Teaching, Testing, and Assessment in a Quantitative Reasoning Course: Taking Aim at a Missing/Moving Target

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Skills

- Rudimentary
  - Reading Tables
  - Raw numbers vs percentages
  - Which way to percentage
  - Percent Change
  - Percentage point change
- Making comparisons
  - Denominators
  - Universe

Skills, continued

- Alternative Explanations
  - Thought process ◦ creativity ◦ independent thinking
  - Operationalize
- Standardization
  - Distribution
  - Rate
- Statistical Significance
  - Gut instincts

Lecture	Title
1	*Demography in the News: Learning to Think Critically*
2	The History and Politics of the Census
3a	Controversies with Census 2000
3b	*Introduction to Age, Period, and Cohort Effects*
4	Changes in the Values and Norms of Americans about Gender
5	Changes in American Families and Households
6a	The Second Demographic Transition in the United States: Exception or Textbook Example?
6b	*The What/Why/How of Standardization*
7	*Demography 101*
8	Poverty and Inequality
9	Thinking Critically and Test Review
10	Race - One Step Forward; One Step Back
11	Who are the New Americans?
12	*Statistics 101*
13	Elderly in the News
14	Overview: What Have We Learned and What is Going to be on the Test?

Lab Lecture	Lab Assignment
Data Dissemination: From the Printing Press to the Web Data from the long form and race-specific results	Characteristics of My Community from Summary File 1 Data Consultant: Raw Numbers and Percentages
Introduction to Census Microdata	Am I Unique?
What should my universe be?	NY Times – How many women are single?
Which way should I percentage? Standardization: Practice makes Perfect	Glimpses of the Second Demographic Transition: Marriage postponement, Cohabitation, and Late Childbearing across the United States Standardization Exercises
Using Data from the International Data Bank	Exercise in Demographic Techniques
Alternative Explanations	Why Do Men Earn More?
Understanding Distributions	Measures of Inequality: Dispersion and Inequality
On Your Own	Immigrant Journey
Show Me: Using simulations to understand statistical concepts	Statistics 101

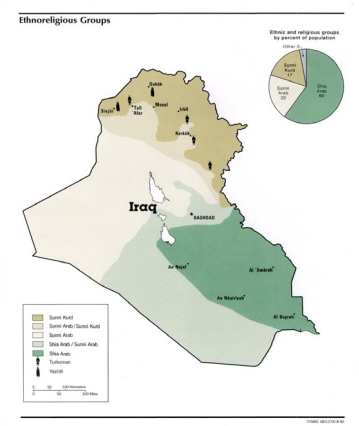
Rudimentary:
Working with percentages

QT-P34: Poverty Status in 1999 of Individuals: 2000
Data Set: Census 2000 Summary File 4 (SF 4) - Sample Data
Geographic Area: United States

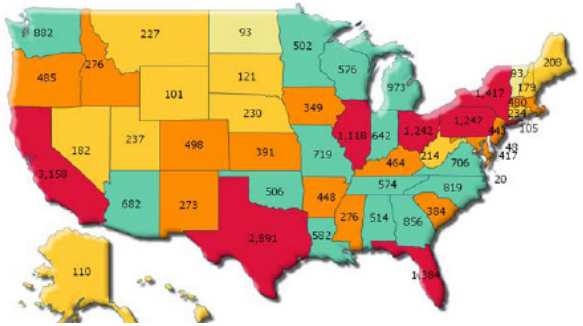
Universe	Poverty Status		Percent
	N	*Poor*	
Total Population	273,882,232	33,899,812	12.4
White alone	206,259,768	18,847,674	9.1
Black alone	32,714,224	8,146,146	24.9

Rudimentary: Making comparisons

- Operation Iraqi Freedom
  - Which US states have the most/least fatalities?
  - Which US state have the highest/lowest death rates?
  - Hypothesis for state differentials

