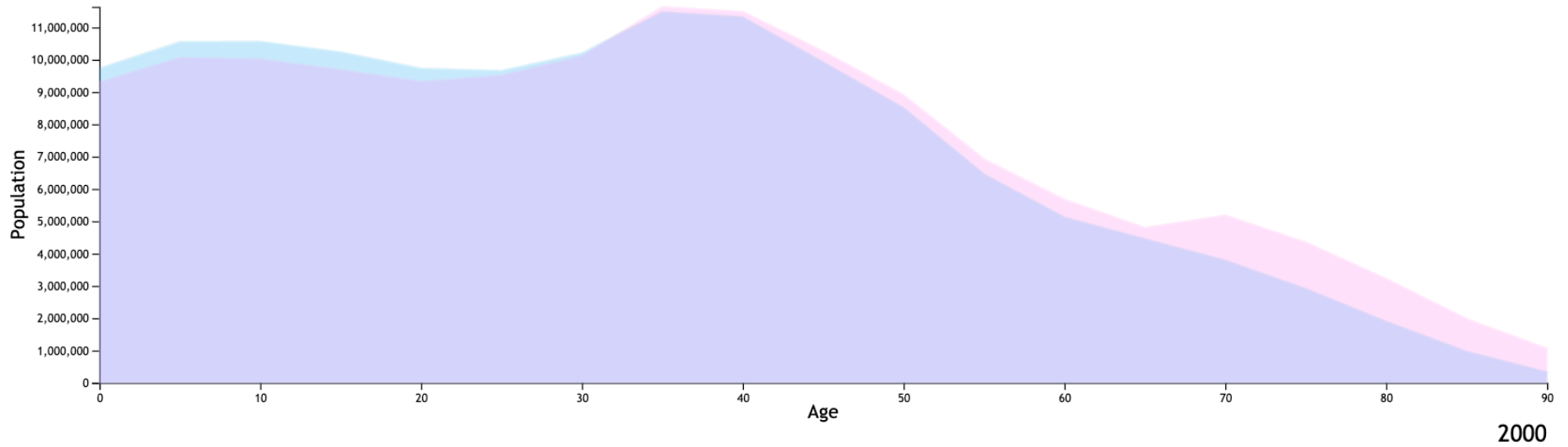
# Population Census: A Century Apart



# US Population Gender Gap

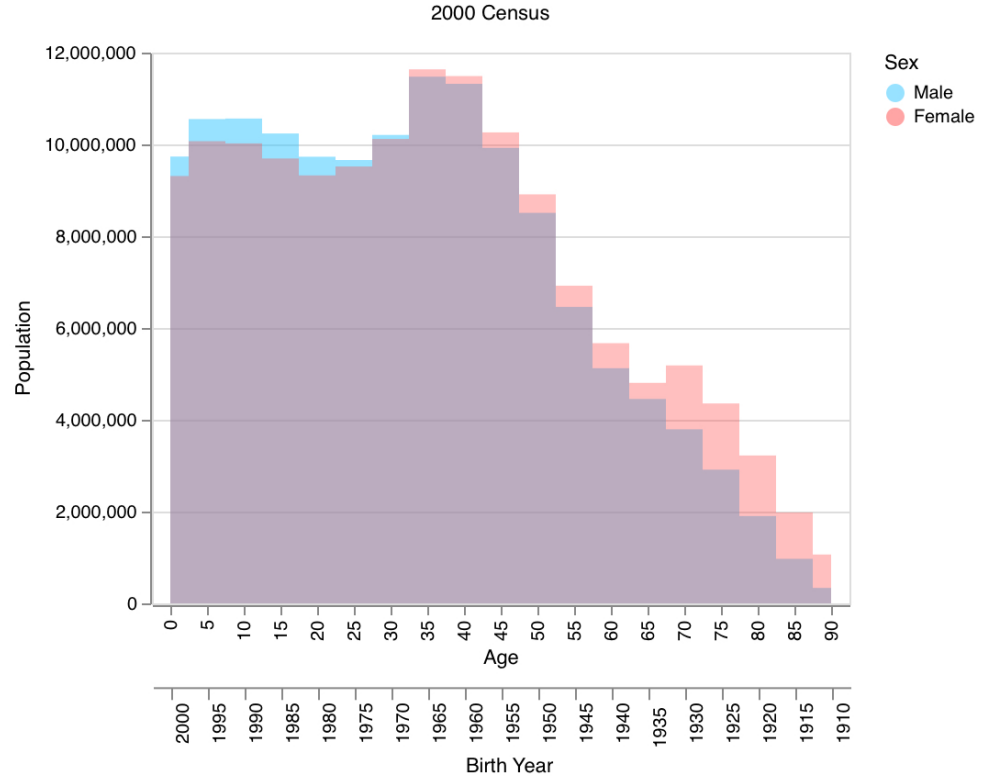
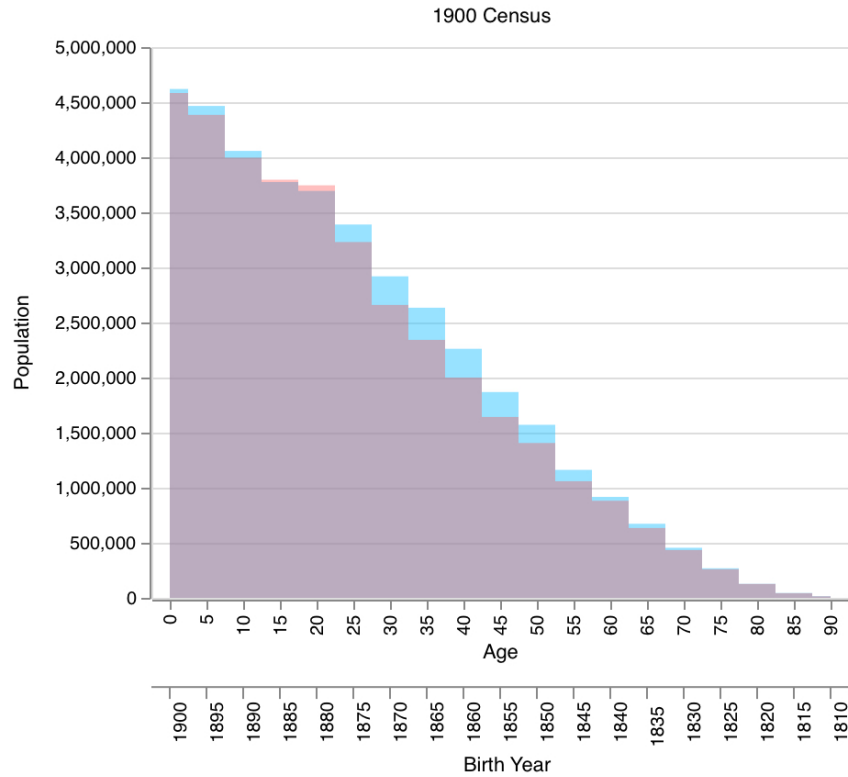


