CSE 512 - Data Visualization

Design & Re-Design

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Last Time:
Data & Image Models
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?

<table>
<thead>
<tr>
<th>Position</th>
<th>Size</th>
<th>Value</th>
<th>Texture</th>
<th>Color</th>
<th>Orientation</th>
<th>Shape</th>
<th>Others?</th>
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</table>

Diagram: Visual Encoding Variables

- Points
- Lines
- Zones
Bertin’s “Levels of Organization”

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>O</th>
<th>Q</th>
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<tr>
<td>Shape</td>
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</tbody>
</table>

Nominal, Ordinal, Quantitative

Note: Q ⊂ O ⊂ N
Choosing Visual Encodings

Assume $k$ visual encodings and $n$ data attributes. We would like to pick the “best” encoding among a combinatorial set of possibilities of size $(n+1)^k$.

**Principle of Consistency**
The properties of the image (visual variables) should match the properties of the data.

**Principle of Importance Ordering**
Encode the most important information in the most effective way.
Design Criteria [Mackinlay 86]

Expressiveness
A set of facts is expressible in a visual language if the sentences (i.e. the visualizations) in the language express all the facts in the set of data, and only the facts in the data.

Effectiveness
A visualization is more effective than another visualization if the information conveyed by one visualization is more readily perceived than the information in the other visualization.
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

### 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

[Mackinlay 86]
## Effectiveness Rankings

[Mackinlay 86]

<table>
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<tr>
<th>QUANTITATIVE</th>
<th>ORDINAL</th>
<th>NOMINAL</th>
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<td>Length</td>
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<td>Angle</td>
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<td>Area (Size)</td>
<td>Texture</td>
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<td>Volume</td>
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<td>Density (Value)</td>
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<td>Slope</td>
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<td>Containment</td>
<td>Volume</td>
<td>Area</td>
</tr>
<tr>
<td>Shape</td>
<td>Shape</td>
<td>Volume</td>
</tr>
</tbody>
</table>
## Effectiveness Rankings

**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

[Source: Mackinlay 86]
A1 Submission Designs

Measures: Population count, Age distribution, Gender ratio, Gender difference, Growth rate

Transforms: Percentages, Counts, Proportions

Encodings: Bar, Line/Area, Pie, Dot/Scatter, Hybrid

Bars: Stacked, Grouped, Opposed Axes

Extra Context: More Years, Mortality, Race, …
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
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.
A1 Submissions
Bar Charts
Was the Population of the United States Older in 2000 Than It Was in 1900?
How did the age distribution of the US population change from 1900 to 2000?
How has the distribution of age changed in the United States over the past century?
How have population age distributions changed between 1900 and 2000?
What is the difference in the number of people in the year 1900 and 2000 at different age groups?

Color Representations

- Blue: The number of people in the year 2000 more than in 1900.
- Orange: The number of people in the year 1900.
What is the change in population distribution by age from 1900 to 2000?
What is the difference of population in each age group between 1900 and 2000

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

Population(10^6)

Age group

0  5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90

0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18

The chart shows the population difference in each age group from 1900 to 2000, categorized by gender.
How is the US population distributed by age groups in 1900 vs. 2000?
Who made it to retirement in 2000?

There were 20.6 million women and 14.4 million men aged 65+ in 2000.
The Aging Population

Percentage change in the makeup of the US population, 1900-2000.

In 1900, 45-49 year olds made up only 4.6% of the US population, but by 2000 they made up 7.2%.

There are relatively fewer young people in the US in 2000 than there were in 1900. Under 35s made up 70% of the population in 1900 but only 49% by 2000!
Stacked Bars
How have the demographics of male and females changed from 1900 to 2000?

**Age (Binned)**

<table>
<thead>
<tr>
<th>Age Range</th>
<th>1900</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - 40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 - 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 - 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 - 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sex**

- Male
- Female

**Sum of People**

- 1900: [Graph showing the sum of people by age and sex for 1900]
- 2000: [Graph showing the sum of people by age and sex for 2000]
What is the gender distribution over age groups in 1900 and 2000?