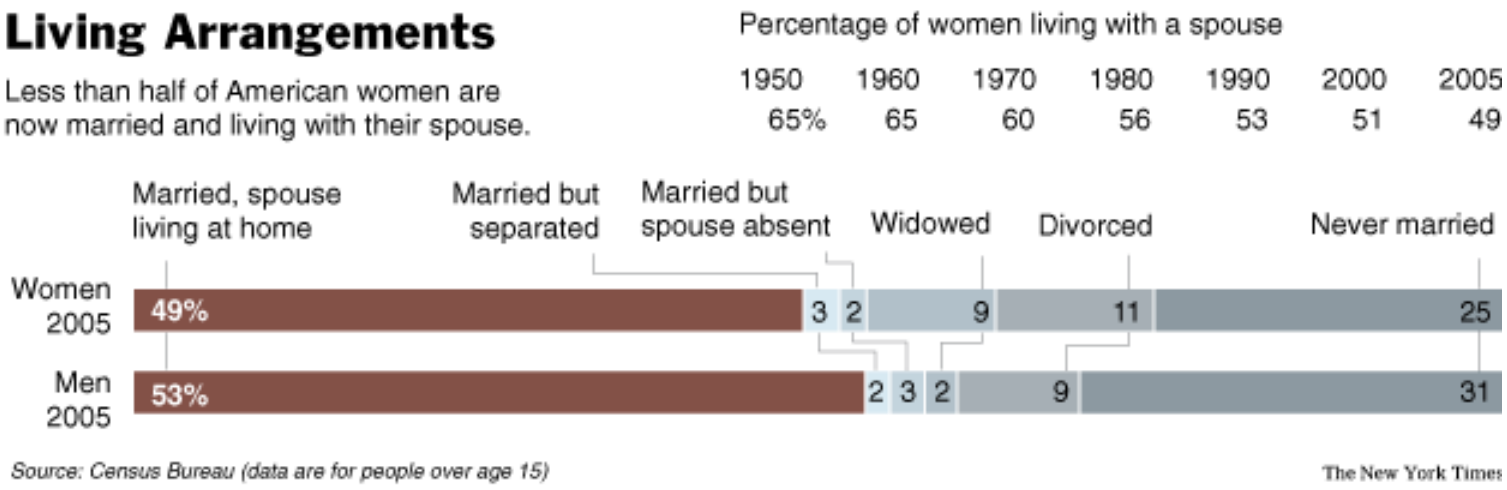


U.S. Census Bureau
American FactFinder



icasualties.org
IRAQ COALITION CASUALTY COUNT

Making comparisons:
Universes and Decomposition



Single Women:
Are they in the majority or not?

- Appropriate universe
- Decompose change
- Examine race

Single Women: Exercises

Table 1. Changes in Marital Status for Women: 1950 to 2005

MARITAL STATUS	1950	1960	1970	1980	1990	2000	2005
Currently Married							
Age 16+	65	60	60	56	53	51	49
Age 19 - 59	73	76	72	65	59	56	55
Never Married							
Age 16+	17	16	18	21	22	23	24
Age 19 - 59	13	11	14	19	23	24	25

Table 2. Decomposing Marital Status: Who are "the not married women" from 1950 to 2005?

MARITAL STATUS	1950	1960	1970	1980	1990	2000	2005
Currently Married	73	76	72	65	59	56	55
Not Currently Married							
Married, Spouse absent	3	2	2	1	2	2	2
Separated	3	3	3	3	3	3	3
Divorced	3	3	5	9	11	13	13
Widowed	6	5	5	4	3	2	2
Never married/single	13	11	14	19	23	24	25