1900



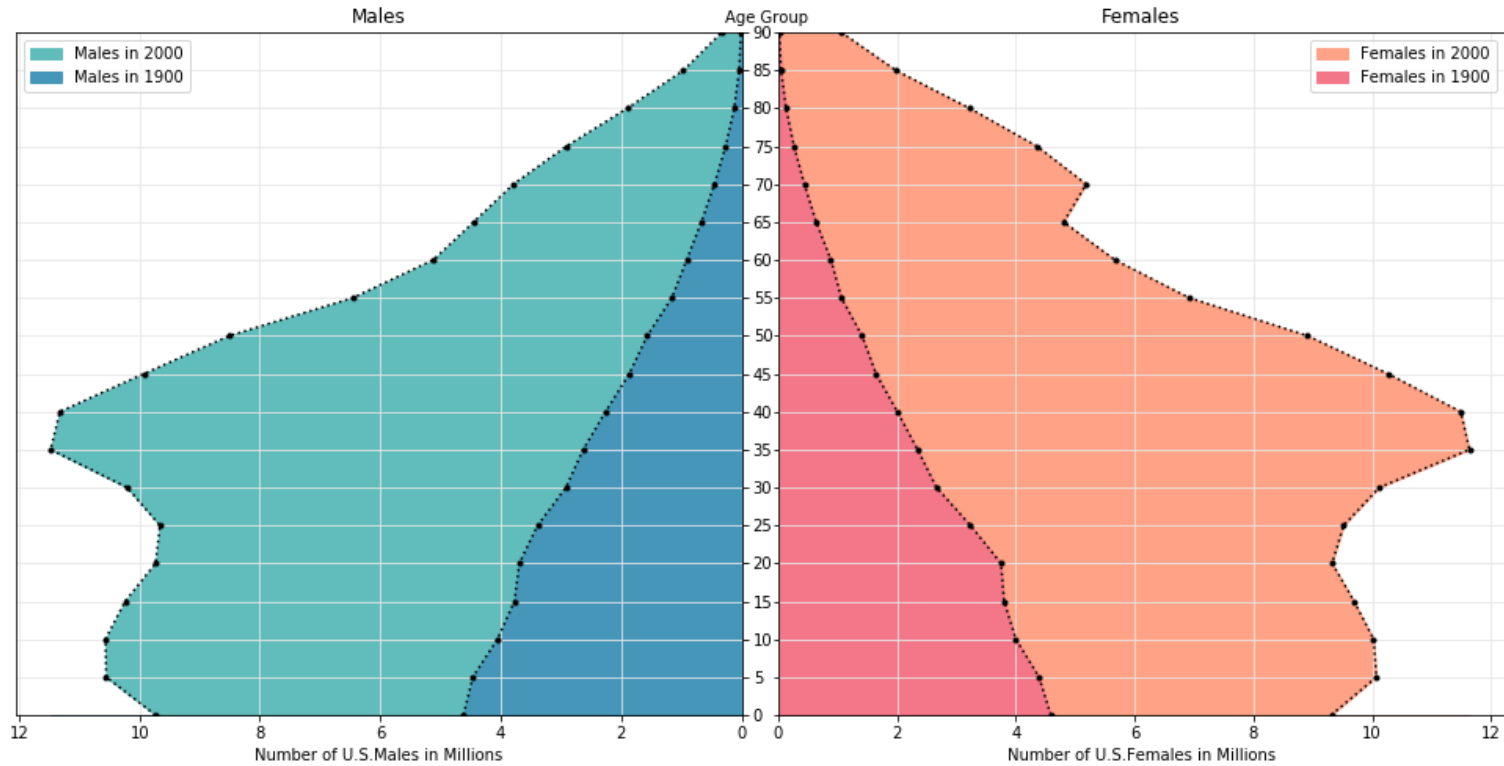
2000

## How did the ratio of females to males change from the beginning to the end of the 20th c.?

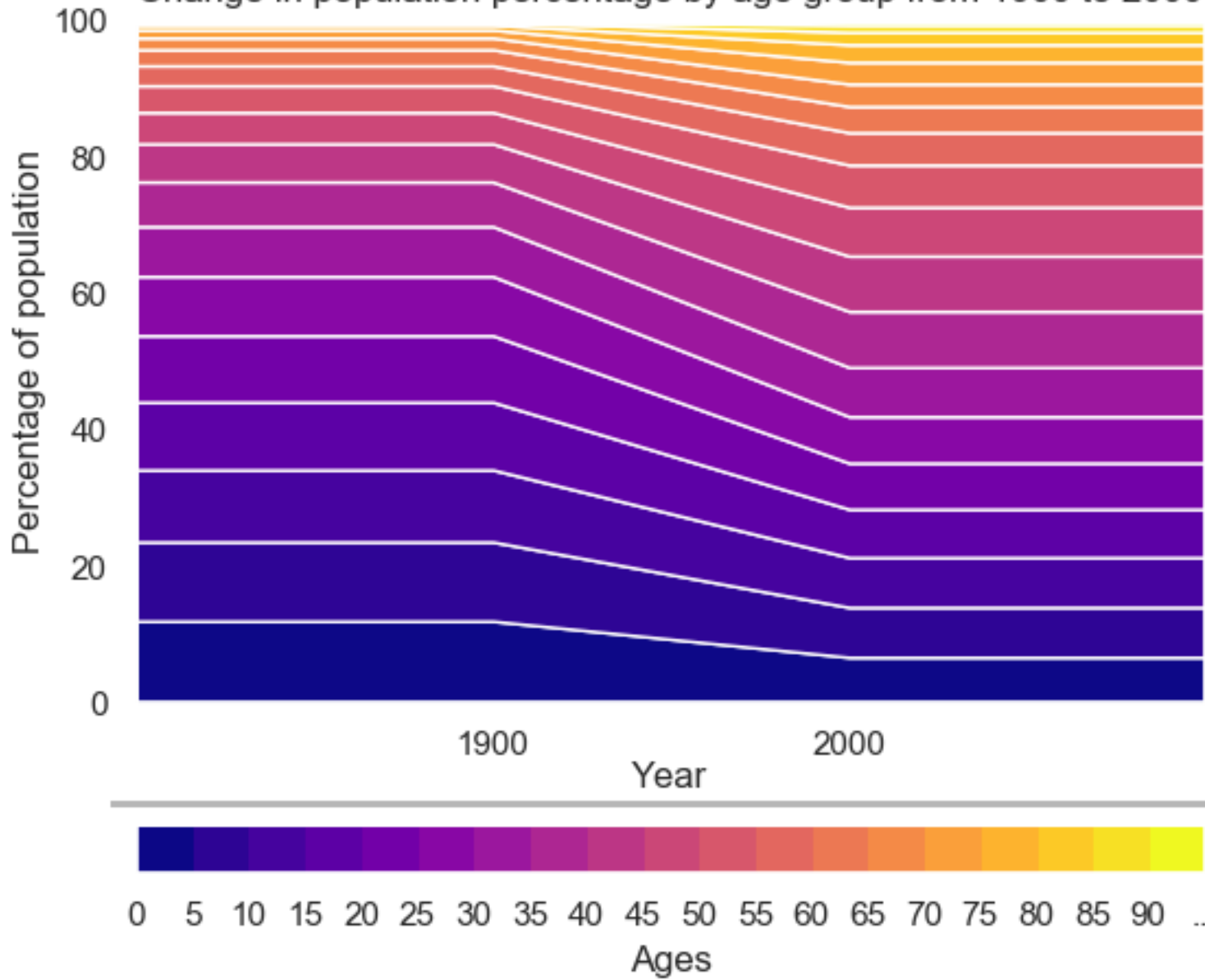




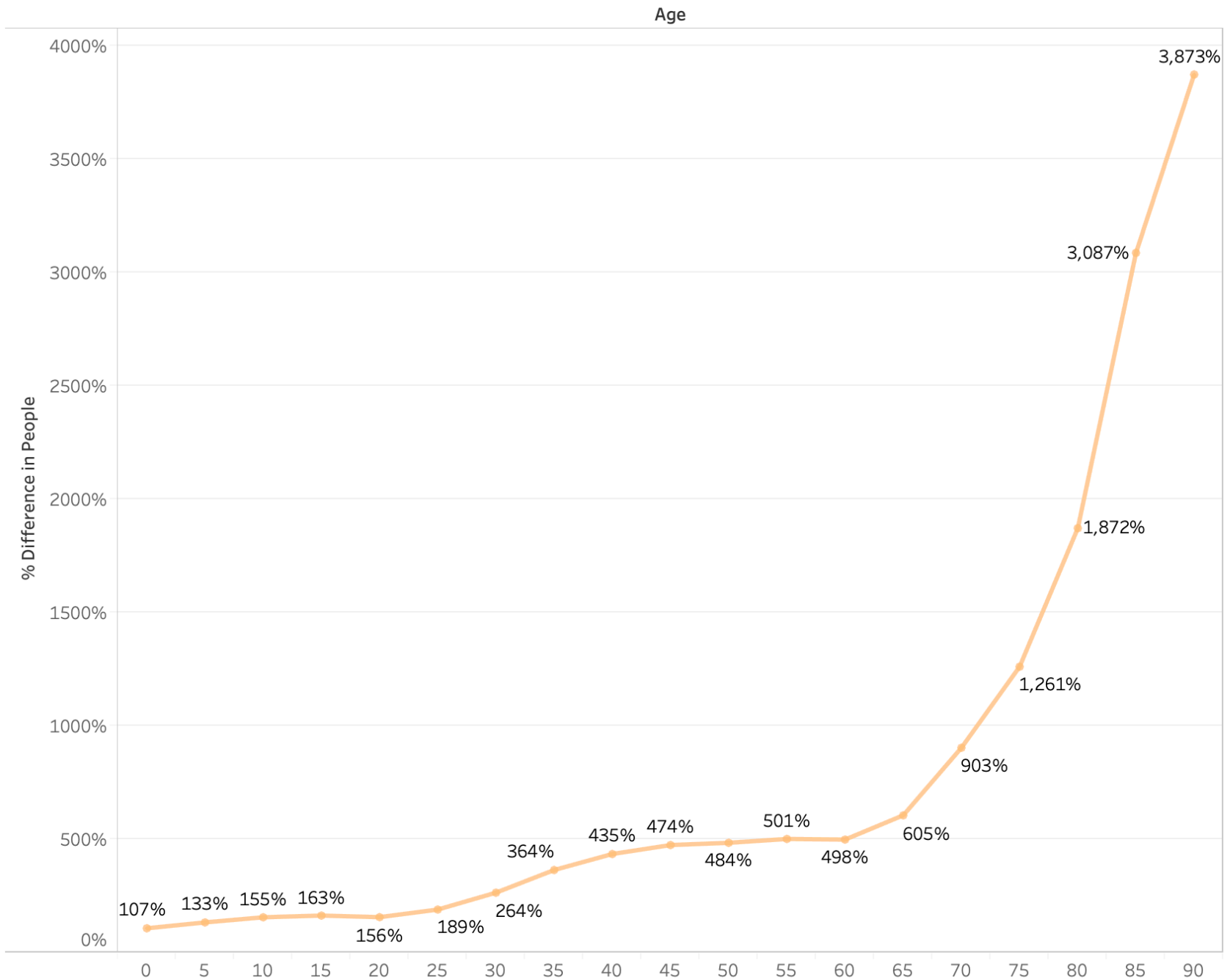
# Age Group Distribution in U.S. Census Data



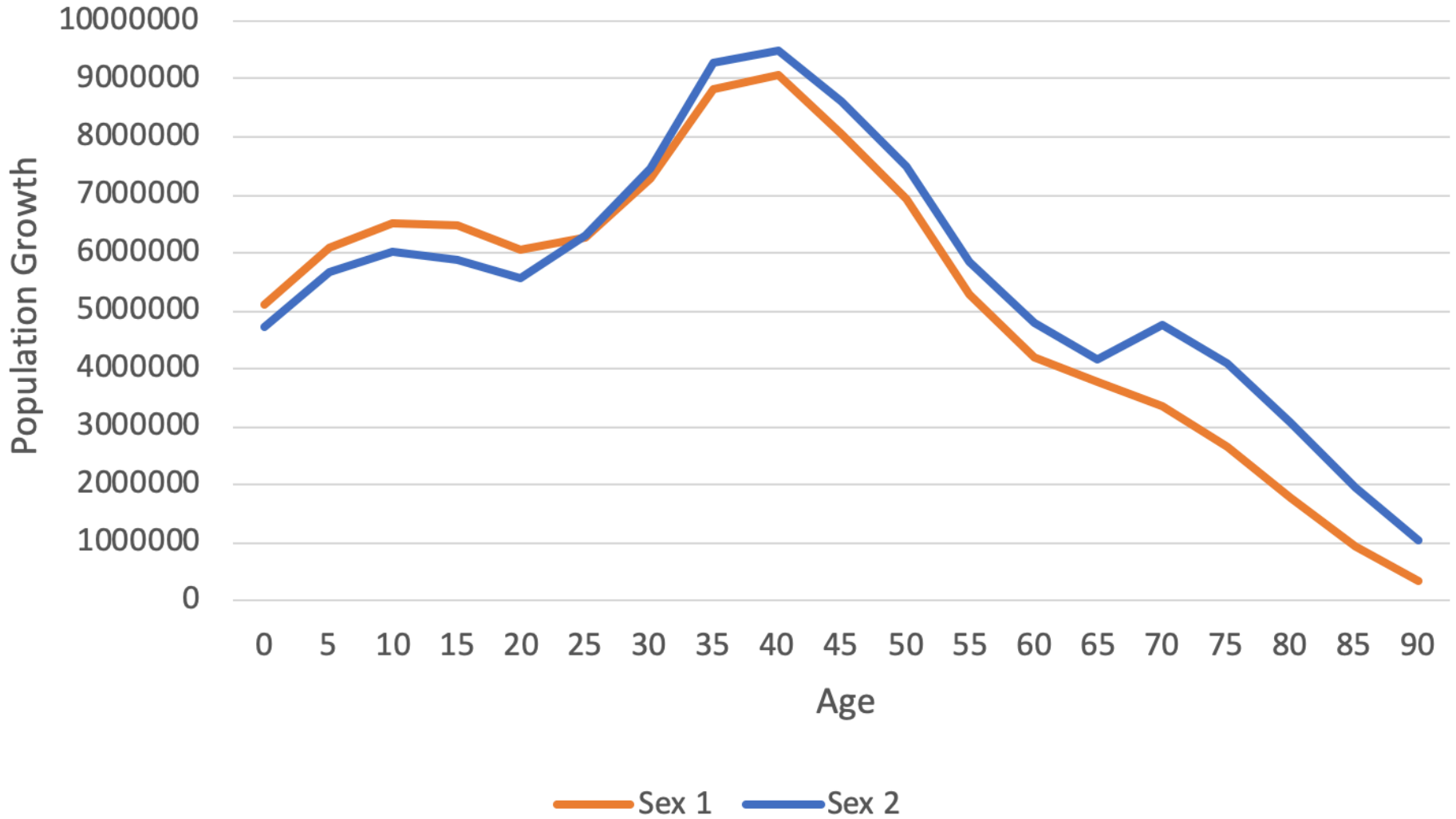
Change in population percentage by age group from 1900 to 2000



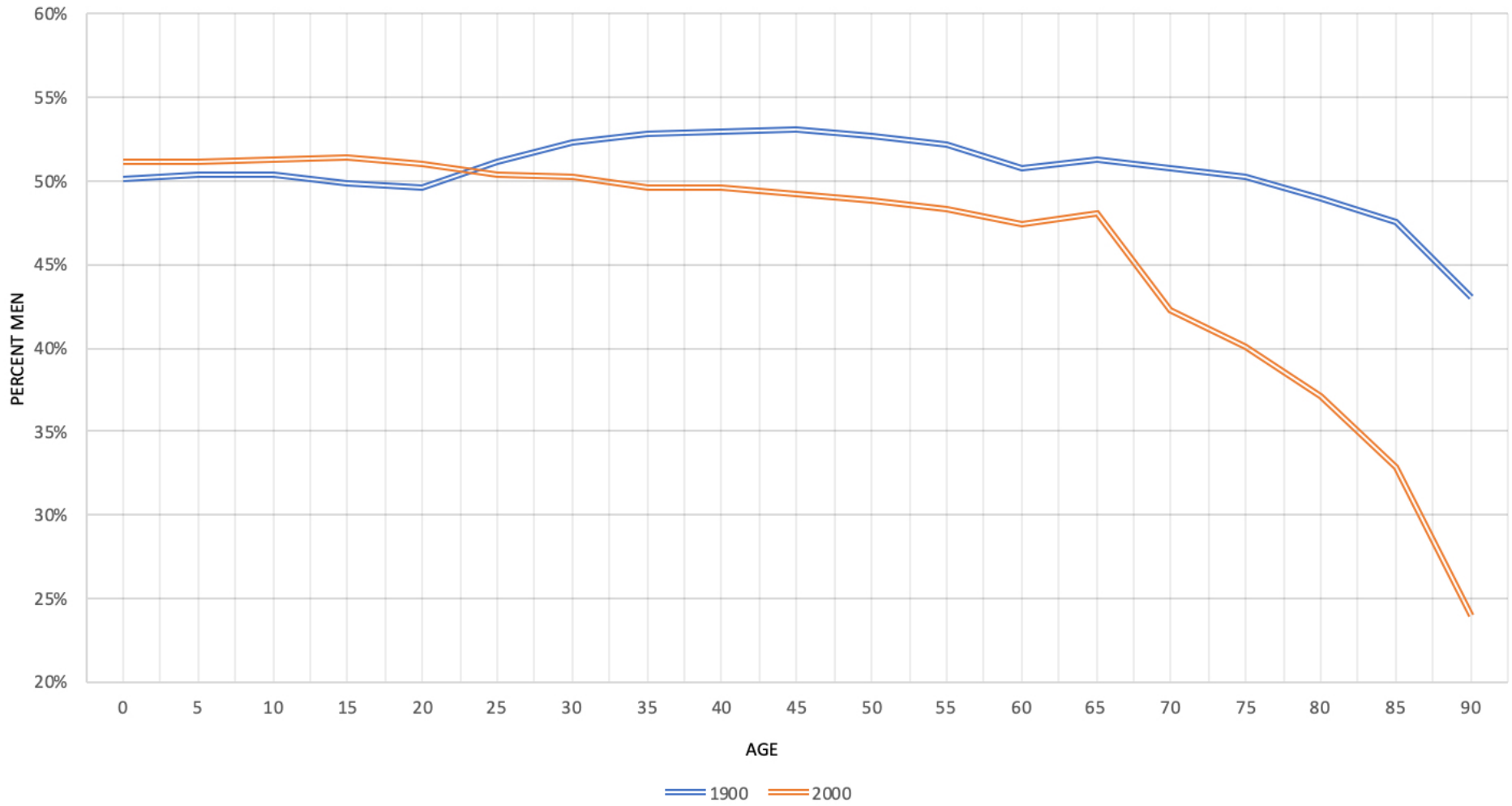
# Population Increase from 1900 to 2000 for Each Age in Percent



