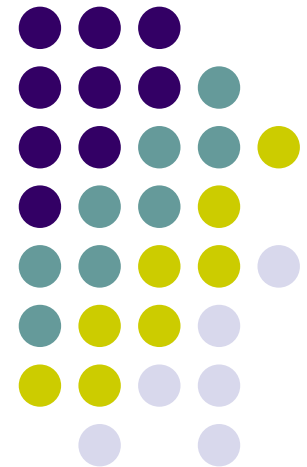
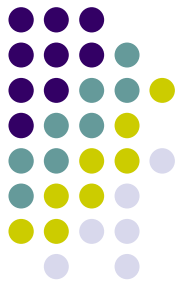


Newsroom Math

Steve Doig
Cronkite School of Journalism
Arizona State University



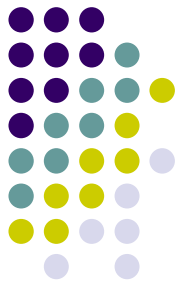
Why math?



- We make too many stupid mistakes in print and on air
 - 3 murders last year, 0 this year
- The bad news: To be a good journalist, you **MUST** be able to do math!

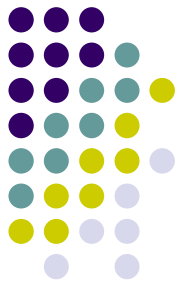
The good news!

- ...it's 6th grade math!
- None of this scary stuff:
 - Calculus
 - Geometry proofs
 - Base-12
 - Trigonometry
 - Ballistics
 - Etc.....



Newsroom math skills

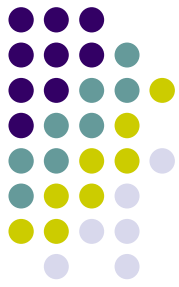
- Sum and difference (duh!)
- Percent
- Percent difference
- Percentage change
- Rates: Per capita, per 100k, etc
- Consumer Price Index
- Polling
- Simple statistics
- Crowd estimating



Comparing NEW and OLD



- Percentage change!
- $(NEW / OLD - 1) * 100$
- \$8 million this year, \$5 million last year
 - $(8/5 - 1) * 100 = 1.6 - 1 = 0.6 = 60\%$,
 - So the budget has *increased* 60%
- \$5 million this year, \$8 million last year
 - $(5/8 - 1) * 100 = 0.625 - 1 = -0.375$
 - So the budget has *decreased* 37.5%



Beware of base changes

- Newsroom budget of \$1 million grows by 10% one year to \$1.1 million!
- Next year, recession, so boss has to cut 10% from budget
- Result: \$1.1 million – 10% of \$1.1 million = \$990,000



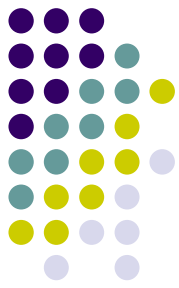
Beware of small bases

- Easy to get big percentage change when you start with small values
- Population 1990: 1,000
 - Population 2000: 1,500
 - Percentage change: +50%
- Population 1990: 1,000,000
 - Population 2000: 1,100,000
 - Percentage change: +10%

Rates



- Number of events per some standard unit (per capita, per 100,000, etc.)
- Use to compare places of different size
- Crime rates, accident rates, etc.
- **(EVENTS / POPULATION) x (“PER” Unit)**



Calculating rates

- (EVENTS / POPULATION) x (“PER” Unit)
- If there were 320 murders in a population of 1,937,086, what is the murder rate per 100,000?
- $320 / 1937086 = 0.0001652\dots$
- $0.0001652 * 100000 = 16.5$ murders per 100,000 population



Consumer Price Index

<http://www.bls.gov/cpi/home.htm>

Consumer Price Index Home Page - Microsoft Internet Explorer

Address: <http://www.bls.gov/cpi/home.htm>

U.S. Department of Labor
Bureau of Labor Statistics
Consumer Price Indexes

www.bls.gov Search | A-Z Index

BLS Home | Programs & Surveys | Get Detailed Statistics | Glossary | What's New | Find It! In DOL

The **Consumer Price Indexes (CPI)** program produces monthly data on changes in the prices paid by urban consumers for a representative basket of goods and services.

February 2005 CPI data are scheduled to be released on March 23, 2005, at 8:30 am Eastern Time.

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GENERAL OVERVIEW:
[Data Available](#) | [Coverage](#) | [Reference Period](#) | [Source of Data](#) | [Forms of Publication](#) | [Uses of the Data](#) | [Major Research in Progress](#) | [Measurement Issues](#)

ECONOMIC NEWS RELEASES:

Latest Numbers

CPI-U, US City Average, All Items:

- 📈 (NSA) +0.2% in Jan 2005
- 📈 (SA) +0.1% in Jan 2005
- 📈 (NSA) +3.0% since Jan 2004

CPI-U, US City Average, All Items Less Food and Energy:

- 📈 (NSA) +0.3% in Jan 2005
- 📈 (SA) +0.2% in Jan 2005
- 📈 (NSA) +2.3% since Jan 2004

CPI-U, US City Average, Medical Care:

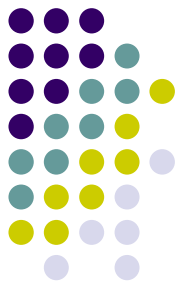


Consumer Price Index



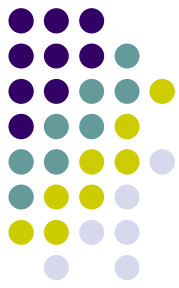
- Use the CPI to correct for inflation

$$\frac{\text{Price Now}}{\text{Price Then}} = \frac{\text{CPI Now}}{\text{CPI Then}}$$