**1900**

- **Before Youth (age: 0-15)**: Female 50.31%, Male 49.69%
- **Youth (age: 16-25)**: Female 49.72%, Male 50.28%
- **Adulthood (age: 26-40)**: Female 52.02%, Male 47.98%
- **Middle Age (age: 41-60)**: Female 52.82%, Male 47.18%
- **Old Age (age: 61+)**: Female 58.65%, Male 41.35%

**2000**

- **Before Youth (age: 0-15)**: Female 48.80%, Male 51.20%
- **Youth (age: 16-25)**: Female 48.78%, Male 51.22%
- **Adulthood (age: 26-40)**: Female 49.95%, Male 50.05%
- **Middle Age (age: 41-60)**: Female 50.93%, Male 49.07%
- **Old Age (age: 61+)**: Female 57.42%, Male 42.58%

**All Age (%)**

- Female: 51.03%
- Male: 48.97%

**All Age (%)**

- Female: 51.01%
- Male: 48.99%
Is gender ratio balanced across different years and ages?

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>Male 100%</td>
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<tr>
<td></td>
<td>15</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>Male 100%</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>Male 100%</td>
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</table>

- **Male**
- **Female**
How does the age distribution of U.S. population change from 1900 to 2000?

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>1900</th>
<th>2000</th>
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<tbody>
<tr>
<td>0-9</td>
<td>24%</td>
<td>14%</td>
</tr>
<tr>
<td>10-19</td>
<td>21%</td>
<td>14.5%</td>
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<tr>
<td>20-29</td>
<td>18%</td>
<td>14%</td>
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<tr>
<td>30-39</td>
<td>14%</td>
<td>15.5%</td>
</tr>
<tr>
<td>40-49</td>
<td>11%</td>
<td>15%</td>
</tr>
<tr>
<td>50-59</td>
<td>7%</td>
<td>11%</td>
</tr>
<tr>
<td>60+</td>
<td>5%</td>
<td>16%</td>
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</table>
How does the racial composition of the US change between 1900 and 2000?
The 3rd Dimension
How Did the U.S. Age Distribution Change from 1900 to 2000?

![3D Bar Chart showing age distribution changes from 1900 to 2000](image.png)

- **Year** (1900, 1920, 1940, 1960, 1980, 2000)
- **Age Group** (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100)
- **Proportion of Population**

The chart highlights the Baby Boomers generation.
Simplify!
Population Ageing

<table>
<thead>
<tr>
<th>Year</th>
<th>Population Ratio</th>
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<tr>
<td>1900</td>
<td>95.89%</td>
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<tr>
<td>2000</td>
<td>87.56%</td>
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</table>

- Green: aged under 65
- Yellow: aged 65 and over
How have populations of males and females changed with respect to each other over 100 years?

- Male:
  - 1900: 0
  - 2000: 2 (200% increase)

- Female:
  - 1900: 0
  - 2000: 4 (200% increase)
How does the burden of care per adult compare between 1900 and 2000?

1900:
- .85 Children
- .07 Seniors

2000:
- .48 Children
- .21 Seniors
Population Pyramids
How U.S. population's construction changed between 1900 and 2000
How has the distribution of the US population changed between 1900 and 2000?
US Population from 1900 to 2000
A changing population profile

Female Male
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85-89
90+

11,635,647 1,411,981 1,571,038 11,475,182

golden and teal: 2000 population
orange and blue: 1900 population
Scaled by max value in 2000 population
Population Structure Change from 1900 to 2000

Age
90  85  80  75  70  65  60  55  50  45  40  35  30  25  20  15  10  5  0

Male2000
Female2000
Male1900
Female1900
How did the population distribution of the United States change between 1900 and 2000?

Source: U.S. Census Bureau via IPUMS
What will the US population look like in 2050?
The Impact of Baby Boomers on American demographics

People born during the U.S. Baby Boom
How did U.S. population change in terms of sex and age groups during the 20th century?