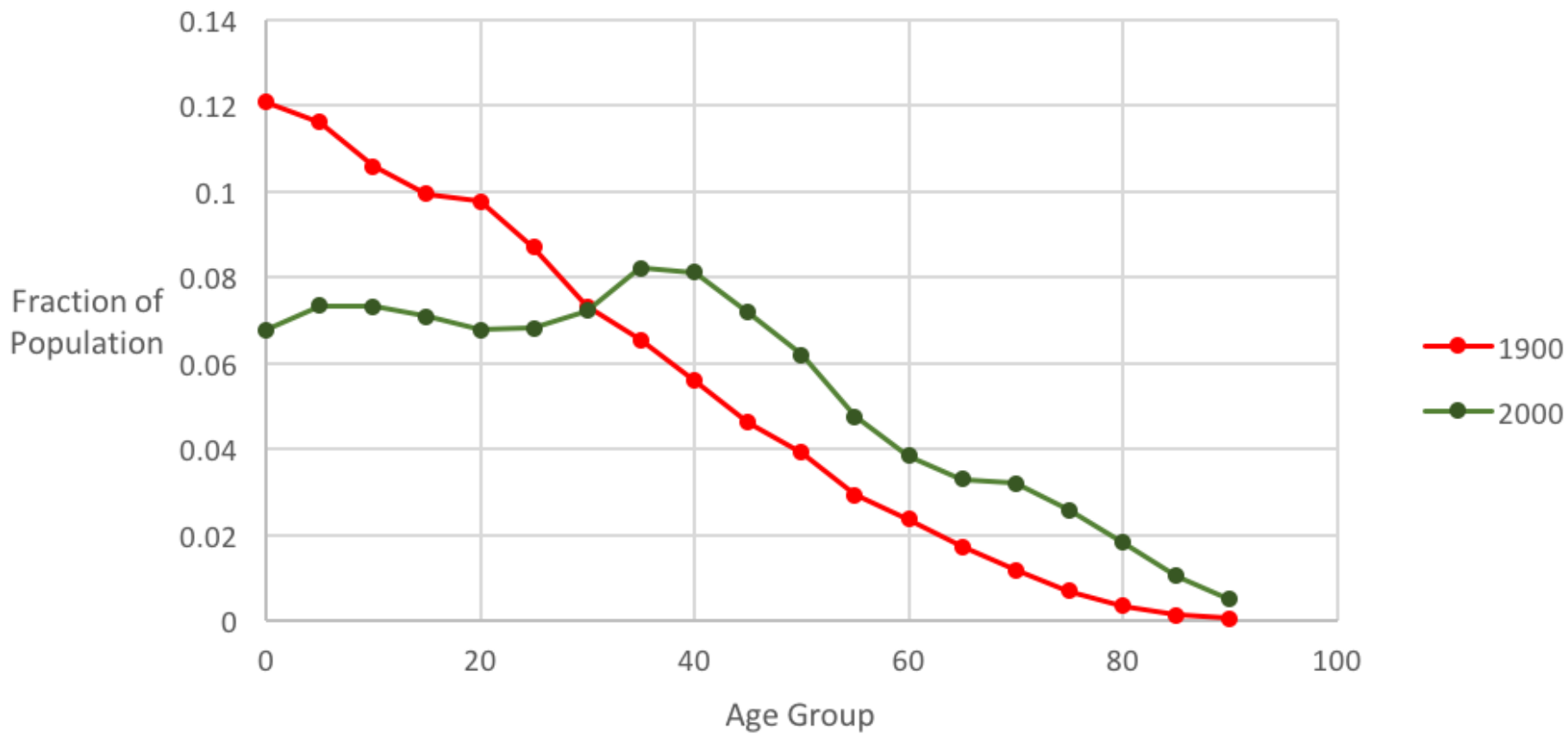
# Population Growth from 1900 to 2000



# PERCENTAGE OF MEN OF TOTAL POPULATION IN 1900 AND 2000

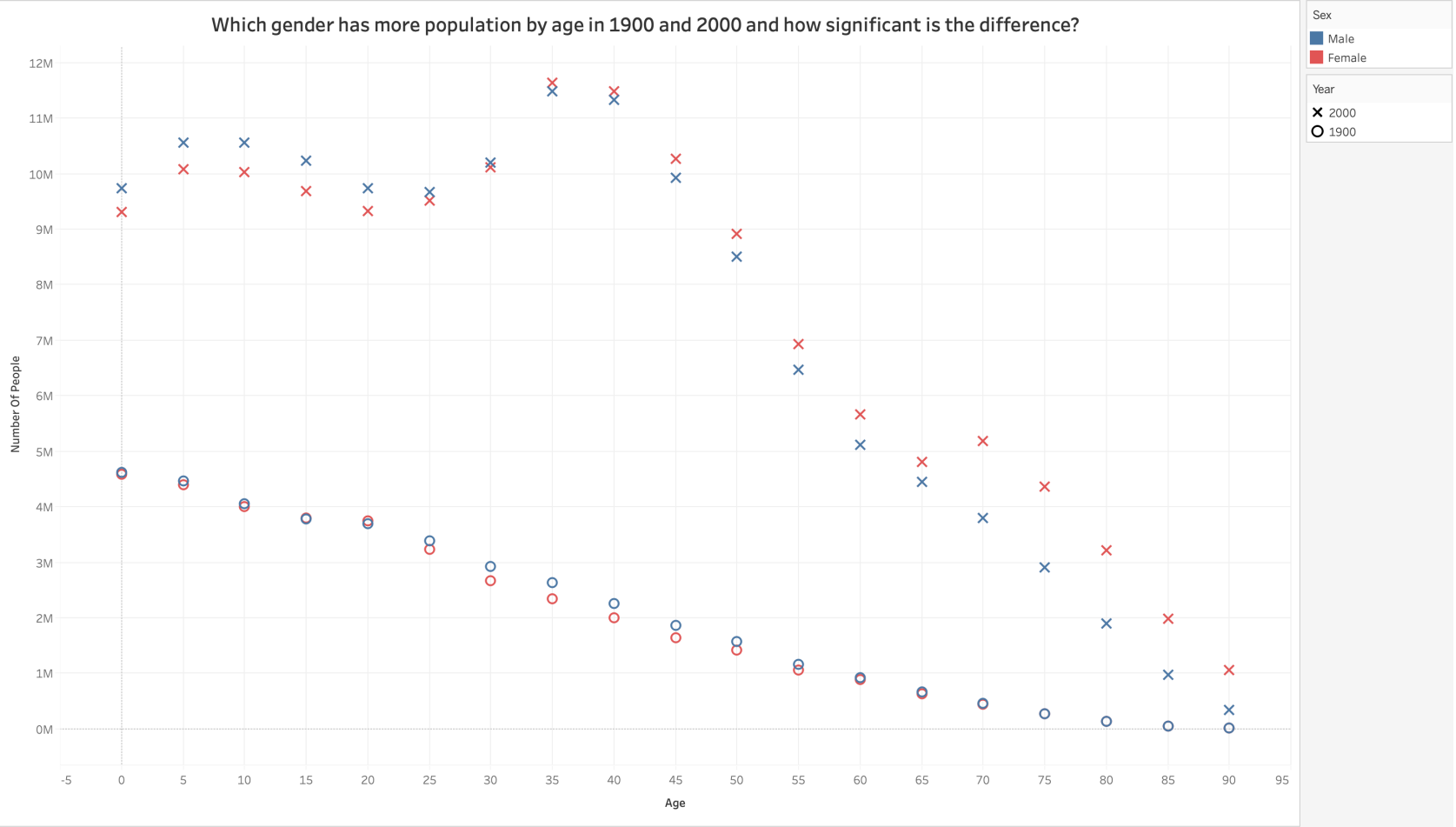


### Fraction of Population of Each Age Group



# Dot / Scatter Plots

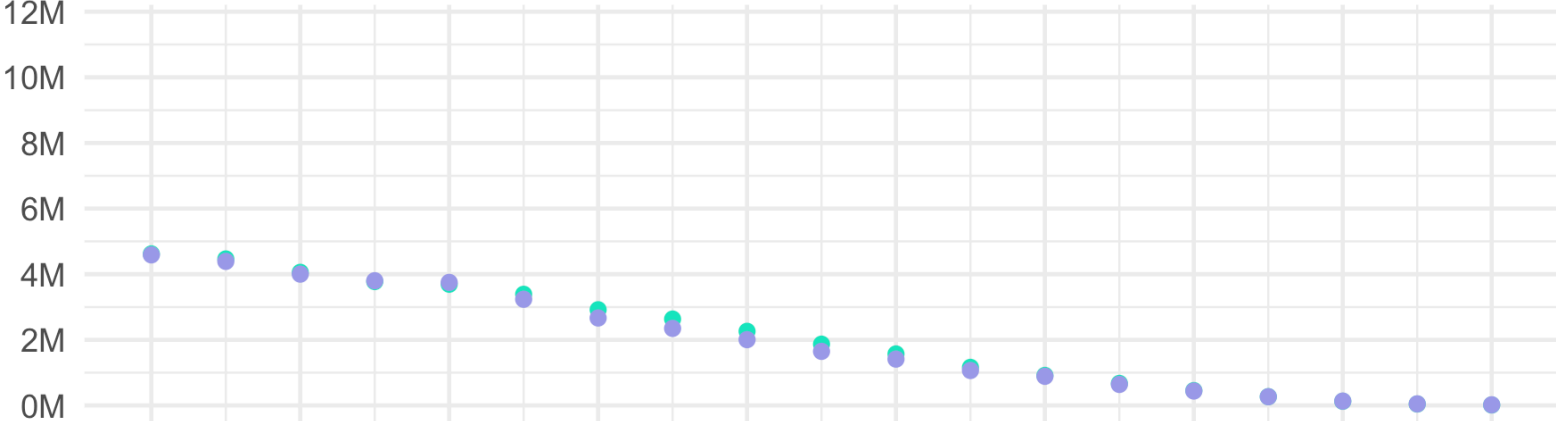
Which gender has more population by age in 1900 and 2000 and how significant is the difference?





# Female vs Male Population Changes in the U.S within a Century

Year 1900



Year 2000



Sex

- Female
- Male

**Data** Analytics

Copy of census2000 (Co...

**Dimensions**

- Year
- Measure Names

**Marks**

Shape

Color Size Label

Detail Tooltip Shape

Measure Values

- ATTR(Sex)
- ATTR(Year)

**Measures**

- Age
- People
- Percentage of total popul...
- Sex
- Number of Records
- Measure Values

Pages

Filters

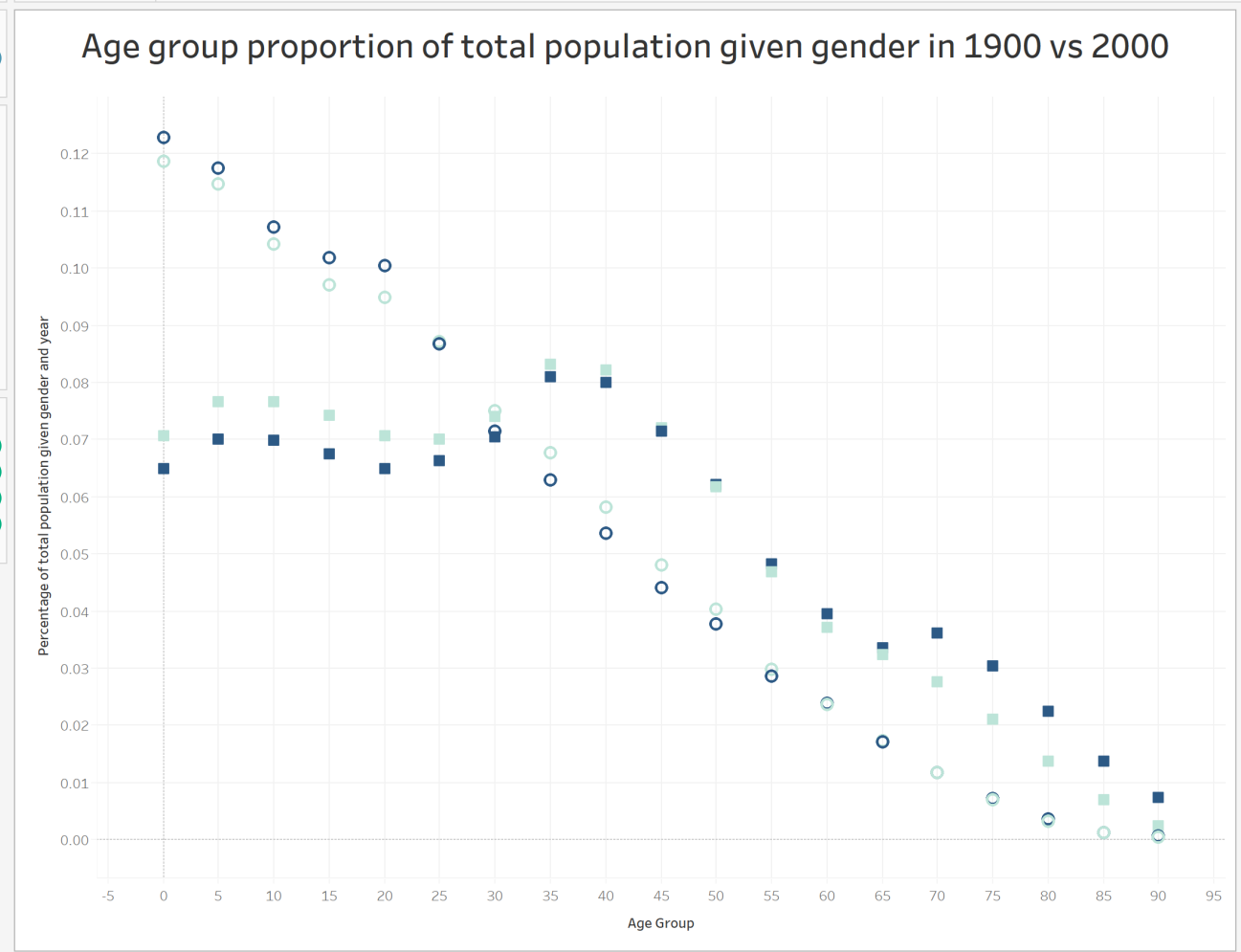
Measure Names

Measure Values

- SUM(Age)
- SUM(Number of Rec..)
- SUM(People)
- SUM(Percentage of ..)

Columns: Age

Rows: Percentage of total p...



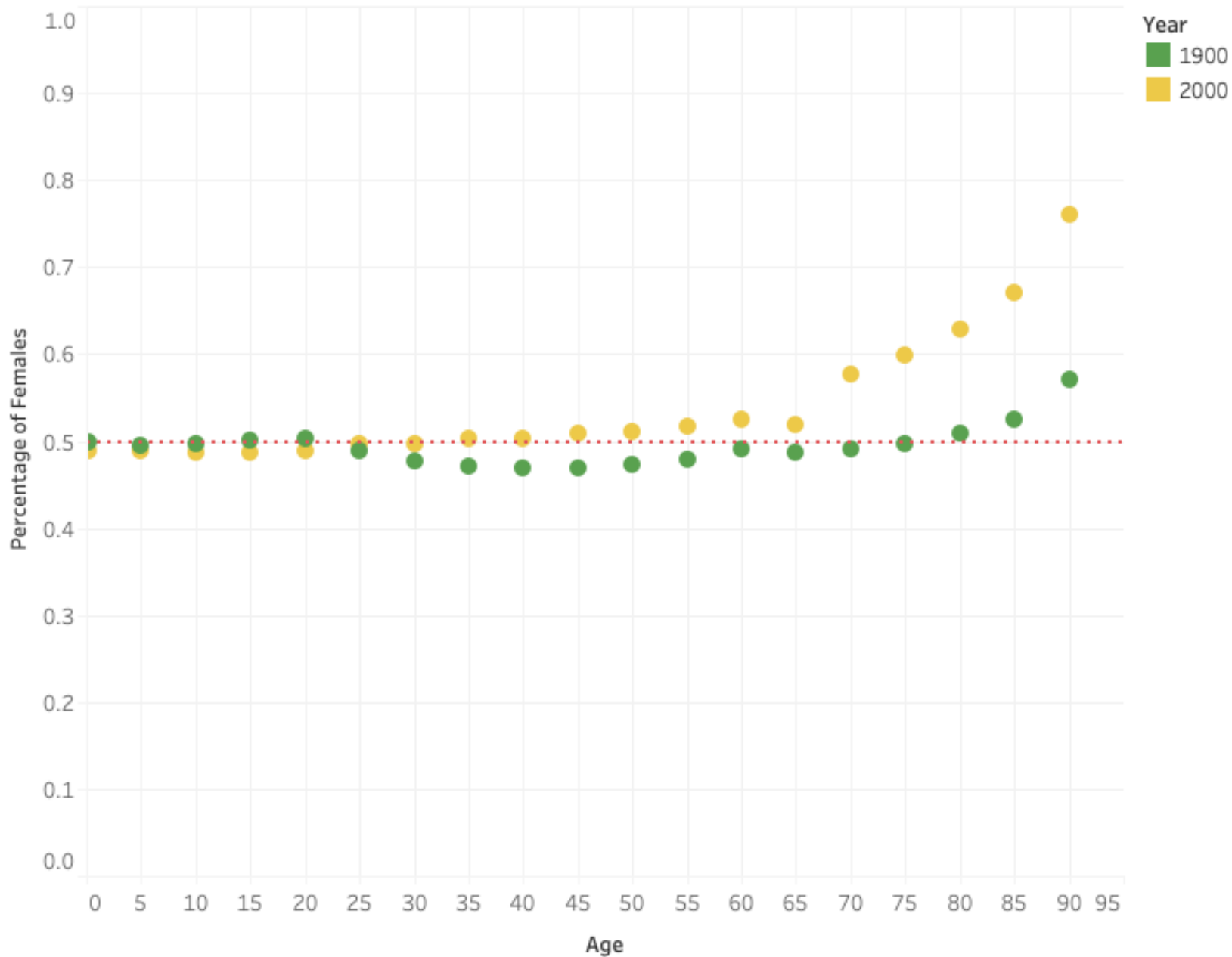
ATTR(Sex)