Universe: 19 to 59

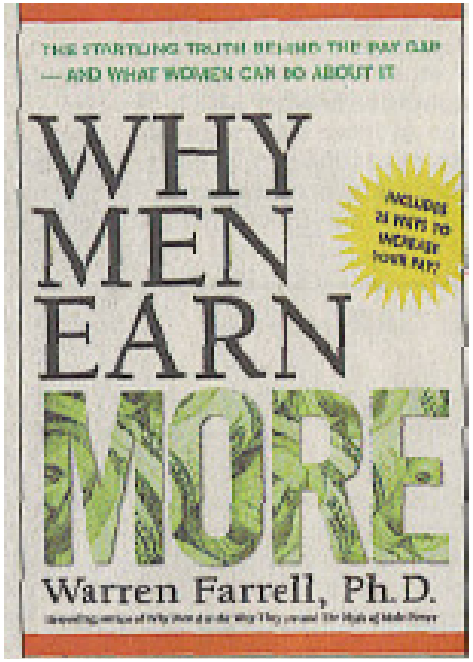
Table 3. Race Differences in Marital Status from 1950 to 2005

Universe: 19 to 59

MARITAL STATUS	1950	1960	1970	1980	1990	2000	2005
Currently Married							
White	75	78	74	68	63	61	59
Black	58	58	52	40	32	31	22
Never Married							
White	13	11	13	17	20	20	21
Black	12	14	19	30	38	41	47

Universe: 19 to 59

Alternative Explanations



Dangerous/Dirty/Daring/Demanding Jobs			Total		Men	Women
Characteristic	**Item**	**Code**	**N**	**% M**	**Mean $$$**	**Mean $$$**
Firefighter	OCCCEN5	374				
Sales rep, wholesale	OCCCEN5	485				
Construction laborer	OCCCEN5	626				
Mining machine oper	OCCCEN5	684				
Fishing/hunting/trapping	INDCEN	028				
Self-employed, incorp	CLWKR	7				
Long commute	TRVTIME	>=90				
Recent immigrant	YR2US	>=1995				

Self-fulfillment/safe jobs			Total		Men	Women
Characteristic	**Item**	**Code**	**N**	**% F**	**Mean $$$**	**Mean $$$**
Elem. Teacher	OCCCEN5	231				
Writer, author	OCCCEN5	285				
Fitness worker	OCCCEN5	462				
Banking	INDCEN	687				
Fed. govt. employee	CLWKR	5				

Worker Characteristics			Total		Men	Women
Characteristic	**Item**	**Code**	**N**	**% M**	**Mean $$$**	**Mean $$$**
College degree	EDUC	13				
Professional degree	OCCCEN5	15				
Hours>50	HOURS	>=50				
Marital status, single	MSP	6				

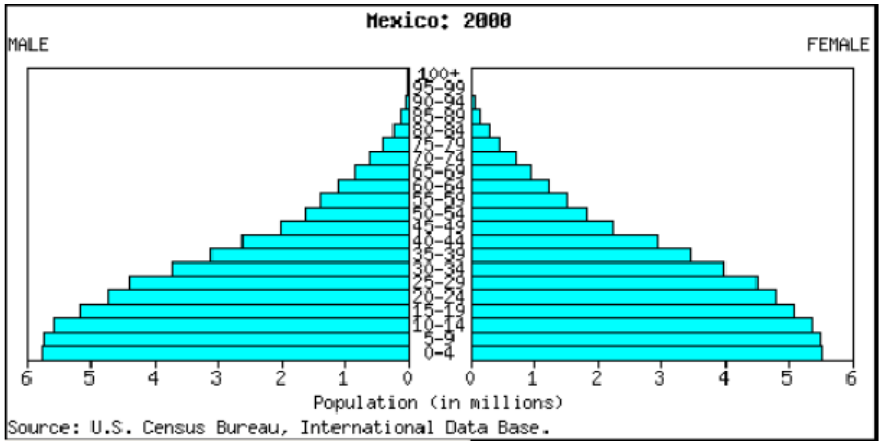
Puzzling Question

- Crude death rate (CDR) for Mexico in 2000 was 4.8.
- CDR for United States is 8.5
- How is that possible?