U.S. Population Pyramid in 1900

- Male: Total: 38,915,235 (51.03%)
- Female: Total: 37,347,586 (48.97%)

U.S. Population Pyramid in 2000

- Male: Total: 137,863,441 (48.99%)
- Female: Total: 143,557,276 (51.01%)

U.S. Population growth trends by sex in different age groups during the 20th century
From 1900 to 2000, is the U.S. getting older?
How has the number of women compared to the number of men in the US changed between 1900 and 2000?
Population composition for 1900 and 2000

Percentage of population in that year

Age

1900 male
2000 male
1900 female
2000 female
How does the demographic make-up of the United States differ between the two years 1900 and 2000?
Is The Old Lady Apocalypse Upon Us?
Or which age groups grew the most between 1900 and 2000?

Female Growth

 semblance

<table>
<thead>
<tr>
<th>Age</th>
<th>Female Growth</th>
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<td>90+</td>
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<tr>
<td>85-90</td>
<td>41x</td>
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<td>16x</td>
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<td>2x</td>
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Male Growth

<table>
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<td>0-5</td>
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</table>

Overall Population Growth: 3.7x (1900-2000)
How have age distributions shifted over the 20th century?

Source: U.S. Census Bureau
Number of people in the labor force
by
age and sex

Year

Sex
Male
Female

Age
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

1900
2000

Number of Working Males
Number of Working Females
Number of Working Males
Number of Working Females
Scatter / Dot Plots
How Did the Age Distribution Change Between the Years 1900 and 2000

Percentage of Population

Age Group (5 year increments)
How did the distribution of Americans' age change in the 20th century?

- Year 1900 / 2000
- Male
- Female

Population per 100,000 Americans

Age Group

The age 0-4 population increased roughly twofold from 1900 to 2000 for both sexes (2.11-fold increase for males and 2.03-fold for females).

At ages 24 or younger, the male population increased relatively more than the female population.

At ages 25 or greater, the female population increased relatively more than the male population.

The age 90+ population increased 53.0-fold for females from 1900 to 2000, but only 23.3-fold for males.

Which demographic groups have grown the most since 1900?
Women’s Population Share per Age Group in the US
1900 versus 2000

Women’s Population Ratio for each Age Group. Color shows details about Year. Size shows total number of women. The marks are labeled by the ratio.
Line & Area Charts
Age distribution of the U.S. population, 1900 vs. 2000
(Source: U.S. Census Bureau via IPUMS)
What are the differences in the male and female US population demographics, and how did they change in the 20th century?
How Did Age Distribution in the United States Change Over the Last Century?

Sex
- Female
- Male

Year
- 1900
- 2000

Within-Cluster Proportion vs. Age (Years)
What Were the Proportions of the Population by Age and Sex for Census Years 1900 and 2000?

A greater proportion of the population was under 30 in 1900 than in 2000.

The baby boom generation, born between 1945 and 1964, was the largest segment of the population in 2000.

Born during WWII

How has the age distribution in the U.S. changed since 1900?
United States Population Census Bureau Data for 1900 and 2000

Total Population
1900: 76.3m
2000: 281.4m

Sex
- Female
- Male

Year
- 1900
- 2000

Age (Years)

Population (Millions)
How does the U.S. population growth between 1900 and 2000 vary by age and sex?
How do genders differ by age group in 1900 and 2000?
Has Modern Medicine Helped the Ladies More?

- Blue line: 1900
- Red line: 2000

% Female (of US population)

Age

- Total average female, 1900
- Total average female, 2000
The Danger of Having Children in the Late 1800’s

Women begin having children

Population Proportion

Proportion of Women

Proportion of Men

Age
How does the fraction of men to women at each age group change across a century?
How Has The Number of Men Compared to Women At Different Ages Changed Between 1900 and 2000?

More Men Than Women

More Women Than Men

Gender Ratio [%]

Age [Years]
How has the Male to Female Ratio changed over the years from 1810 to 2000?
Ode to Playfair
How did the U.S. Age Distribution Change over 100 Years?

Larger proportion of population is this age in 1900

Larger proportion of population is this age in 2000

Percentage of Population

1900s

2000s

Age

0 10 20 30 40 50 60 70 80 90
Slope Graph
How did the population growth of individual age groups contribute to the overall population growth in the United States between 1900 and 2000?