1 2

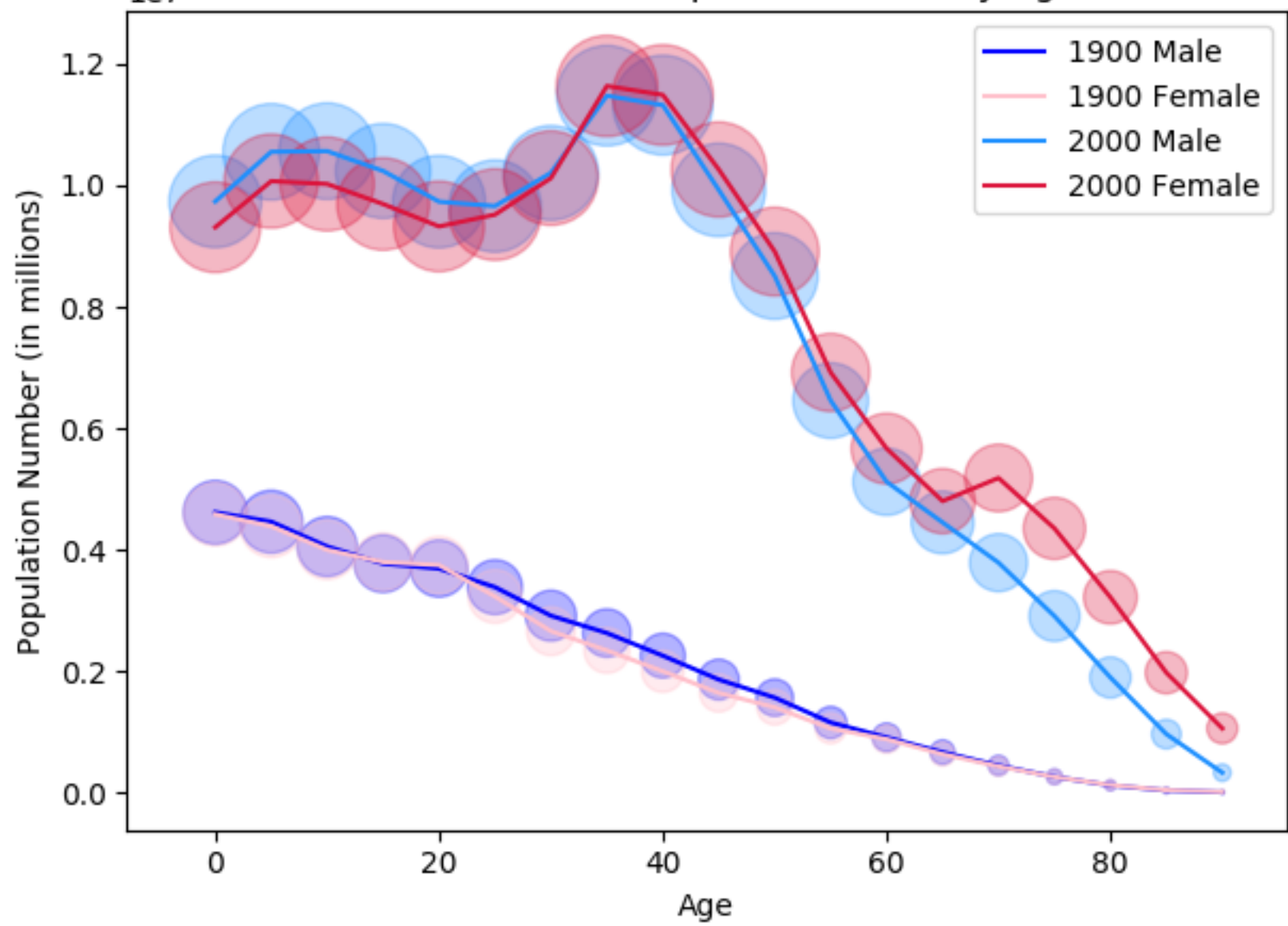
ATTR(Year)

- 1,900
- 2,000

# How does the gender distribution change in age groups within 1900 and 2000 census collections?

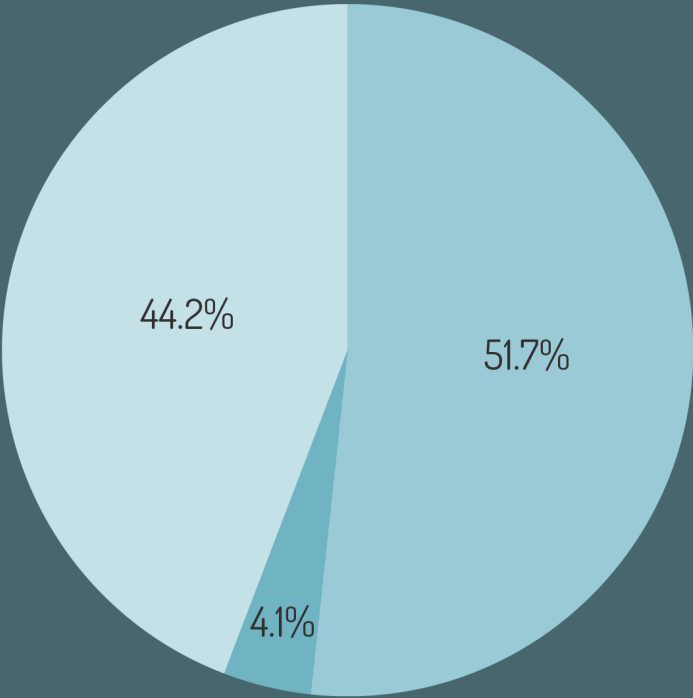


How does Male and Female Population Differ by Age and Year?

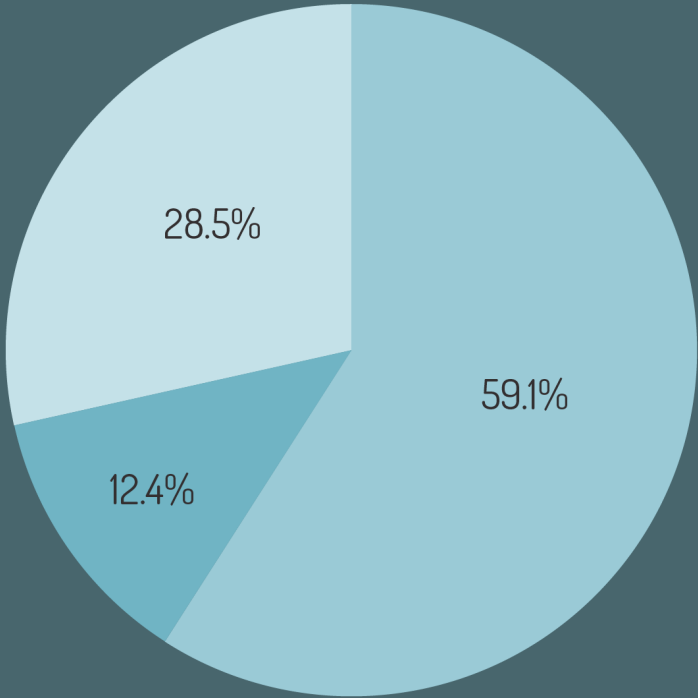


# Circular Charts

# Percentage of US Population by Age Group, 1900 vs 2000



1900



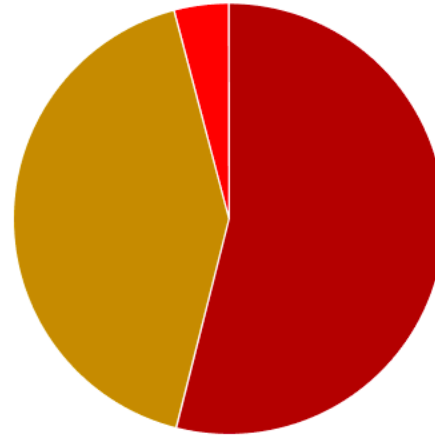
2000

### Age Groups

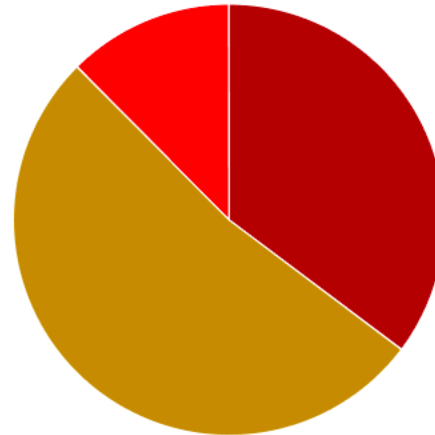
- 0-19
- 20-64
- 65-up




# Is the US population getting proportionately older?

US population in  
**1900**



US population in  
**2000**

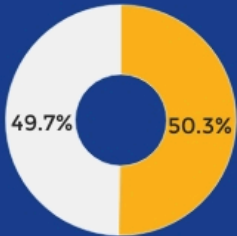
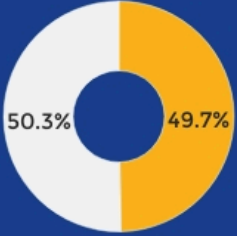
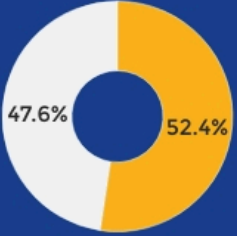
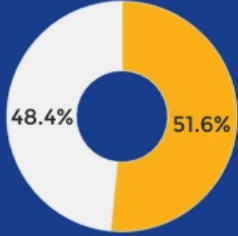
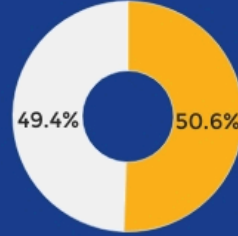
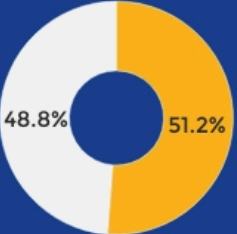
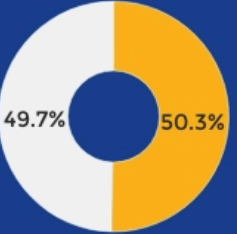
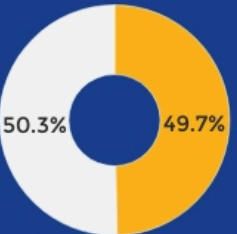
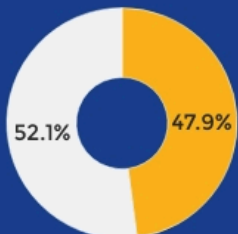
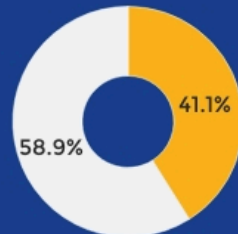


 under 25     age 25 - 44     over 65



# Change in Gender Distribution of US Population in 1900 Vs. 2000, by Age Group

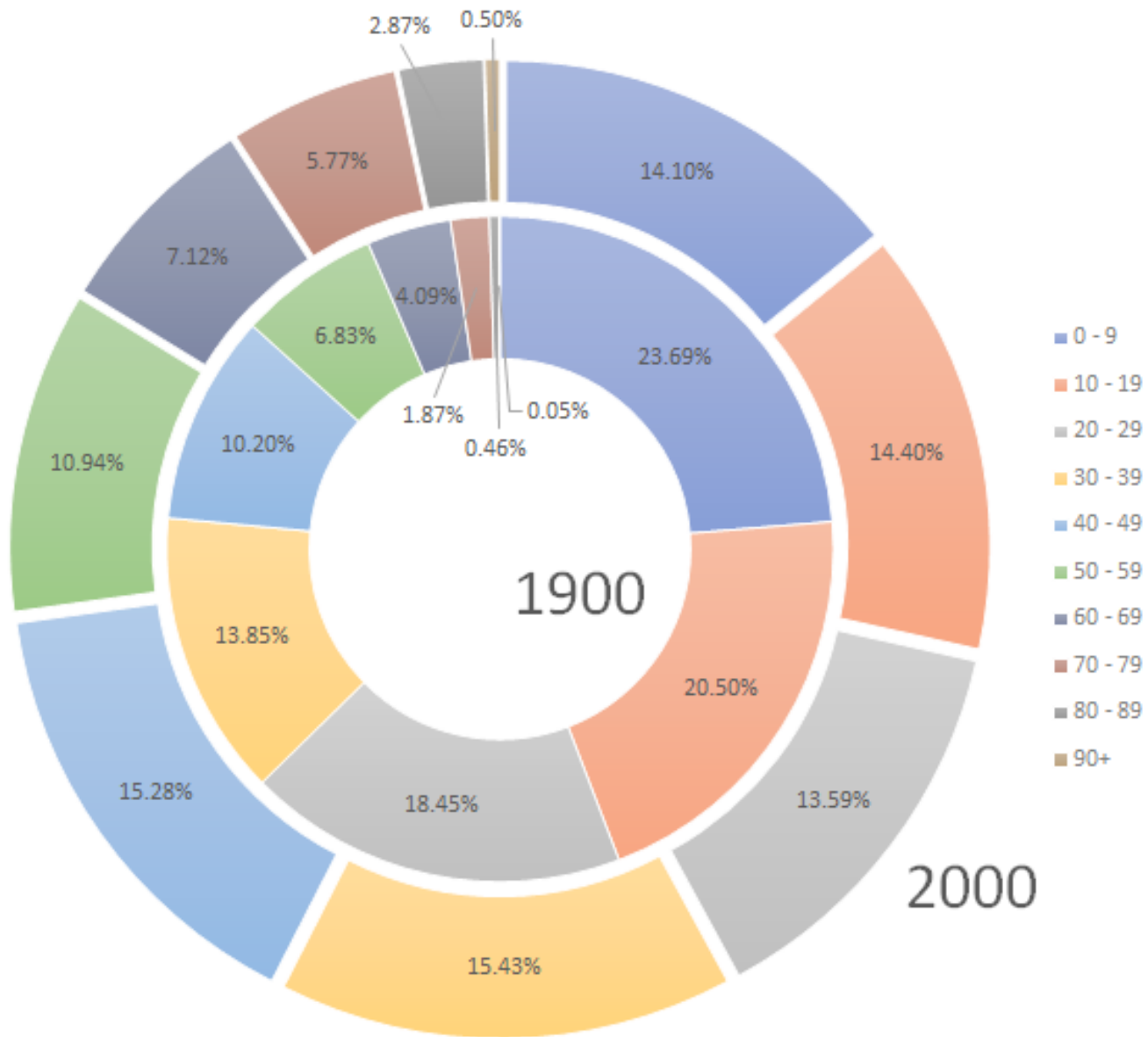


Year	Children (0 - 14 y.o.)	Early Working Age (15 - 24 y.o.)	Prime Working Age (25 - 54 y.o.)	Mature Working Age (55 - 64 y.o.)	Elderly (65+ y.o.)
1900	 <p>● Male 13,142,996 ● Female 12,981,428</p>	 <p>● Male 7,468,884 ● Female 7,552,804</p>	 <p>● Male 14,642,648 ● Female 13,313,960</p>	 <p>● Male 2,078,479 ● Female 1,952,140</p>	 <p>● Male 1,582,228 ● Female 1,547,254</p>
2000	 <p>● Male 30,850,759 ● Female 29,402,802</p>	 <p>● Male 13,142,996 ● Female 12,981,428</p>	 <p>● Male 61,093,746 ● Female 61,934,414</p>	 <p>● Male 11,582,481 ● Female 12,590,229</p>	 <p>● Male 14,367,721 ● Female 20,612,918</p>