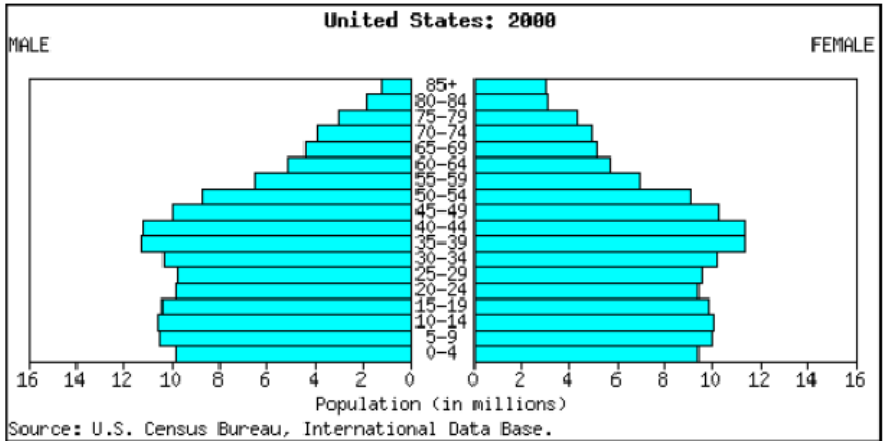
Puzzling Question:

Answer with Standardization

Population Pyramids for Mexico



Population Pyramids for United States



More standardization problems

Distribution of UM faculty by rank and salary according to gender, September 2001

Male Faculty	%	Mean $$
Asst Prof	19%	$61,464
Assoc Prof	22%	$73,626
Full	59%	$102,211

Female Faculty	%	Mean $$
Asst Prof	35%	$57,366
Assoc Prof	36%	$67,367
Full	29%	$96,620

What would female faculty earn at UM if they had the same rank distribution as malc faculty?

What would feamle faculty earn at UM if they got paid the same at each rank as male faculty?

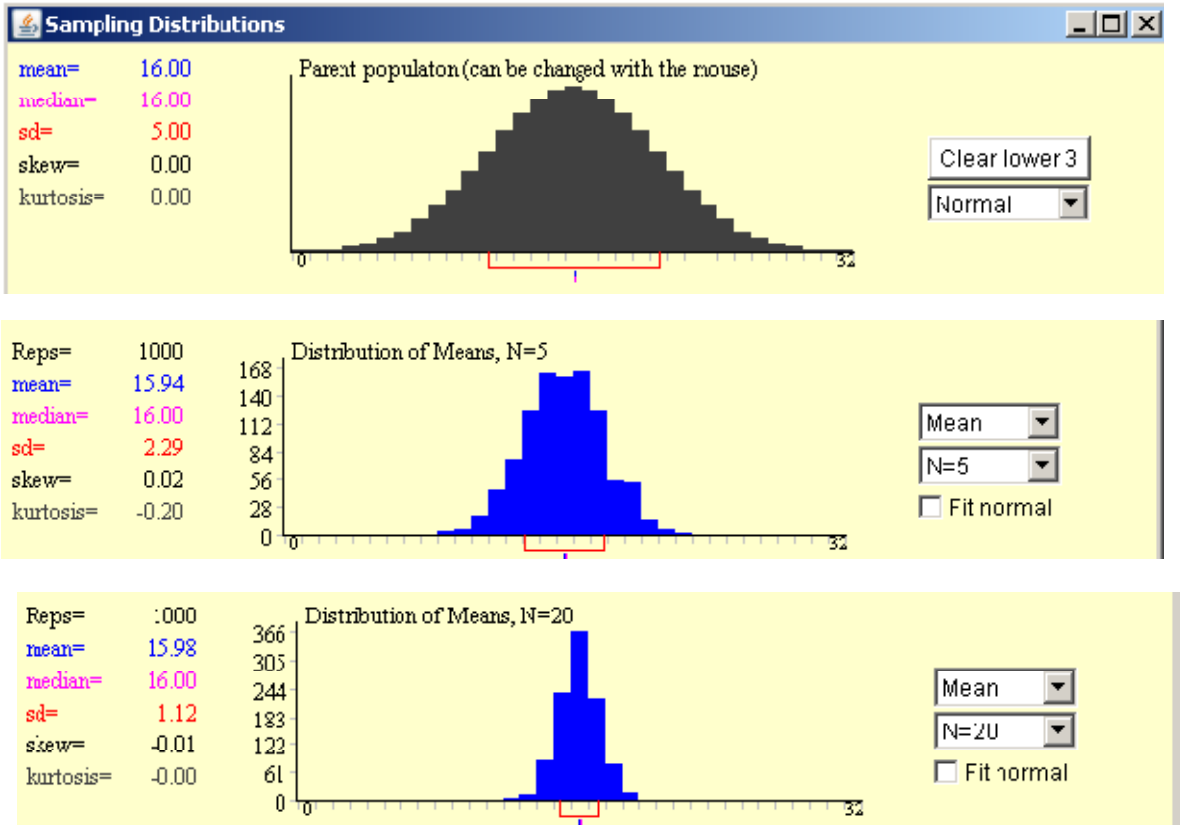
If males are 72 percent of UM faculty, what is the overall compensation for faculty?