Year 1900
- All Americans: 76 million

Year 2000
- All Americans: 281 million (+269%)
- Adults: 32 million
- Children: 26 million
- Youth: 15 million
- Seniors: 3 million
- 147 million (+360%)
- 60 million (+131%)
- 39 million (+160%)
- 35 million (+1,018%)
Sex Ratio Change Between 1900 and 2000

- Age: 20-24 yrs

Pop. 7,445,099

Pop. 19,051,579
Sex Ratio Change Between 1900 and 2000

Sex Ratio (M:F)

Pop. 35,287

Age: 90-99 yrs

Pop. 1,900,889
Sankey Diagram
Did the relative proportion of age demographics in the US change between 1900 and 2000?

Sorted by relative proportion of the population in each age bracket.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>1900</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>0.237</td>
<td>0.154</td>
</tr>
<tr>
<td>10-19</td>
<td>0.205</td>
<td>0.153</td>
</tr>
<tr>
<td>20-29</td>
<td>0.184</td>
<td>0.144</td>
</tr>
<tr>
<td>30-39</td>
<td>0.139</td>
<td>0.141</td>
</tr>
<tr>
<td>40-49</td>
<td>0.102</td>
<td>0.136</td>
</tr>
<tr>
<td>50-59</td>
<td>0.109</td>
<td>0.136</td>
</tr>
<tr>
<td>60-69</td>
<td>0.068</td>
<td>0.071</td>
</tr>
<tr>
<td>70-79</td>
<td>0.041</td>
<td>0.058</td>
</tr>
<tr>
<td>80+</td>
<td>0.019</td>
<td>0.034</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.034</td>
</tr>
</tbody>
</table>
Heatmaps
Has the age group containing the largest percentage of Americans shifted?
Pie Charts
How do different age groups of seniors (65+) differ by gender composition for 1900 and 2000?

Legend
- % Female
- % Male

<table>
<thead>
<tr>
<th></th>
<th>65-69 Years</th>
<th>70-74 Years</th>
<th>75-79 Years</th>
<th>80-84 Years</th>
<th>85-89 Years</th>
<th>90+ Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td><img src="chart1900_65-69.png" alt="Chart" /></td>
<td><img src="chart1900_70-74.png" alt="Chart" /></td>
<td><img src="chart1900_75-79.png" alt="Chart" /></td>
<td><img src="chart1900_80-84.png" alt="Chart" /></td>
<td><img src="chart1900_85-89.png" alt="Chart" /></td>
<td><img src="chart1900_90+.png" alt="Chart" /></td>
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<tr>
<td>2000</td>
<td><img src="chart2000_65-69.png" alt="Chart" /></td>
<td><img src="chart2000_70-74.png" alt="Chart" /></td>
<td><img src="chart2000_75-79.png" alt="Chart" /></td>
<td><img src="chart2000_80-84.png" alt="Chart" /></td>
<td><img src="chart2000_85-89.png" alt="Chart" /></td>
<td><img src="chart2000_90+.png" alt="Chart" /></td>
</tr>
</tbody>
</table>
Multi-View or Dual Axis
What is population distribution in 1900 and 2000 with respect to age?

(a) Year: 1900

(b) Year: 2000

Gender

- Female
- Male
How has the Distribution of Age in the U.S. Changed from 1900 to 2000?

Percent of Population in Each Age Group

Age Composition of Total Population

Year

1900

Population: 76,262,821

Year

2000

Population: 281,420,717
Figure 1: U.S. Demographics by Gender in 1900 and 2000 (Source: U.S. Census data)

NOTE: Overlapping histograms are used to compare data sets in each plot. Each bin includes values less than the final age listed for its range (e.g. a value of 10 would be included in the 10-15 bin).

Plot descriptions: (top) Displays the age distribution for females in 1900 and 2000, showing the increase in population across all age groups. (second from top) Displays the age distribution for males in 1900 and 2000, showing a similar trend to that seen in the previous plot. (third from top) Displays the age distribution for both males and females in 1900. Areas where the histograms for males and females overlap are shown in purple. This plot shows that men between the ages of 25 – 55 slightly outnumbered women in the same age ranges. (bottom) Displays the age distribution for both males and females in 2000. This plot shows that women aged 45 and older outnumber men in the same age ranges.
Changes of different genders from different ages between 1900 and 2000

The total population of 1900 is 76262821, while of 2000 is 281420717
Is there a correlation between population and death between 1900 and 2000?