\*numerical data is in number of people

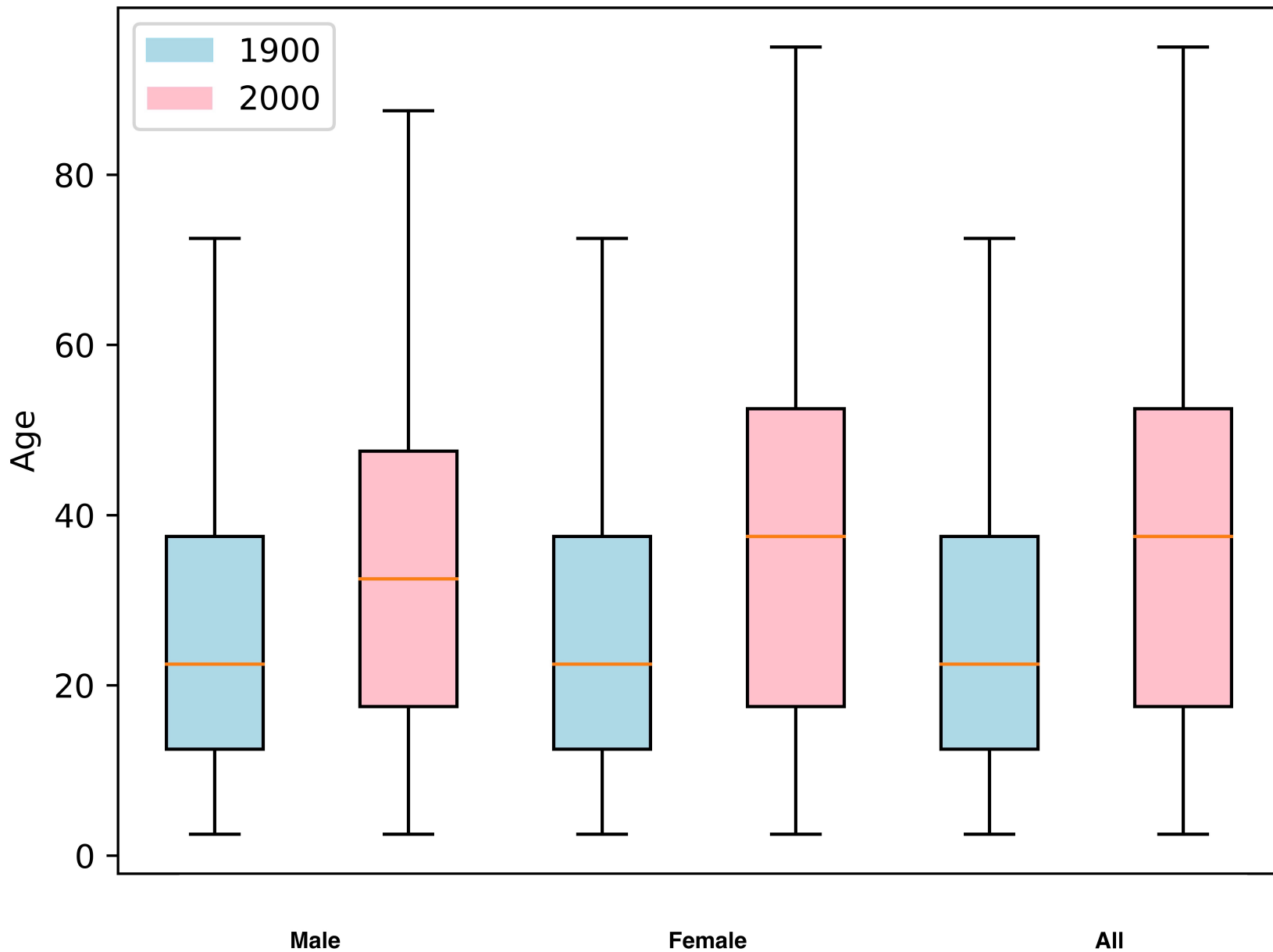


# Age Distribution between 1900 and 2000



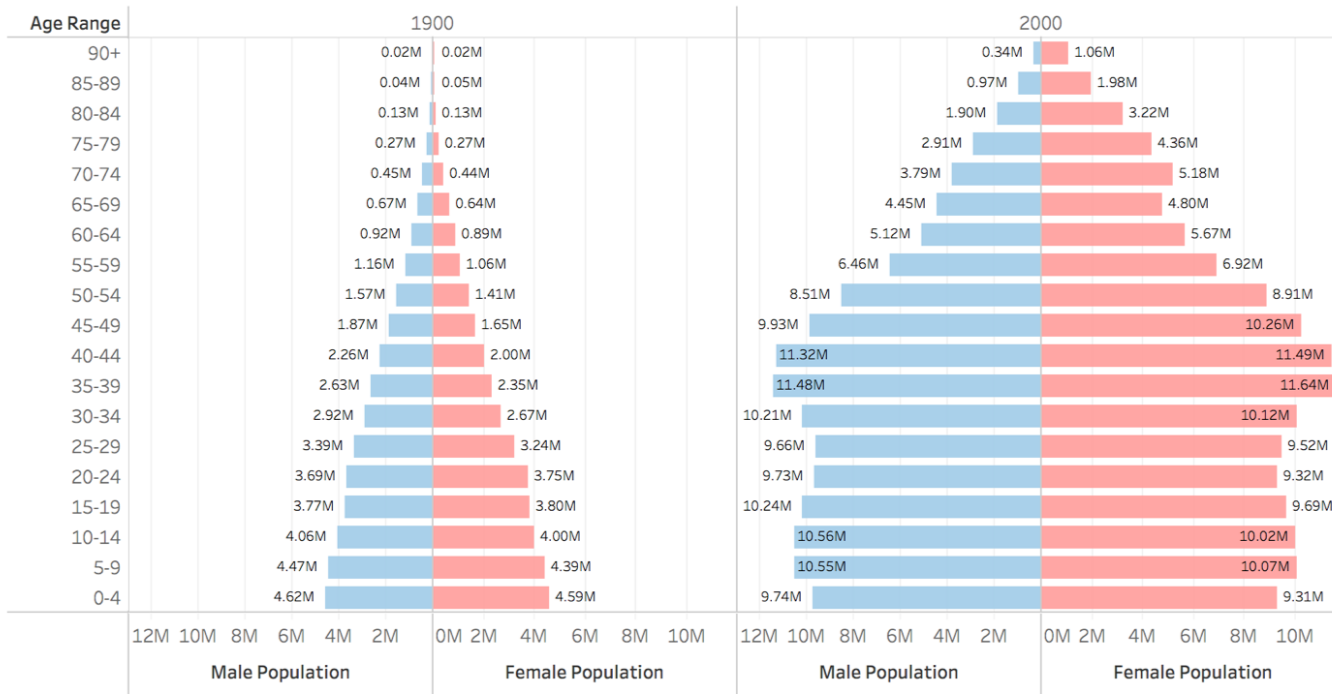
**Other!**

Population age distribution in 1900 and 2000



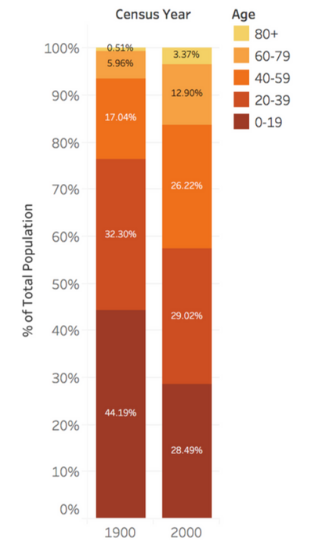
# How has the age distribution of the U.S. population changed from 1900 to 2000?

U.S. Population Distribution by Age & Gender: 1900 vs. 2000



Sum of Male Population and sum of Female Population for each Age Range broken down by Census Year.

Percent Distribution of the Total U.S. Population by Age: 1900 to 2000



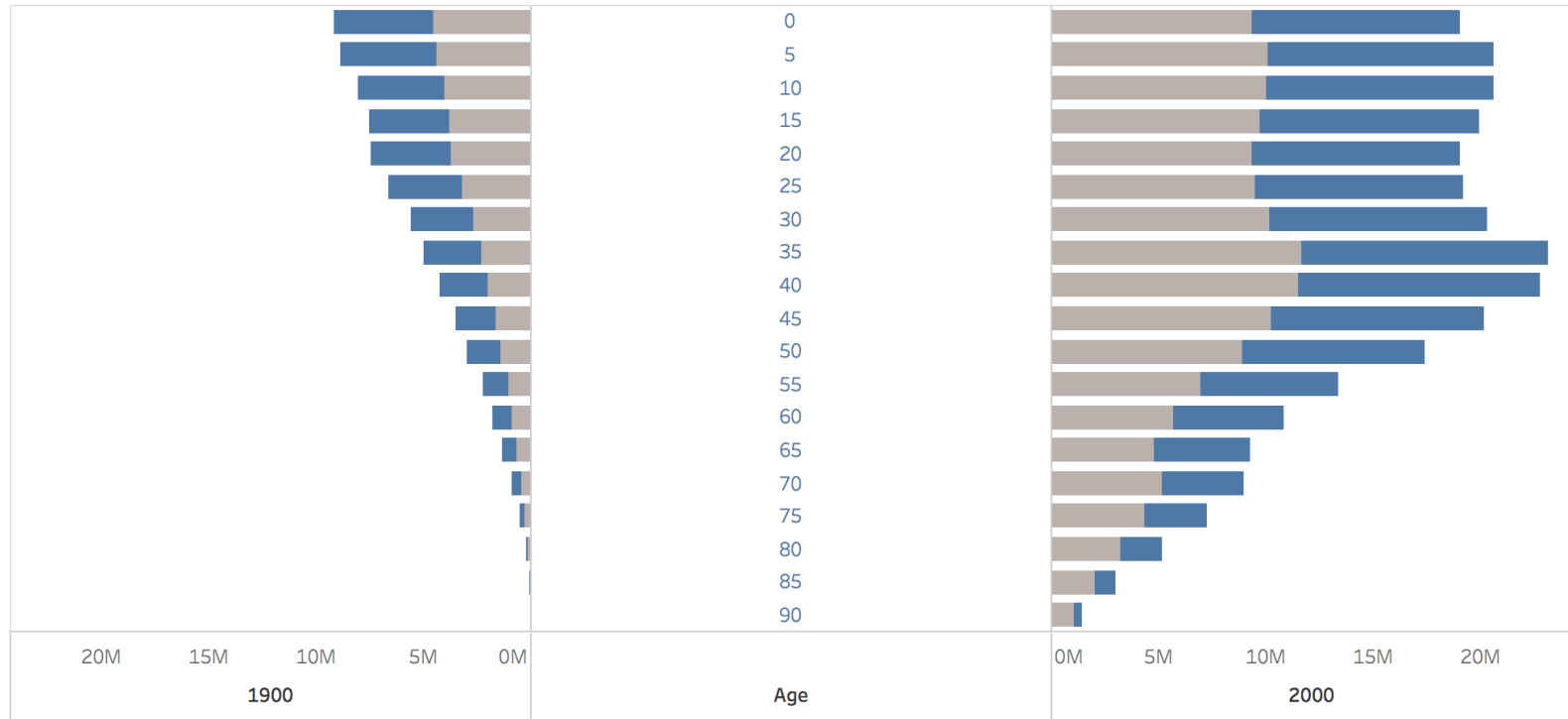
% of Total People for each Census Year. Color shows details about Age (bin).

# Simple Demographic Analysis Dashboard, 1900 vs. 2000

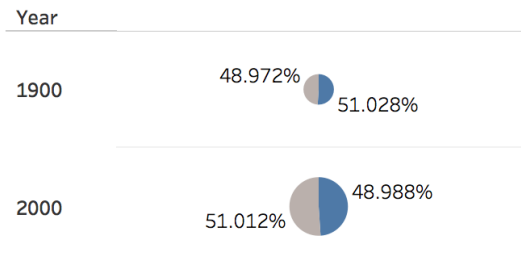
CSE 442 - WI 20 - Chenghao Zhu (Jessica) - chengz27

Sex  
■ Male  
■ Female

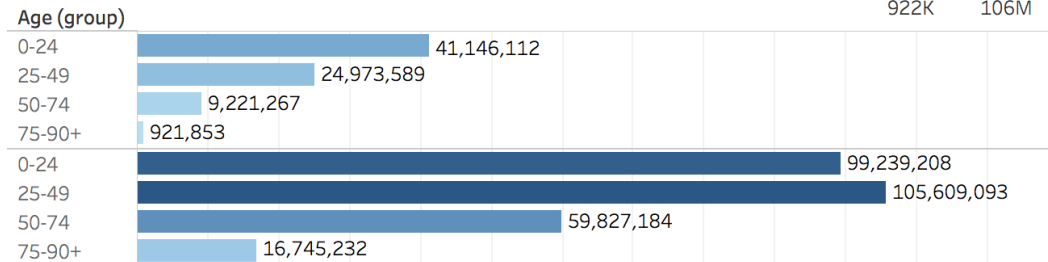
## Sex and Age Profiles of US Population



