

Building Evaluation Capacity Session (3) 8

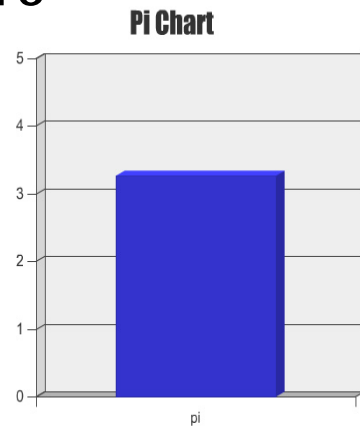
Data Visualization, Math for Evaluators



Anita M. Baker
Evaluation Services



Bruner Foundation
Rochester, New York



General Characteristics of Effective Tables and Graphs

- The table or graph should present **meaningful** data.
- The data should be **unambiguous**.
- The table or graph should convey ideas about data **efficiently**.

Materials adapted from
Gary Klass (Illinois State University), 2002
Oehlert and Weisberg, 2008 (University of Minnesota)
Tufte, Edward, Presenting Data and Information, 2010



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Be Kind to your Readers

- ▶ Label *everything!*
- ▶ Use the kind of display best suited to your data.
- ▶ Identify units: numbers, percentages, places, types of people.
- ▶ *Minimize the ratio of ink-to-data (Tufte):* de-emphasize the chart, bring out the data.
- ▶ Use color to your advantage, but make sure your tables and graphs will print in black and white.



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Standards of "Graphical Excellence"

Edward Tufte

- ▶ Well-designed presentation of data of substance
- ▶ Complex ideas communicated with clarity, precision and efficiency
- ▶ The greatest number of ideas, in the shortest time, in the smallest space, with the least ink



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Table 4: Number of Scholarship Awards and Students,
by Type of Recipient

RECIPIENT	Scholarships		Students Number
	Number	%	
HS or Current College Students	91	89%	1554
Graduate Students	6	6%	106
Private/Parochial Students	2	2%	75
Special Opportunities	3	3%	27
TOTAL	102		1762



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Table Basics

- ▶ Design for purpose and audience
- ▶ Round (use whole numbers)!
- ▶ Organize
- ▶ Simplify
- ▶ Add summaries
- ▶ Good title/labels
- ▶ Clean layout/proper spacing



Table 5: Number of Disbursements and Mean Value of Scholarship Awards by Type of Recipient,

RECIPIENT TYPE	Mean Value	Total Value	Number of Disbursements
HS or Current College Students	\$1,264	\$3,276,885	2592
Graduate Students	\$3,098	\$ 514,200	166
Private/Parochial Students	\$1,117	\$ 145,250	130
Special Opportunities	\$ 928	\$ 33,400	36
TOTAL		\$3,969,735	2924

Source: Rochester Area Community Foundation Scholarship Payout database, 2008 – 2015, n=102 scholarships.



General Characteristics of Effective Tables and Graphs

- The table or graph should present **meaningful** data.
- The data should be **unambiguous**.
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Meaningful Data in Tables

- ▶ Where appropriate, use rates, ratios and per capita measures in addition to aggregate totals.
- ▶ Two time points are better than one.
 - Show change over a meaningful time period (e.g., change over 5-years).
 - Multi-year trends are often best presented in graphs rather than tables.
- ▶ Show the source of the data.



Unambiguous Data in Tables

Each number in a table should have a precise meaning.

- Use titles, headings, and notes to specify the contents of the table cells, rows and columns.
- Carefully select measures: e.g., frequencies (counts) vs. percentages, vs. rates (e.g., number per 1000).
- Clearly define numerators and denominators, and distribution decisions.

e.g., % of high school students who were scholarship recipients (12%)
% of scholarship recipients who were high school students (89%)

Be especially clear when defining change.

- Percentage change vs. percentage point change



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Table 4: Number of Recipients and Available Scholarships,
by Type of Recipient

RECIPIENT TYPE	Scholarships		Recipient Number
	Number	%	
HS or Current College Students	91	89%	1554
Graduate Students	6	6%	106
Private/Parochial Students	2	2%	75
Special Opportunities	3	3%	27
TOTAL	102		1762

Source: Rochester Area Community Foundation Scholarship Payout database, 2008 – 2015.



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Table 5: Number of Disbursements and Mean Value of Scholarship Awards by Type of Recipient,

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TOTAL		\$3,969,735	2924

Source: Rochester Area Community Foundation Scholarship Payout database, 2008 – 2015, n=102 scholarships.