Using the CPI

- Gasoline in 1965 was \$0.30 per gallon.
- CPI in 2005 = 194.6
- CPI in 1965 was 30.8
- $2005 \text{ price} / 0.30 = 194.6 / 30.8$
- $2005 \text{ price} = (194.6 / 30.8) * 0.30$
- $2005 \text{ price} = 6.32 * 0.30 = \1.90
- Gas in 1965 cost the equivalent of \$1.90 per gallon in today's dollars



Newsroom Statistics

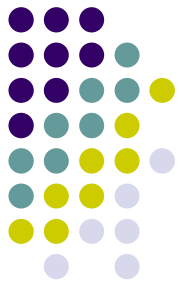
- **Maximum, minimum, range**
- **Mean (Average):** Add the values, then divide by number of values
- **Median:** Sort the values, then find the middle one
- **Mode (rarely used):** The most common value

Baseball salaries 1994-95 strike period



- Mean (average): \$1.2 million
- Median: \$350,000
- Mode: \$100,000

Weighted average



- Don't average averages
- Example:
 - Teacher average: \$37,000
 - Janitor average: \$20,000
 - Principal average: \$75,000
 - District average: **\$44,000??**



Weighted average (continued)

- Teachers: $10,000 \times \$37,000 = \370.0m
- Janitors: $2,000 \times \$20,000 = \$ 40.0\text{m}$
- Principals: $500 \times \$75,000 = \$ 37.5\text{m}$

- Sum: $12,500$ $\$447.5$ million
- **Weighted average: \$35,800**

Public opinion surveys



- Survey vs. census
- A **random** sample is necessary
- Size of the population being sampled **doesn't matter** -- only sample size matters



Sampling error

- Rule: The bigger the sample, the smaller the error
- Sampling error = $1/\sqrt{N}$
 - N=100 $1 / \sqrt{100} = 1/10 = +/- 10$ pts.
 - N=400 $1 / \sqrt{400} = 1/20 = +/- 5$ pts.
 - N=900 $1 / \sqrt{900} = 1/30 = +/- 3.3$ pts

Reporting poll results



- Don't report unscientific polls
- Don't make a big deal about small differences
- Beware of big error margins on subgroups
- Don't forget that a poll at best is a snapshot of now, not a predictor of the future

Estimating crowds



- Beware the “official” estimate
- Better method:
 - Estimate the area in sq feet (L x W)
 - Divide by:
 - 10 for a loose crowd
 - 7.5 for a tighter crowd
 - Account for turnover?

Newsroom math test (www.ire.org)



Investigative Reporters and Editors - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www.ire.org/>

Google Search Web PageRank 37 blocked AutoFill Options

Reporting Guides, Beat Sources
IRE Awards
Latest contest, Past winners, How to enter
Endowment
Funding IRE's future
Broadcast Center
Videostreamed clips, IRE feeds, IRE videos
Database Library
Government database collection, Data analysis
Campaign Finance Information Center
Campaign Finance Database, Stories
FOI Center
Columns Awards

groups and news organizations in condemning the judicial punishment of reporters who refuse to reveal confidential sources.

- 2005 IRE Conference: Plan to be in Denver, June 2-5.

TRAINING

- Training calendar:** IRE educates journalists in the latest techniques of finding, understanding and reporting on stories. Find out where you can attend our training.
- Better Watchdog Workshops:** These workshops are intensive sessions to help journalists learn investigative skills and to produce enterprising and informative stories. Hands-on CAR training is offered at some events.
- CAR Boot Camps:** Attend a computer-assisted reporting Boot Camp and learn to acquire electronic information, use spreadsheets and databases to analyze and translate it into high-impact stories.

IRE BUSINESS

- Breakthroughs:** A contribution to IRE's endowment ensures that our work continues and grows.
- Looking for a job?** IRE's free Job-Wanted board is available for members to anonymously post their qualifications, describe the job they want and invite employers to contact them.

iraq, the shuttle explosion, blackouts, consumer issues and much more. For discussions about investigative journalism, see [Neiman Watchdog](#) or join an [IRE listserv](#).

- Social Network Analysis:** Explore the uses of SNA for visualizing and diagramming relationships between individuals and businesses and institutions.
- Net Tour:** A strategy guide with starting points to help with effective research on the Internet.
- Investigative Reporter's Handbook:** An indispensable reference that includes examples of local investigative reporting and easy-to-find Internet address lists to help students and professionals.
- Math test for journalists:** Test your skills with this interactive test developed by Steve Doig, Arizona State University, and inspired by Phil Meyer, UNC-Chapel Hill.
- The Database Library** maintains government data about a wide array of topics and makes it available to journalists.
- IRE's Resource Center** is a rich reserve of more than 20,000 print and broadcast stories and more than 2,000 tipsheets to help you start and complete the best work of your career.
- The Campaign Finance Information Center** Web site features a tool for searching a database of federal contracts by contractor or by country.

http://www.ire.org/education/math_test.html

Internet

Newsroom math bibliography



- “Numbers in the Newsroom”, by Sarah Cohen, IRE
- “Precision Journalism (4th edition)”, by Phil Meyer
- “Innumeracy”, by John Allen Paulos
- “A Mathematician Reads the Newspaper,” by John Allen Paulos