Overview

- Missing/Moving Target
  - History
  - Priority
- Proper mix
  - Substantive subject matter
  - Quantitative skills
- Evaluation
  - Show me that you understand concepts
    - Substantive
    - Quantitative reasoning

Statistical Significance: via Simulation

Rice Virtual Lab in Statistics


Sampling Distributions
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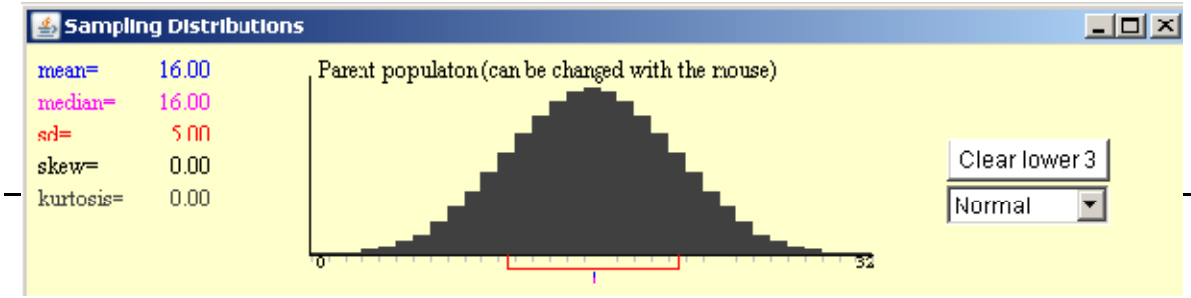
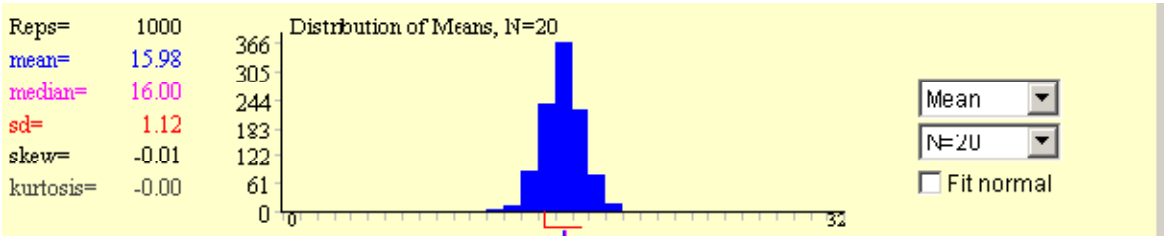
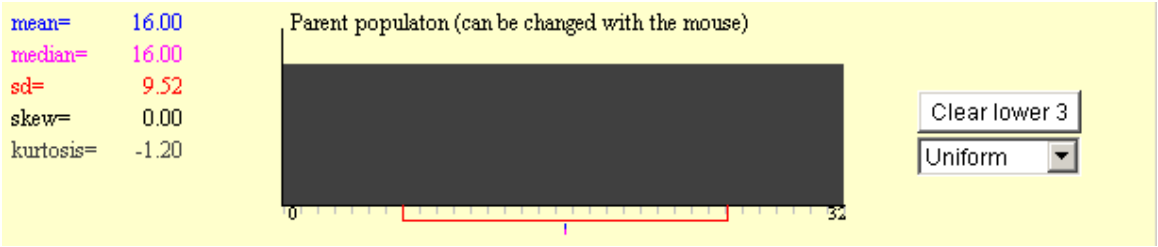
median= 16.00
sd= 5.00
skew= 0.00
kurtosis= 0.00
Parent populaton (can be changed with the mouse)
0
32
Clear lower 3
Normal
Reps= 1000
mean= 15.94
median= 16.00
sd= 2.29
skew= 0.02
kurtosis= -0.20
Distribution of Means, N=5
168
140
112
84
56
28
0
0
32
Mean
N=5
Fit normal
Reps= 1000
mean= 15.98
median= 16.00
sd= 1.12
skew= -0.01
kurtosis= -0.00
Distribution of Means, N=20
366
305
244
183
122
61
0
0
32
Mean
N=20
Fit normal