Totals vs. Rates

Murders* in Ten Largest US Cities, 1998

Chicago	703
New York	633
Detroit	430
Los Angeles	426
Philadelphia	338
Houston	254
Dallas	252
Phoenix	185
San Antonio	89
San Diego	42

*Murder and non-negligent manslaughter

Hartford	17
Lambertville	0

Murder Rates* in Ten Largest US Cities, 1998

Detroit	43.0
Chicago	25.6
Philadelphia	23.3
Dallas	23.1
Phoenix	15.1
Houston	14.1
Los Angeles	11.8
New York	8.6
San Antonio	8.1
San Diego	3.5

* Murder and non-negligent manslaughter per 100,000 population

Efficient Use of Data in Tables

- Sort data on the most meaningful variable
- Time always left to right
- Similar data goes down the columns
- Highlight important comparisons
- Don't force comparisons between two different tables
- Use consistent formatting across tables

Data can be quickly interpreted by the reader.



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Rounding!

- Use two significant figures where ever possible.

Total Scholarship Value, 2008-2015 = \$3,959,7351
Total Scholarship Value, 2008-2015 = 4 million dollars.

- Never forget meaningfulness.

Life expectancy = 67.14 years
.01 year is about 4 days

- The one exception is for archival tables.



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Uses for Tables

- Exploration/Organization
- Storage
- Communication

Adapted from G. Oehlert, rev. by S. Weisberg, School of Statistics, University of Minnesota, 2/2008



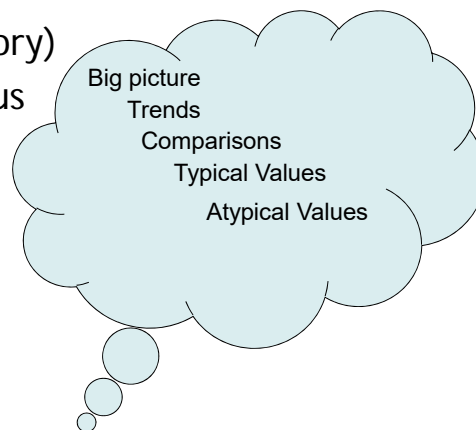
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When Using Tables to Communicate

- Target an audience
- Have a goal (tell a story)
- Make the story obvious
- Be uncluttered
- Cause no pain



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Two Time Points are better

Murder Rates in Ten Largest US Cities, 1995-1998

	1995	1998	Net Change
Detroit	47.6	43.0	- 4.6
Chicago	30.0	25.6	- 4.4
Philadelphia	28.2	23.3	- 4.9
Dallas	26.5	23.1	- 3.3
Los Angeles	24.5	11.8	- 12.7
Phoenix	19.7	15.1	- 4.6
Houston	18.2	14.1	- 4.1
New York	16.1	8.6	- 7.5
San Antonio	14.2	8.1	- 6.1
San Diego	7.9	3.5	- 4.4

* Murder and non-negligent manslaughter per 100,000 population



Source: Statistical Abstract 2000 CD-ROM tables 332; and Bureau of Justice Statistics:
<http://www.ojp.usdoj.gov/bjs/data/cities92.wk1>

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Sort on Meaningful Variables

Percent of 9-year-olds who watch
more than 5 hours of TV per weekday

Country	%
Canada	14.9
Denmark	6.0
Finland	6.1
France	5.5
Germany	4.4
Ireland	11.8
Italy	9.2
Netherlands	12.6
Spain	17.5
Sweden	4.7
United States	21.5

Percent of 9-year-olds who watch
more than 5 hours of TV per weekday

Country	%
United States	21.5
Spain	17.5
Canada	14.9
Netherlands	12.6
Ireland	11.8
Italy	9.2
Finland	6.1
Denmark	6.0
France	5.5
Sweden	4.7
Germany	4.4



Source: Uri Bronfenbarger, et. al. The State of Americans (New York: The Free Press, 1996) from: William
 Bennett, The index of Leading Cultural Indicators (New York: Broadway Books, 1999), p.230

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Two Time Points are better . . . Alternative Sort

Murder Rates in Ten Largest US Cities, 1995-1998

	1995	1998	Net Change
Los Angeles	24.5	11.8	- 12.7
New York	16.1	8.6	- 7.5
San Antonio	14.2	8.1	- 6.1
Philadelphia	28.2	23.3	- 4.9
Detroit	47.6	43.0	- 4.6
Phoenix	19.7	15.1	- 4.6
Chicago	30.0	25.6	- 4.4
San Diego	7.9	3.5	- 4.4
Houston	18.2	14.1	- 4.1
Dallas	26.5	23.1	- 3.3

* Murder and non-negligent manslaughter per 100,000 population



Source: Statistical Abstract 2000 CD-ROM tables 332; and Bureau of Justice Statistics:
<http://www.ojp.usdoj.gov/bjs/data/cities92.wk1>

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Time Goes Left to Right!