## Sex Ratio

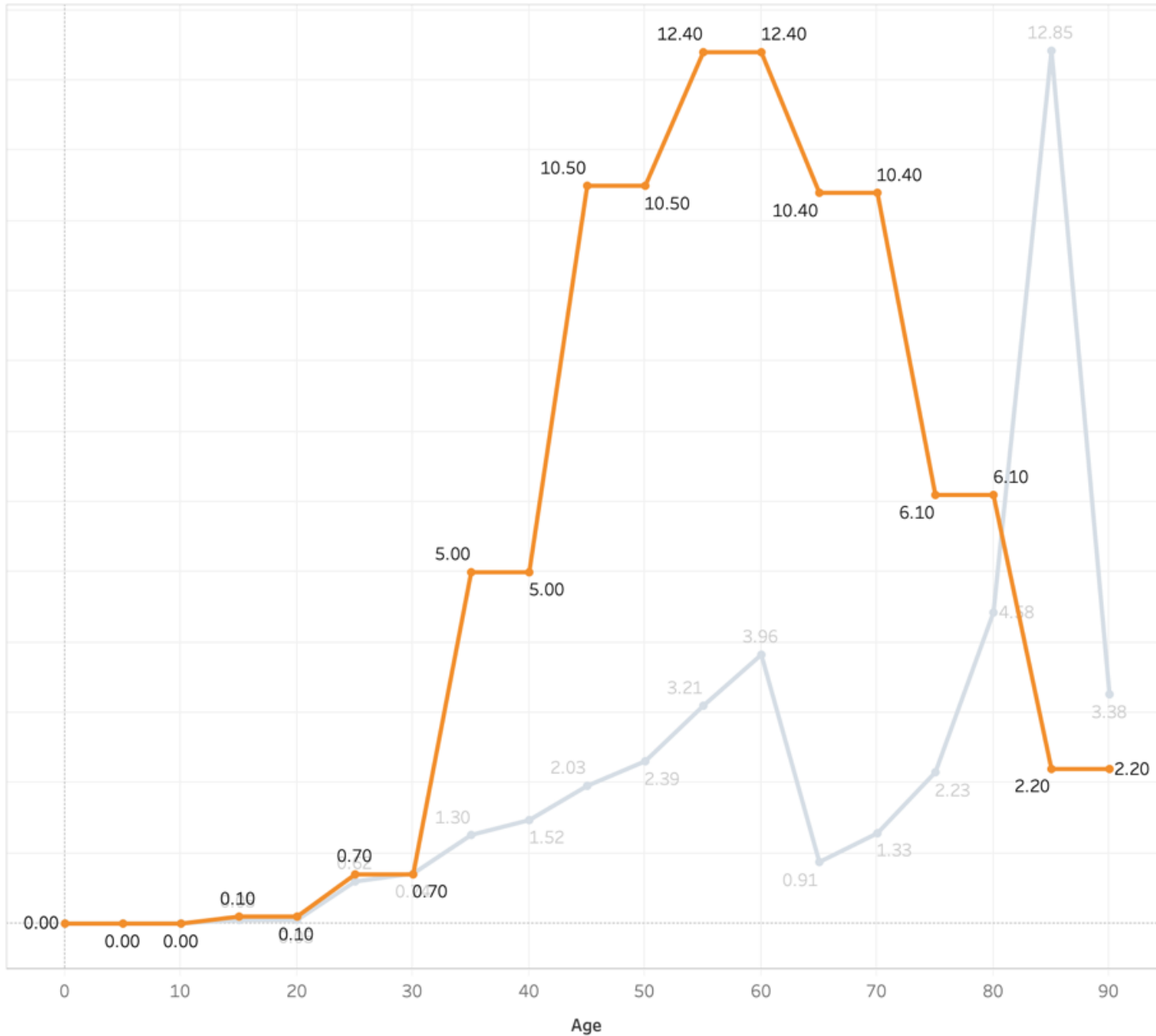


## Distribution by Age Group

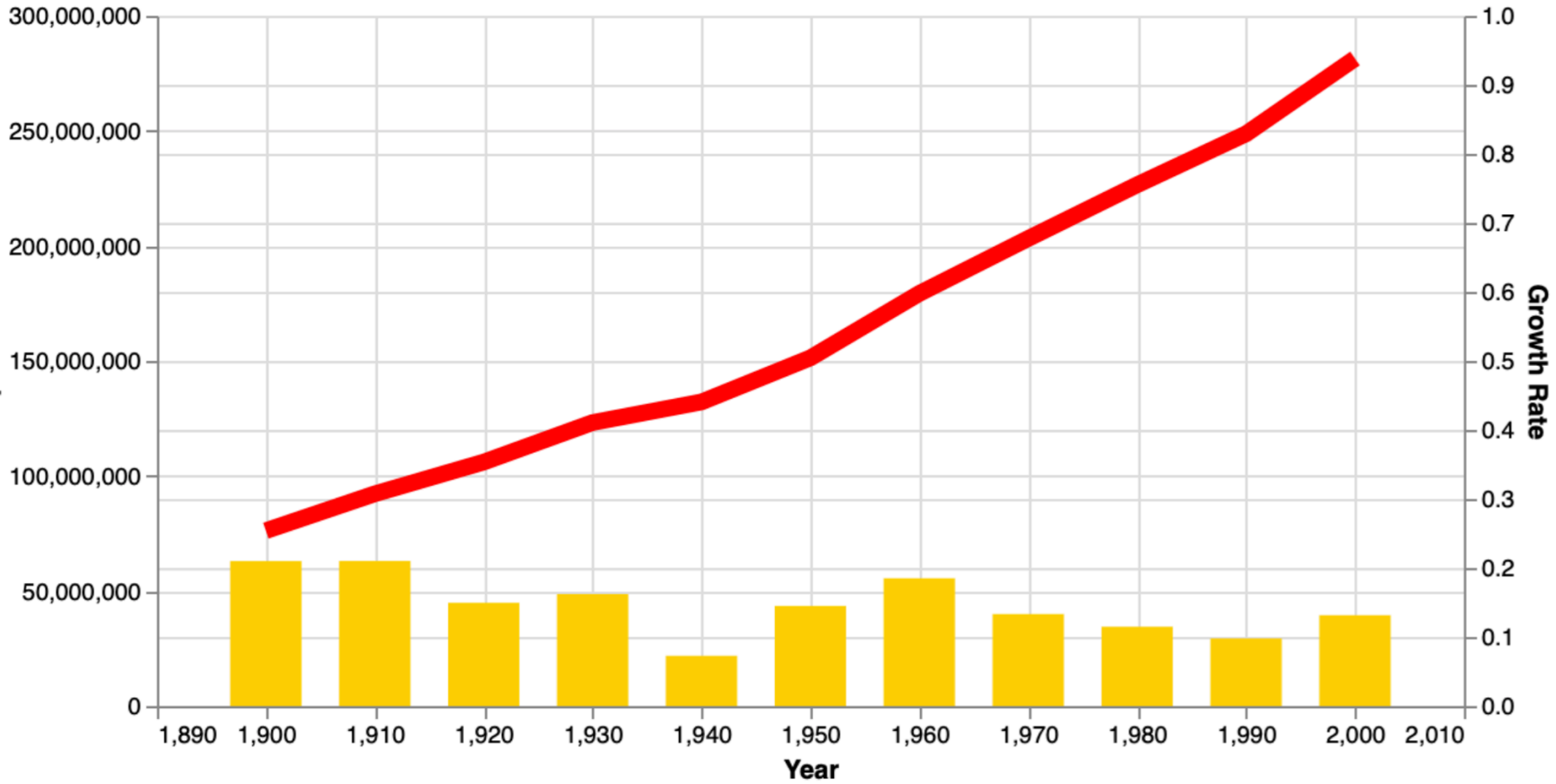


# Mortality Rates Related to Alcoholism in the United States (1900 vs. 2000)

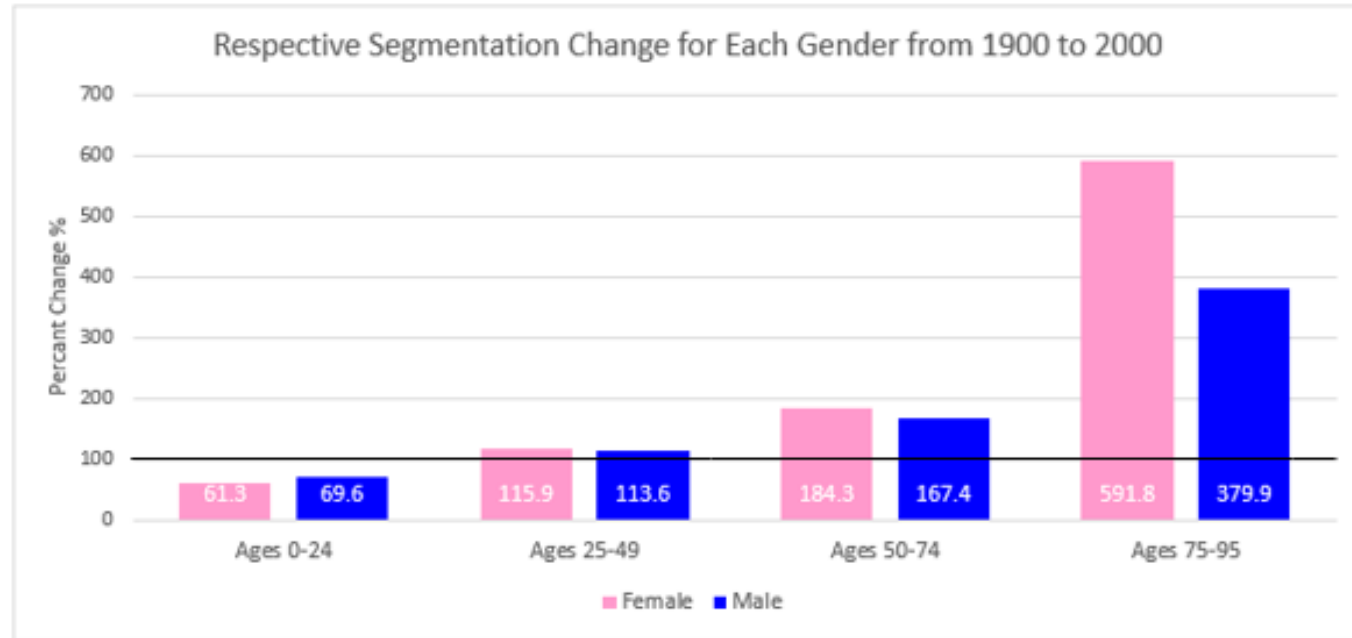
Legend  
■ Death Rate (1900)  
■ Death Rate (2000)



# Population Growth of US in a Century

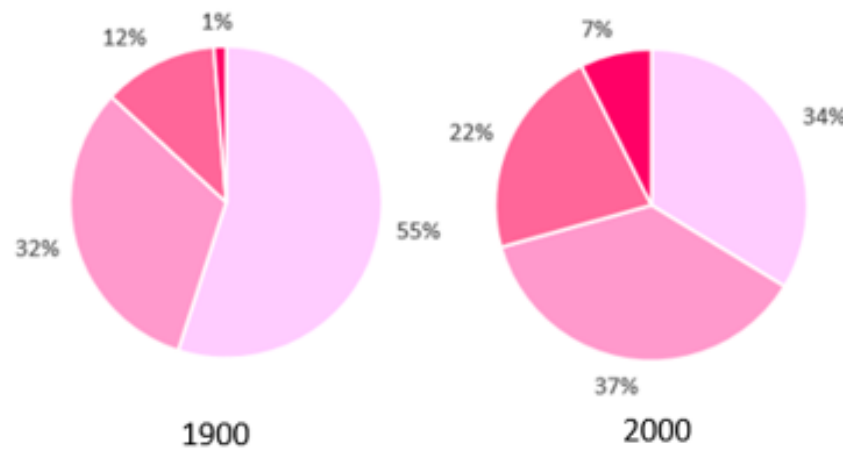


# How Has the Distribution of the Population Between Age Groups Changed from 1900 to 2000 For Each Gender?

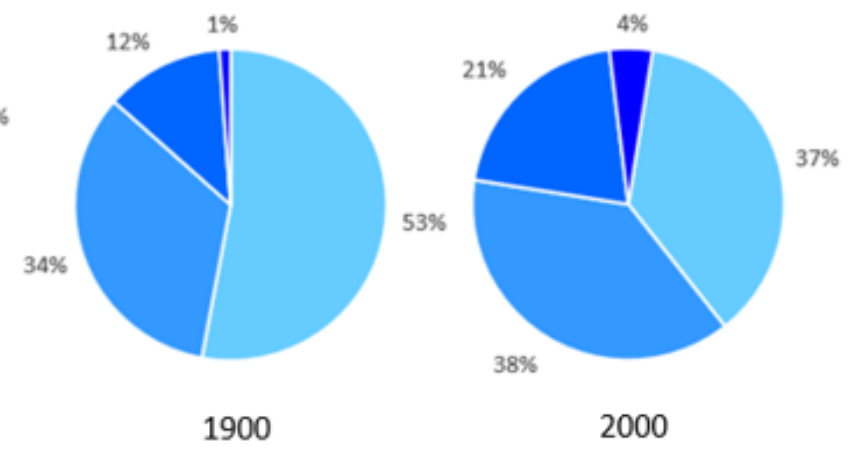


The black line represents where the segmentation would not have changed over the 100-year period

Female Population Segmentation by Age Group



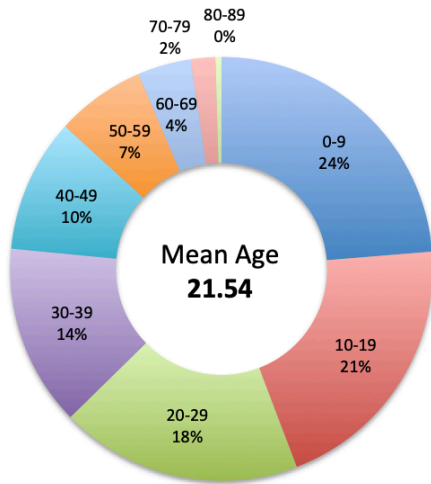
Male Population Segmentation by Age Group



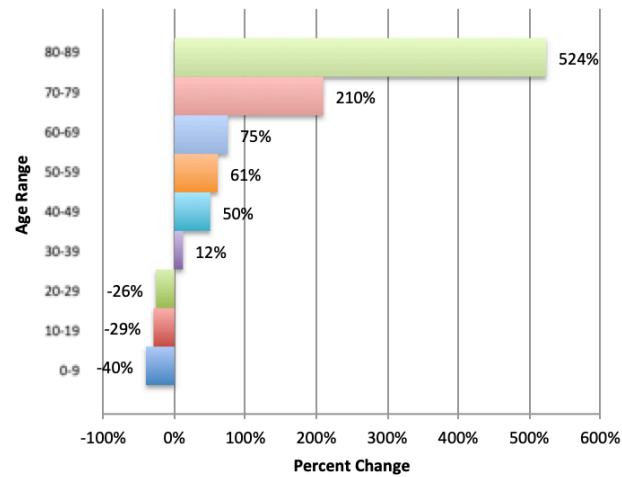
■ Ages 0-24  
 ■ Ages 25-49  
 ■ Ages 50-74  
 ■ Ages 75-95  
 ■ Ages 0-24  
 ■ Ages 25-49  
 ■ Ages 50-74  
 ■ Ages 75-95