Sampling Distributions
mean= 16.00
median= 16.00
sd= 5.00
skew= 0.00
kurtosis= 0.00
Parent populaton (can be changed with the mouse)
0
32
Clear lower 3
Normal


Reps= 1000
mean= 15.98
median= 16.00
sd= 1.12
skew= -0.01
kurtosis= -0.00
Distribution of Means, N=20
366
305
244
183
122
61
0
0
32
Mean
N=20
Fit normal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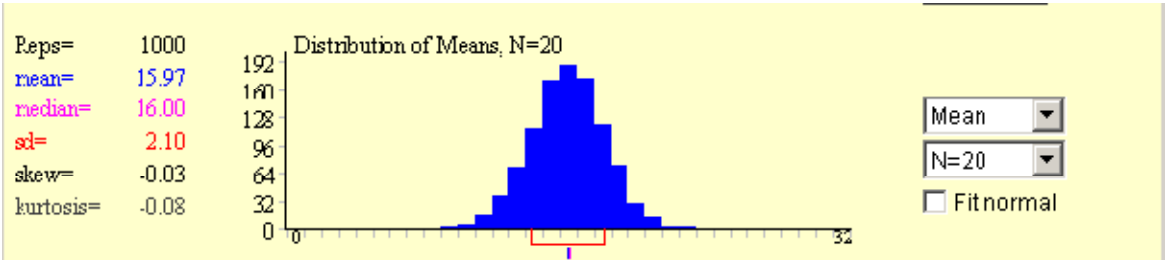
skew= 0.00
kurtosis= -1.20
Parent populaton (can be changed with the mouse)
0
32
Clear lower 3
Uniform


Reps= 1000
mean= 15.97
median= 16.00
sd= 2.10
skew= -0.03
kurtosis= -0.08
Distribution of Means, N=20
192
160
128
96
64
32
0
0
32
Mean
N=20
Fit normal

QR2 course

- Subject matter is important
- Exercises
  - Real world – in the news
  - Not rote; no cheat sheets; must think
  - Context helps students create their own rules
- Changes
  - Will shift some readings from context to QR
  - **Looking for suggestions**

Evaluation

Class Skill Distribution:
Subject Matter and QR Proficiency

	Quantitative Reasoning		
Subject	*Strong*	*Average*	*Weak*
Strong	25.0%	14.3%	
Average	14.3%	32.1%	10.7%
Weak	3.6%		

Evaluation

Letters of Recommendation
by Student Type