Do you favor or oppose allowing students
and parents to choose a private school to
attend at public expense?

National Totals

	'03 %	'04 %	'05 %	'06 %	'07 %	'08 %	'09 %	'10 %
Favor	33	36	44	44	41	39	34	46
Oppose	65	61	52	50	55	56	62	52
Don't Know	2	3	4	6	4	5	4	2



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Scholarship Disbursement 2009 - 2015

Year	Average Disbursement	TOTAL
2009	\$1,096	\$403,426
2010	1,175	\$458,174
2011	1,297	\$522,510
2012	1,436	\$590,074
2013	1,388	\$526,214
2014	1,460	\$590,040
2015	1,607	\$592,849



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Storage

PUBLIC SCHOOLS	Grade 8 - 1992									
	Graduated College		Some Education After High School		Graduated High School		Did Not Finish High School		I Don't Know	
	Percentage of Students	Average Proficiency	Percentage of Students	Average Proficiency	Percentage of Students	Average Proficiency	Percentage of Students	Average Proficiency	Percentage of Students	Average Proficiency
NATION	40 (1.4)	279 (1.4)	18 (0.6)	270 (1.2)	25 (0.8)	256 (1.4)	8 (0.6)	248 (1.8)	9 (0.5)	251 (1.7)
Northeast	38 (3.1)	282 (4.2)	18 (1.1)	267 (3.0)	26 (2.2)	259 (4.2)	8 (0.9)	246 (4.2)	10 (1.2)	250 (3.3)
Southeast	35 (1.9)	270 (1.9)	17 (0.8)	263 (2.0)	28 (1.4)	249 (1.9)	12 (1.6)	246 (4.2)	8 (1.0)	248 (4.3)
Central	42 (2.7)	283 (2.9)	20 (1.4)	273 (1.6)	26 (1.7)	264 (2.3)	4 (0.7)	*** (***)	7 (0.8)	258 (3.8)
West	43 (2.9)	279 (2.6)	18 (1.2)	274 (2.6)	19 (1.5)	252 (2.9)	9 (1.1)	248 (2.4)	11 (0.9)	248 (2.9)
STATES										
Alabama	33 (1.6)	261 (2.5)	18 (0.7)	258 (2.0)	29 (1.1)	244 (1.8)	13 (0.9)	239 (2.0)	7 (0.6)	237 (2.9)
Arizona	36 (1.5)	277 (1.5)	22 (1.0)	270 (1.5)	21 (0.9)	256 (1.6)	10 (0.7)	245 (2.5)	12 (0.8)	248 (2.7)
Arkansas	30 (1.1)	264 (1.9)	20 (0.8)	264 (1.7)	31 (1.1)	248 (1.6)	11 (0.7)	248 (2.4)	8 (0.6)	245 (2.7)
California	39 (1.8)	275 (2.0)	18 (1.0)	266 (2.1)	17 (0.9)	251 (2.1)	10 (0.9)	241 (2.2)	16 (1.1)	240 (2.9)
Colorado	46 (1.2)	282 (1.3)	19 (0.9)	276 (1.6)	21 (0.9)	260 (1.5)	6 (0.6)	250 (2.4)	7 (0.5)	252 (2.6)
Connecticut	47 (1.3)	288 (1.0)	16 (0.8)	272 (1.8)	22 (0.9)	260 (1.8)	6 (0.6)	245 (3.3)	9 (0.6)	251 (2.4)
Delaware	39 (1.2)	274 (1.3)	18 (1.0)	268 (2.3)	30 (1.0)	251 (1.7)	6 (0.5)	248 (4.0)	8 (0.9)	248 (3.4)
Dist. Columbia	32 (1.0)	244 (1.7)	17 (0.8)	240 (1.9)	29 (0.8)	224 (1.6)	9 (0.7)	225 (3.2)	12 (0.6)	229 (2.2)