Population sorted in Different Age Group

Number of Death in 1900 Sorted in Different Age Group

Number of Death in 2000 Sorted in Different Age Group
Did Gender and Age Representation in the Workforce Become More Proportional to their Respective Population Sizes Between 1900 and 2000?

Representation in Workforce

(% of Workforce Per Age Group Per Year
% of Total Population that Year)

Representation Legend

- overrepresentation
- proportional representation
- underrepresentation

Age Groups

male

female

1900

2000
How, and why, did the distribution of ages in the U.S. change from 1900 to 2000?

Proportion of population in older age groups increased substantially.

Younger age groups are proportionally smaller in 2000 than in 1900.

More children live passed adolescence and the older tend to live longer.
How did the United States population change between the 1900 and 2000 Census as a function of age and gender?
How does the female to male ratio change with total population across age groups in the U.S. for census years 1900 and 2000?
Has the 20th century affected female and male populations differently?

**Difference between # of women and # of men**

- **1900**
  - # of women - # of men
  - Year
  - 1900
  - 2000

- **1990**
  - Age (bin)
  - # People
  - Sex
  - 1
  - 2

- **2000**
  - Age (bin)
  - # People
US Population and Gender Trends Across Age Group

Population
US population in millions of people from 1900 and 2000 US Census

Year
- 1900
- 2000

Female Gender Percentage
Breakdown of gender in population for each age group measured by percentage of females. Axis at 50% denotes equal proportions of male and females for that age group.

Population data taken from the 1900 and 2000 US census.
Aging U.S. Population between 1900 and 2000

The U.S. population in 2000 increased 269% from the 1900 census, however the exceptional growth between these two periods was not evenly distributed among age groups. The change in U.S. age demographics is likely the result of an aging Baby Boomer generation (those born between 1946 and 1964).
Administrivia
A2: Exploratory Data Analysis

Use visualization software to form & answer questions

First steps:
Step 1: Pick domain & data
Step 2: Pose questions
Step 3: Profile the data
Iterate as needed

Create visualizations
Interact with data
Refine your questions

Author a report
Screenshots of most insightful views (10+)
Include titles and captions for each view

Due by 11:59pm Friday, Apr 13
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Due by 11:59pm
Friday, Apr 13
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

**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

[McKinlay 86]
Teacher Salaries: Is It Really That Bad?
National and State averages for K-12 Public-School Teachers

UNITED STATES
Avg. Salary: $47,974
Avg. vacation days: 33

HOURLY
Hours per week on site: 33.5
Public-School Teacher: $34.96
Private-School Teacher: $27.08
Average Worker: $14.68
Police: $22.83
Fire: $17.31

CANADA
Avg. Salary: $40,670
Avg. vacation days: 35

HOURLY: $13.01
Hours per week on site: 35.6


AVERAGE: Workers' salaries used for comparison are those of white-collar, non-sales employees.
Source: The Atlantic 300 no. 2 (September 2007)
Number of Classified U.S. Documents
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>90T</td>
</tr>
<tr>
<td>2004</td>
<td>91R</td>
</tr>
<tr>
<td>2003</td>
<td>92I</td>
</tr>
<tr>
<td>2002</td>
<td>95E</td>
</tr>
<tr>
<td>2001</td>
<td>96T</td>
</tr>
<tr>
<td>2000</td>
<td>78C</td>
</tr>
<tr>
<td>1999</td>
<td>88T</td>
</tr>
<tr>
<td>1998</td>
<td>85R</td>
</tr>
<tr>
<td>1997</td>
<td>94I</td>
</tr>
<tr>
<td>1996</td>
<td>90T</td>
</tr>
<tr>
<td>1995</td>
<td>94T</td>
</tr>
<tr>
<td>1994</td>
<td>95E</td>
</tr>
<tr>
<td>1993</td>
<td>90E</td>
</tr>
</tbody>
</table>

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 backward. They are wines that will demand patience from collectors, while providing enjoyment for the patient. There will not be as much of the 2001s available for early drinking, but 2000 was also a very good vintage.
Preparing for a Pandemic

Source: Scientific American, 293(5). November, 2005, p. 50
Music: Super Cuts (page 92)