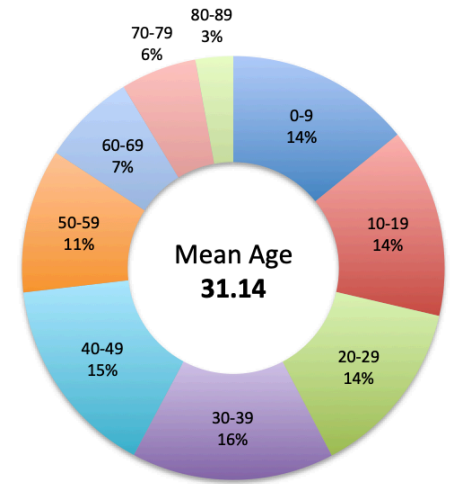
Age Demographic of the 1900 Census



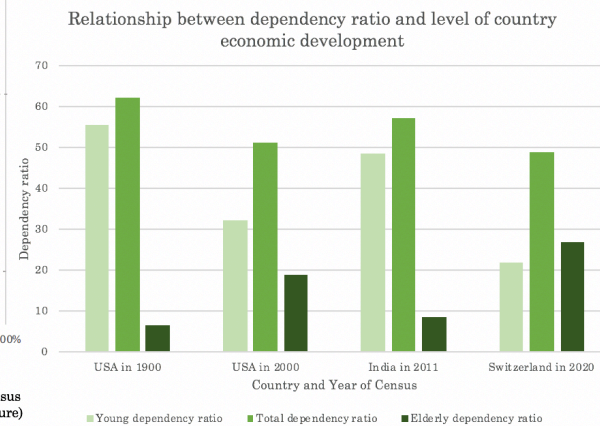
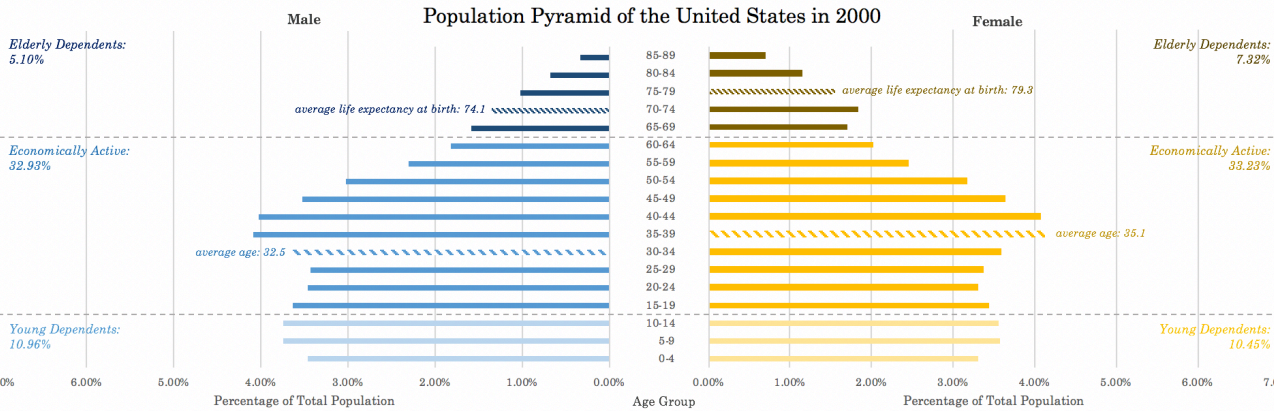
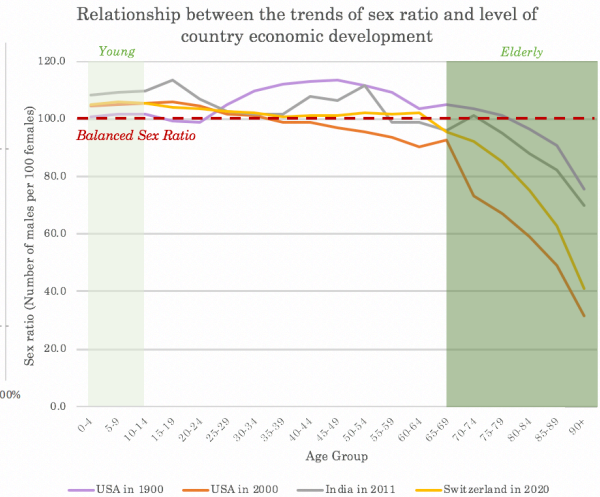
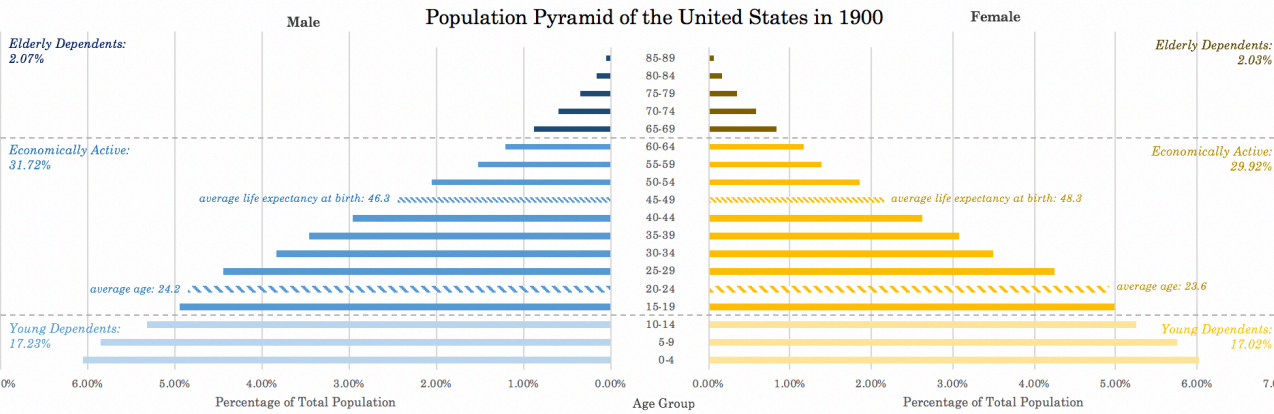
Percent Change of Age Demographic between the 1900 and 2000 Census



Age Demographic of the 2000 Census

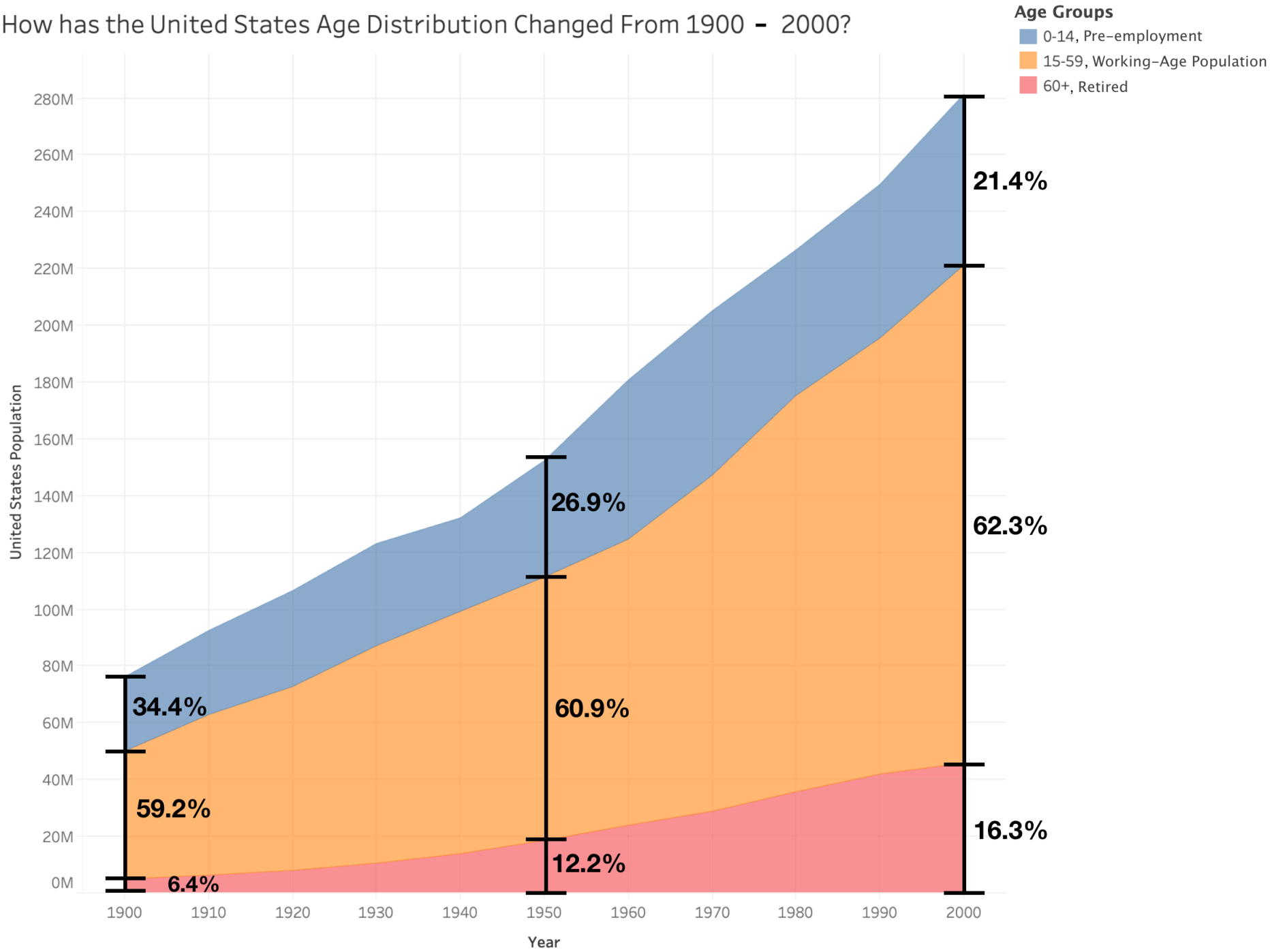


Questions: How have the US population demographics changed over a century? Is there any relationship in the trends of sex ratio and dependency ratio with the level of country economic development?



Data Sources:  
Age and Sex of the US Population from U.S. Census Bureau via IPUMS; Average life expectancy at birth (all races), United States (<https://www.cdc.gov/nchs/data/hus/2010/022.pdf>); India Age and Gender Census ([http://censusindia.gov.in/Census\\_And\\_You/age\\_structure\\_and\\_marital\\_status.aspx](http://censusindia.gov.in/Census_And_You/age_structure_and_marital_status.aspx)); Switzerland Age and Gender Census (<https://www.worldometers.info/demographics/switzerland-demographics/#age-structure>)

# How has the United States Age Distribution Changed From 1900 - 2000?



# Design Considerations

**Title, labels, legend, captions, source!**

## **Expressiveness and Effectiveness**

Avoid unexpressive marks (lines? gradients?)

Use perceptually effective encodings

Don't distract: faint gridlines, pastel highlights/fills

The "elimination diet" approach - start minimal

## **Support comparison and pattern perception**

Between elements, to a reference line, or to totals

Use human-friendly units (10M or 10,000,000?)

# Design Considerations

**Transform data** (e.g., invert, log, normalize)

**Group / sort** data by meaningful dimensions

**Reduce cognitive overhead**

Minimize visual search, minimize ambiguity

Appropriate size, aspect ratio, legible text

Avoid legend lookups if direct labeling works

Avoid color mappings with indiscernible colors

**Be consistent!** Visual inferences should consistently support data inferences.

**Remove**  
to improve  
(the **data-ink** ratio)

# Administrivia

# Updates

A2: Exploratory data analysis (Tue 1/28)

1. Choose dataset and identify questions of interest

2. Analysis

- Start by cleaning data...
- then get a broad overview. Sanity check the shape of things and look for any quality issues.
- Dive deeper to answer specific questions and explore interesting features as they come up.

Deliverable: A sequence of annotated visualizations that clearly communicate your findings.



# Re-Design Exercise

# Re-Design Exercise

## **Task: Analyze and Re-design visualization**

Identify data variables (N/O/Q) and encodings

Critique the design: what works, what doesn't

Sketch a re-design to improve communication

Be ready to share your thoughts with the class

Break into groups with those sitting near you

(~4 people per group)

# Effectiveness Rankings [Mackinlay 86]

## QUANTITATIVE

Position  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Density (Value)  
Color Sat  
Color Hue  
Texture  
Connection  
Containment  
Shape

## ORDINAL

Position  
Density (Value)  
Color Sat  
Color Hue  
Texture  
Connection  
Containment  
Length  
Angle  
Slope  
Area (Size)  
Volume  
Shape

## NOMINAL

Position  
Color Hue  
Texture  
Connection  
Containment  
Density (Value)  
Color Sat  
Shape  
Length  
Angle  
Slope  
Area  
Volume

## Teacher Salaries: Is It Really That Bad?

National and State averages for K-12 Public-School Teachers



### UNITED STATES

AVG. SALARY: \$47,674

Avg. vacation days: 63

#### HOURLY

Hours per week on-site: 36.5  
 Public-School Teacher: \$34.06  
 Private-School Teacher: \$21.08  
 Average Worker: \$25.08  
 Police: \$22.64  
 Fire: \$17.91