Florida	39 (1.5)	268 (1.9)	19 (0.7)	266 (1.9)	24 (1.1)	251 (1.8)	8 (0.7)	244 (2.7)	10 (0.7)	244 (3.2)
Georgia	35 (1.7)	271 (2.1)	18 (0.7)	264 (1.7)	30 (1.2)	250 (1.3)	11 (0.8)	244 (2.2)	6 (0.6)	245 (2.6)
Hawaii	38 (1.1)	267 (1.5)	15 (0.9)	266 (1.9)	25 (1.0)	246 (1.8)	6 (0.5)	242 (3.5)	16 (0.8)	246 (2.1)
Idaho	48 (1.2)	281 (0.9)	20 (0.8)	278 (1.3)	19 (0.9)	268 (1.4)	7 (0.5)	254 (2.3)	6 (0.5)	254 (2.8)
Indiana	33 (1.5)	283 (1.5)	21 (0.9)	275 (1.9)	32 (1.1)	260 (1.6)	8 (0.6)	250 (2.6)	6 (0.5)	249 (3.3)
Iowa	44 (1.4)	291 (1.2)	21 (0.8)	285 (1.5)	25 (1.1)	273 (1.3)	4 (0.4)	262 (2.4)	5 (0.4)	266 (2.8)
Kentucky	28 (1.4)	278 (1.6)	19 (0.8)	267 (1.6)	32 (0.9)	254 (1.6)	15 (0.9)	246 (1.7)	6 (0.4)	242 (2.8)
Louisiana	32 (1.4)	256 (2.5)	20 (0.9)	259 (1.8)	30 (1.3)	242 (1.6)	10 (0.7)	237 (2.4)	7 (0.6)	236 (3.7)
Maine	40 (1.5)	288 (1.4)	22 (1.0)	281 (1.5)	26 (1.1)	267 (1.1)	6 (0.5)	259 (2.7)	5 (0.5)	266 (2.6)
Maryland	44 (1.7)	278 (1.8)	18 (0.9)	266 (1.9)	25 (1.2)	250 (1.8)	6 (0.8)	240 (3.7)	7 (0.5)	245 (3.8)
Massachusetts	48 (1.5)	284 (1.3)	17 (0.8)	272 (1.8)	21 (1.0)	261 (1.4)	7 (0.6)	248 (3.2)	7 (0.6)	248 (2.6)
Michigan	38 (1.6)	277 (2.2)	23 (0.9)	271 (2.0)	26 (0.9)	257 (1.7)	6 (0.5)	249 (2.0)	7 (0.6)	248 (3.0)
Minnesota	48 (1.3)	290 (1.0)	21 (0.9)	284 (1.8)	22 (0.9)	270 (1.8)	3 (0.4)	256 (4.2)	7 (0.6)	268 (3.0)
Mississippi	38 (1.7)	254 (1.6)	16 (0.7)	256 (2.0)	29 (1.4)	239 (1.8)	13 (0.8)	234 (1.8)	7 (0.6)	231 (2.8)
Missouri	36 (1.3)	280 (1.7)	22 (0.9)	275 (1.5)	29 (1.0)	284 (1.6)	8 (0.7)	254 (2.4)	6 (0.5)	252 (2.9)
Nebraska	46 (1.5)	287 (1.2)	20 (1.0)	280 (1.6)	24 (1.2)	267 (1.7)	4 (0.5)	247 (3.3)	6 (0.6)	256 (3.8)



G. Oehlert, rev. by S. Weisberg, School of Statistics, University of Minnesota, 2/2008

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A Few Last Things To Remember

- ▶ Align your data.
- ▶ Avoid **FANCY FONTS** (use bold for titles and headings).
- ▶ Arrange numbers in columns for comparison (so they are closer and the digits line up).
- ▶ Use row or column summaries (e.g., means or totals), to provide a standard of usual.
- ▶ Remove excess lines/boxing -- thin, straight, borders under the title and heading cells and under the main body of data.
- ▶ Use space to emphasize groups/gaps; use caution though, excess space breaks adjacency.
- ▶ Power point tables should usually have fewer than 24 data points.