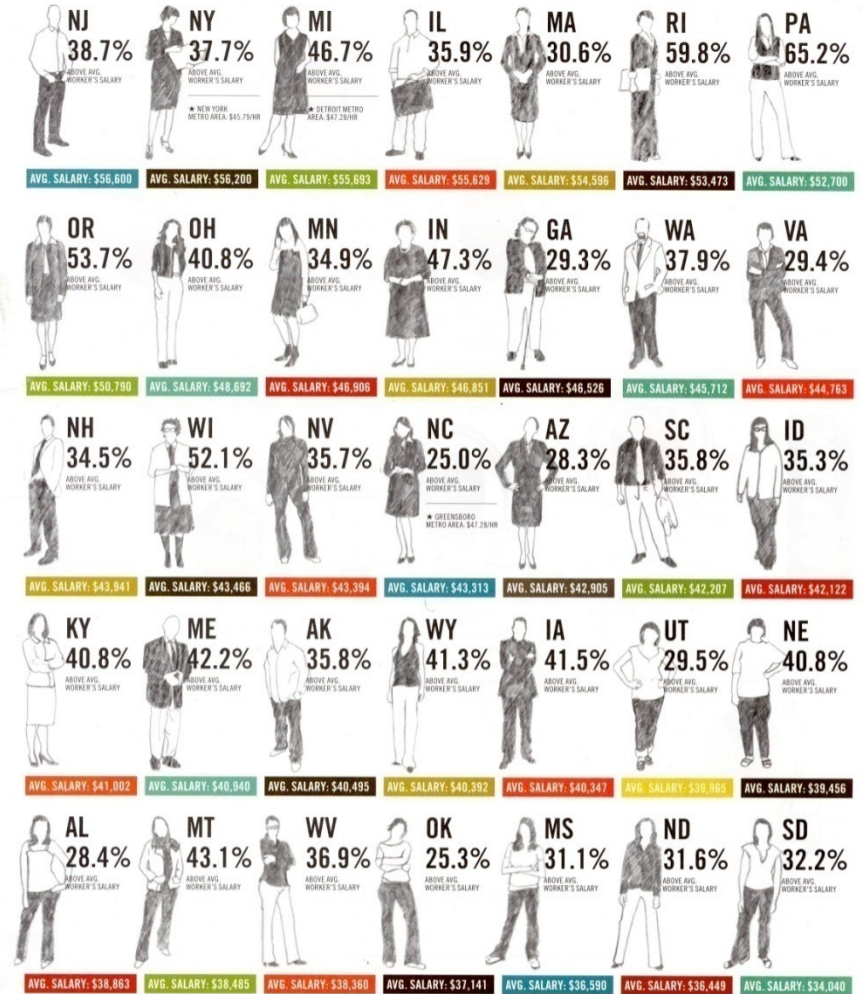
### CANADA

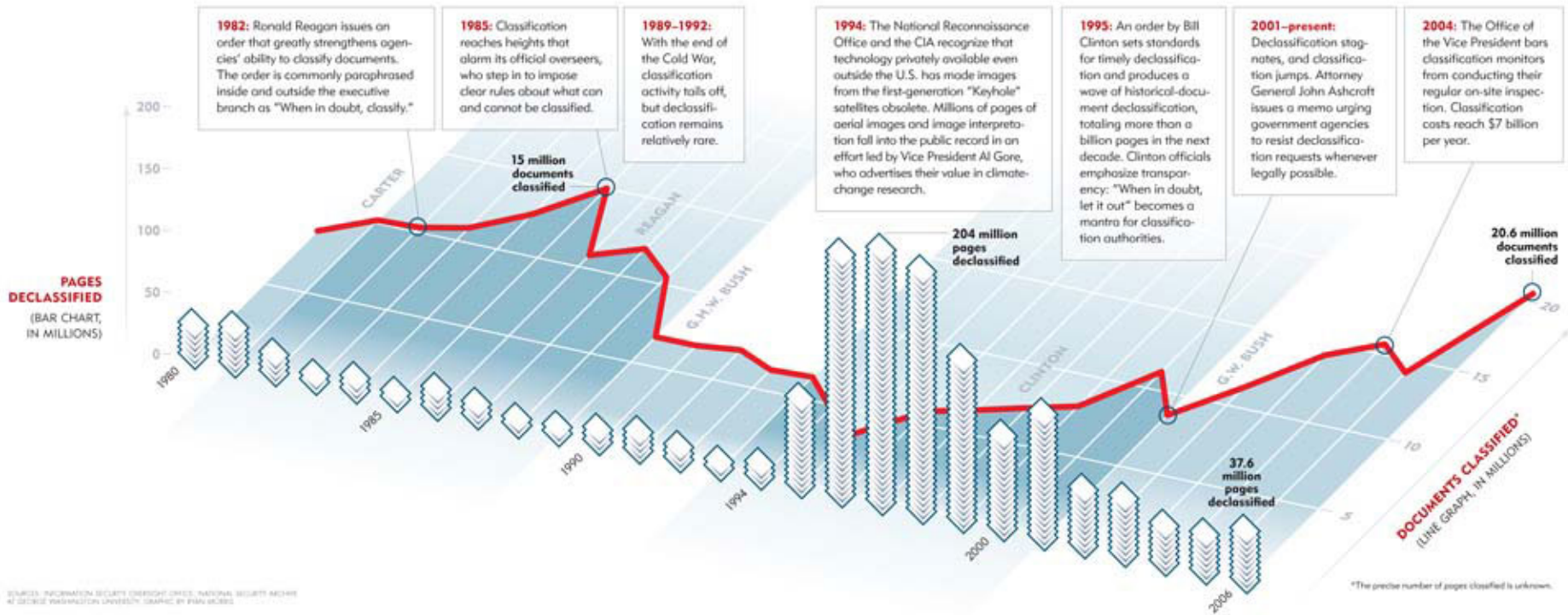
AVG. SALARY: \$43,000

Avg. vacation days: 50

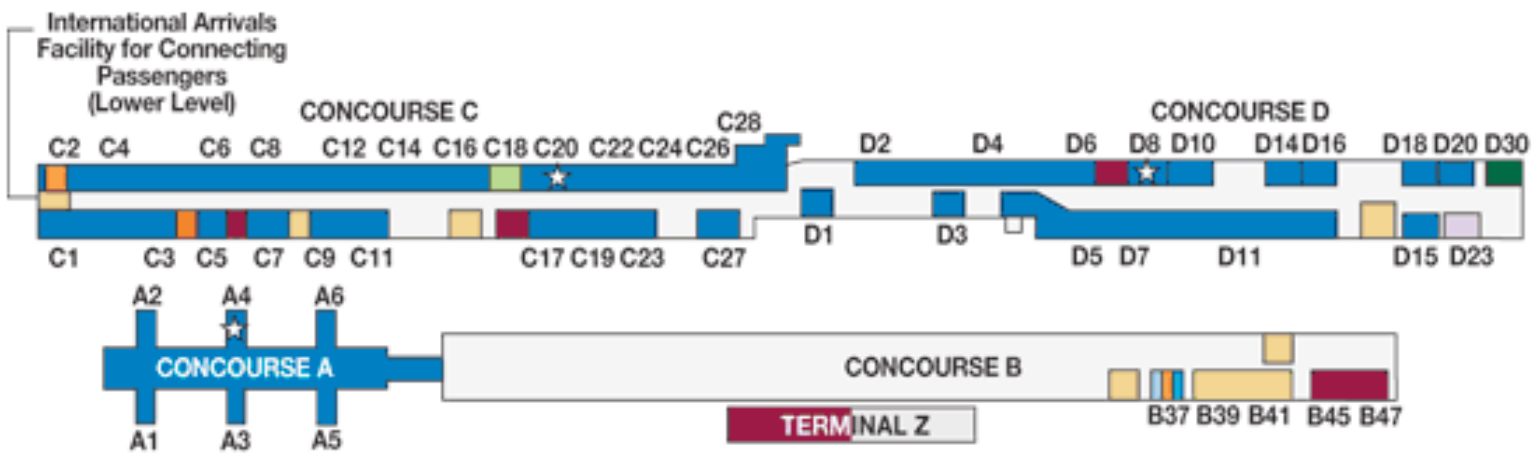
HOURLY: \$30.18

Hours per week on-site: 55.6





Source: *The Atlantic* 300 no. 2 (September 2007)  
 Number of Classified U.S. Documents



\* Terminals are connected by shuttles.

- |                                   |                            |                             |
|-----------------------------------|----------------------------|-----------------------------|
| United / TED Gate Area            | Lufthansa Check-in         | Austrian Airlines Gate Area |
| United Premier Check-in           | Air Canada Gate Area       | SAS Gate Area               |
| United Check-in                   | Air Canada Check-in        | BWIA Gate                   |
| United International Check-in     | Mobile Lounge Dock         | South African Airways       |
| United Red Carpet Club            | ANA Check-in               | US Airways Gates            |
| United First International Lounge | ANA Fuji Lounge/Gate Area  | United EasyCheck-in         |
| Lufthansa Gate Area               | Austrian Airlines Check-in | US Airways Check-in         |

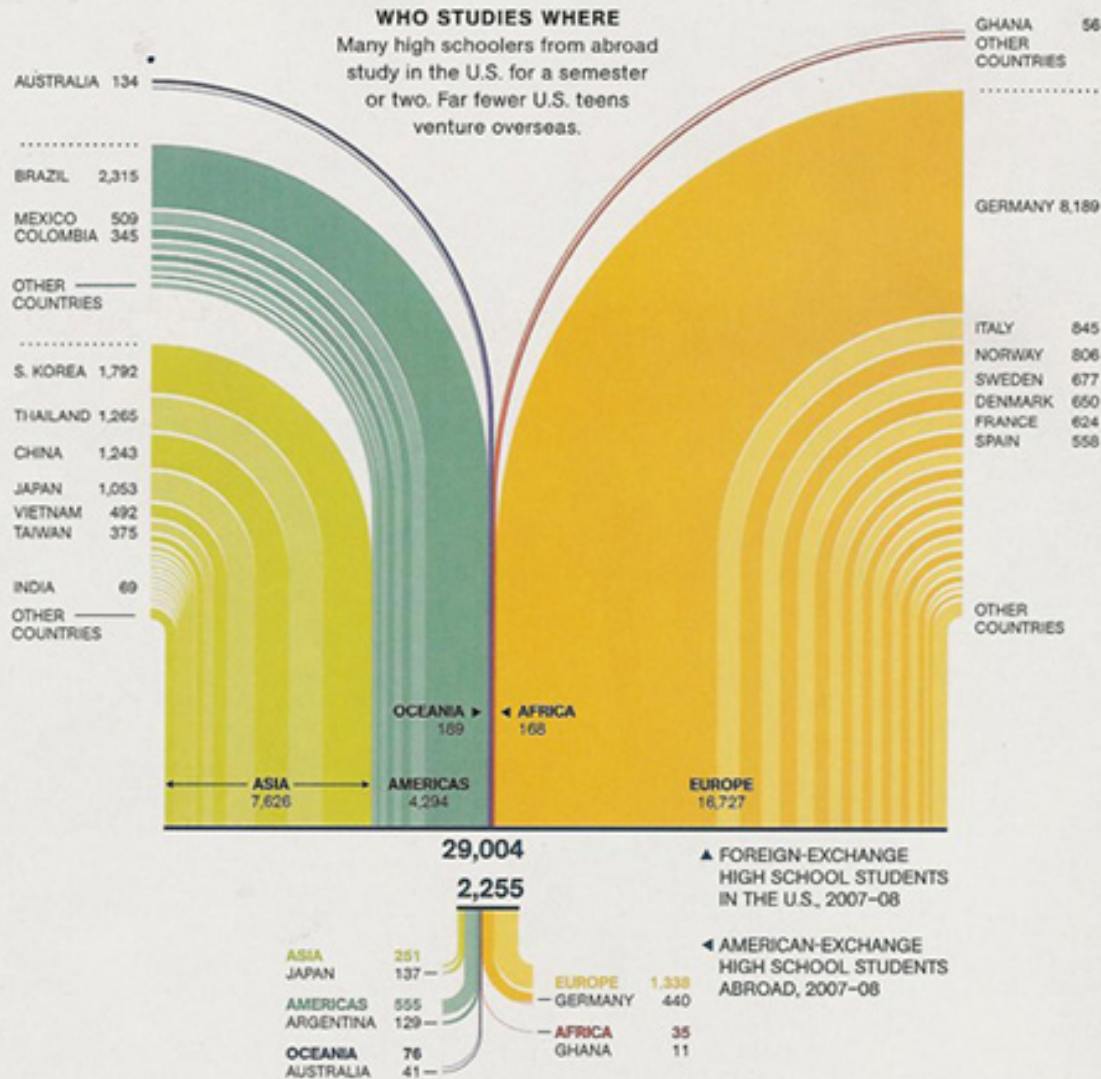
EasyCheck-in is available at this airport.



11 2006

Washington Dulles Airport Map

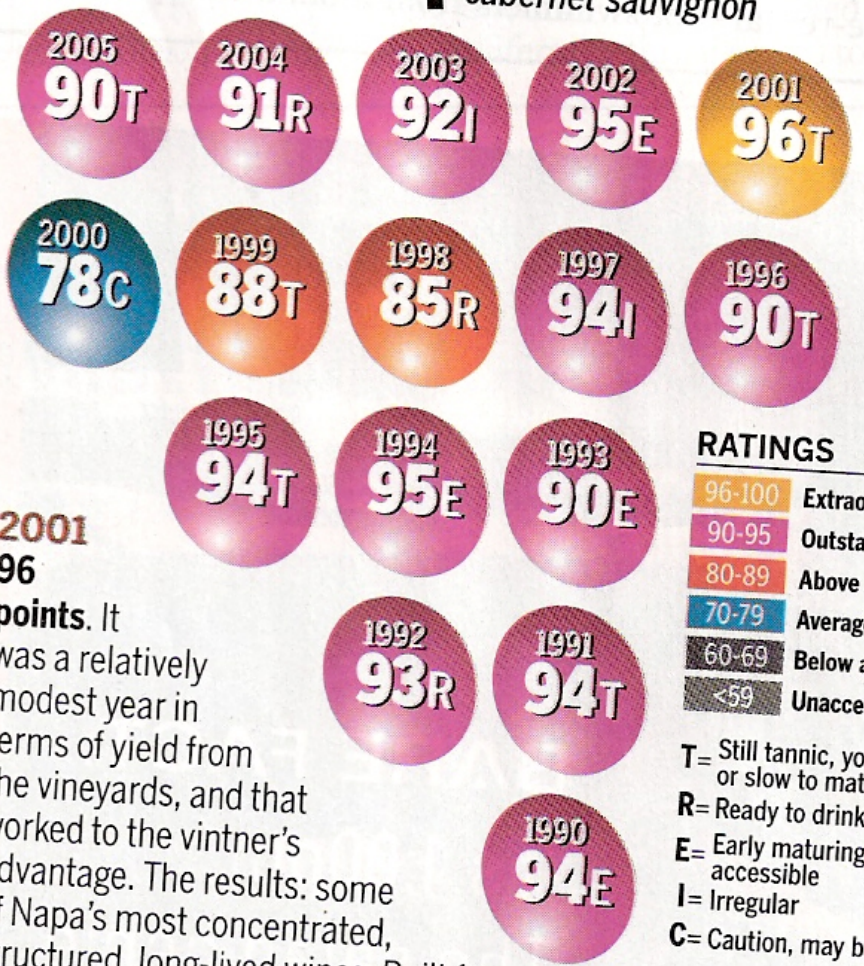
Source: United Airlines Hemispheres



Source: *National Geographic*, September, 2008, p. 22.  
 Silver, Mark. "High School Give-and-Take."

# IT WAS A VERY GOOD YEAR?

Robert Parker's ratings for vintages of Napa Valley cabernet sauvignon



**2001**  
**96**  
points. It was a relatively modest year in terms of yield from the vineyards, and that worked to the vintner's advantage. The results: some of Napa's most concentrated, structured, long-lived wines. Built for aging, they are rich, densely colored, fruity and

**RATINGS**

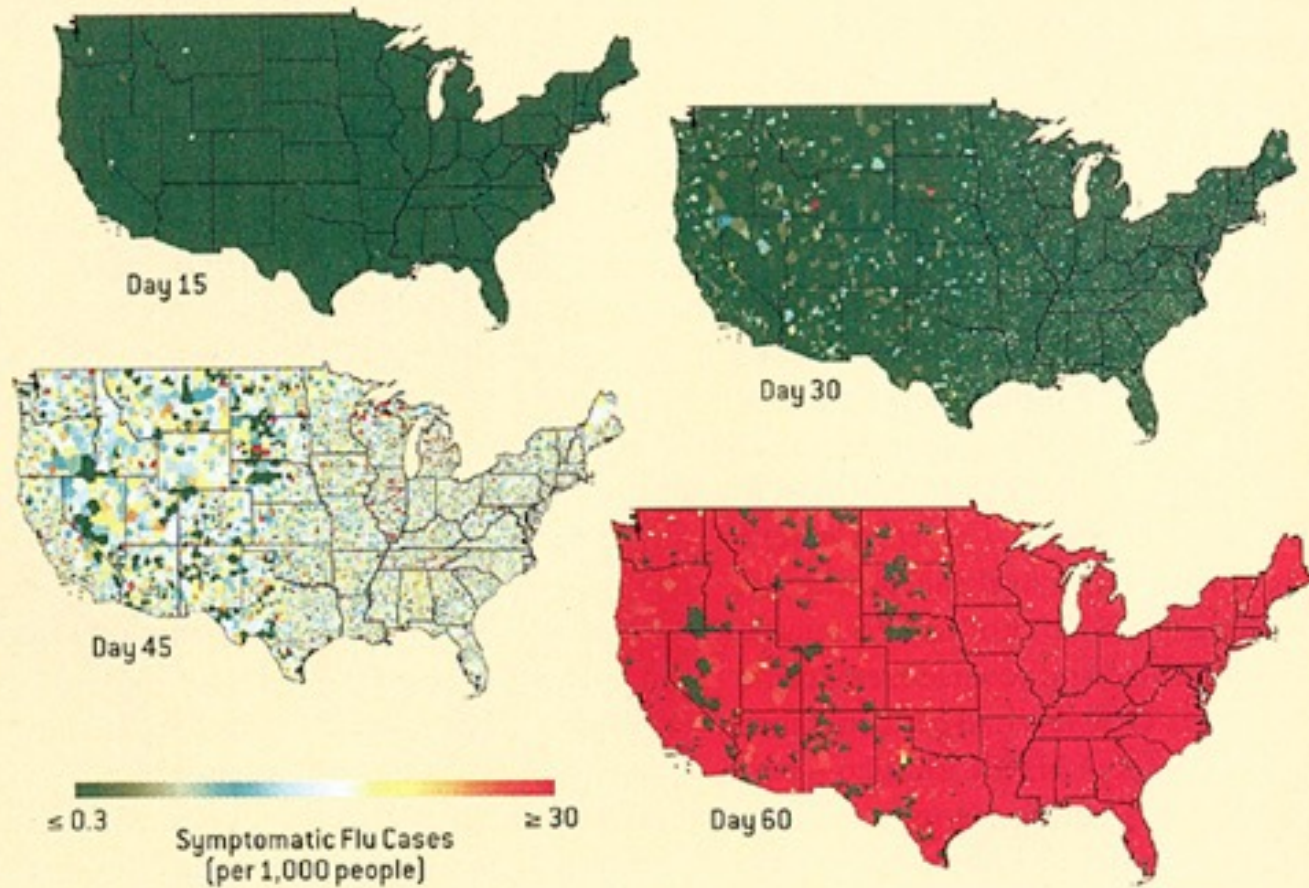
96-100	Extraordinary
90-95	Outstanding
80-89	Above average
70-79	Average
60-69	Below average
<59	Unacceptable

T= Still tannic, youthful, or slow to mature  
 R= Ready to drink  
 E= Early maturing and accessible  
 I= Irregular  
 C= Caution, may be too old



# Pandemic Flu Hits the U.S.

A simulation created by researchers from Los Alamos National Laboratory and Emory University shows the first wave of a pandemic spreading rapidly with no vaccine or antiviral drugs employed to slow it down. Colors represent the number of symptomatic flu cases per 1,000 people (see scale). Starting with 40 infected people on the first day, nationwide cases peak around day 60, and the wave subsides after four months with 33 percent of the population having become sick. The scientists are also modeling potential interventions with drugs and vaccines to learn if travel restrictions, quarantines and other disruptive disease-control strategies could be avoided.



Preparing for a Pandemic

Source: *Scientific American*, 293(5). November, 2005, p. 50