Example: Survey

Table 6b: Percent of Cohort Survey Respondents Who Reported the Following Efforts to Engage and Retain Them Happened Regularly at their Beacons

	Spring 2015 N=232
Activities were interesting	91%
I got to learn new things	91%
There were things going on that made me want to stay involved	87%
Activities were challenging	83%
Youth were encouraged to participate by staff	91%
Youth were encouraged to participate by other youth	86%



Example: Survey by Responses

Table 3: Percent of Participants Who Think They Will Be Helped by Allied Against Violence (AAV) Training

Percent of Training Participants (N=93) who Think AAV Training Will Help Them:↓	Some	A Lot	TOTAL
Discuss issues of violence with clients	44%	56%	100%
Access additional strategies for self-care/stress reduction	47%	51%	98%
Provide positive interventions for clients	32%	65%	97%
Understand the importance of self-care/stress reduction	58%	38%	96%
<i>Offer clients new ways to:</i>			
De-escalate Situations	31%	67%	98%
Manage Anger	54%	43%	97%
Do safety planning	45%	52%	97%
Conduct Bystander Interventions	39%	58%	97%

Note: the difference between the total and 100% is the proportion who indicated they did not expect the training would help them at all. For each question fewer than 5 participants indicated the training did not help them at all.



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Example: Record Review Comparison

Table 1.3: Participation and Accomplishments for Students in College Access Programs, 2009

	City 1	City 2	Total
PROGRAM PARTICIPATION			
Percent of Students/Families who were involved in:	N=239	N=334	N=573
Mentoring	44%	53%	49%
SAT/ACT Prep	54%	41%	47%
Accelerated Coursework	2%	6%	4%
Parent Education	51%	46%	49%
Financial Aid Information	84%	87%	86%
PARTICIPANT MILESTONES			
Percent of Students who:	N=61	N=79	N=140
Completed FAFSA*	75%	84%	80%
Submitted College Applications*	68%	87%	78%
Reported College Acceptance* [Applicants Only]	72%	79%	76%

*These data are only for grade/age eligible students.



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Example: Record Review Comparisons

Table 3: Changes in Average Attendance at New and Mature Sites, 2014-15 – 2015-16

	New Sites	CHANGE	Mature Sites	CHANGE
Avg. Total Hours 2014-15	79	+86%	132	+26%
Avg. Total Hours 2015-16	147 ↑		166↑	

New sites began serving students in 2014-5, mature sites began serving students in 2012-13.
Target = 150 hours



Example: Survey Comparison

Table 6: Self-Reported Attendance and Plans to Continue Attending Afterschool Programs, Spring 2015 v. Spring 2016

	Spring 2015	Spring 2016
ASP PROGRAM CONNECTIONS		
Attended prior year	45%	66%↑
Attended prior summer	32%	51%↑
Plans to come next summer	42%	55%↑
Plans to come next school year	45%	70%↑



Disaggregation and Definitive Statements

	Walk-in Visitors n=442	Second Saturdays n=244	First Thursdays n=589	Community Days n=563	Total n=1838
Black or African- American	6%	20%	10%	14%	12%
Hispanic/ Latino	5%	17%	9%	9%	9%
Caucasian	80%	51%	75%	62%	69%

- Most of the adult walk-in visitor respondents (80%) identified their race/ethnicity as white. The others identified as Black or African American (6%), Hispanic or Latino (5%) or *other* (9%).
- The racial/ethnic composition of the Second Saturday, Community Days and First Thursday groups were quite different. A total of 20% of Second Saturday respondents, 14% of Community Days and 10% of First Thursday respondents indicated they were Black or African American; 17% of Second Saturday respondents, and 9% of First Thursday and Community Days respondents indicated they were Hispanic or Latino.



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Table 22: Percent of Scholarship Recipient Respondents Who Agreed with the Following Statements About Scholarship Impact.

% who <i>agreed</i> their Community Foundation scholarship . . . (n=268)	
Helped them continue their post-secondary education	92%
Helped them attend their top choice college	81%
Made it possible to afford attendance at college	51%
Limited their access to other financial aid.	11%

Almost all recipient respondents reported their scholarships helped them persist and allowed choice. A few experienced negative consequences.



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Example: Disaggregation

Table 22b. Scholarship Impacts, by Race/ethnicity and Family Income

% of respondents who reported their scholarship was <i>very helpful</i>	
Recipients who identified as African American	82%
Recipients who identified as Caucasian	37%
% of respondents who reported their scholarship made it possible for them to attend at all	
Recipients whose families earned less than \$50,000	63%
Recipients whose families earned \$50,000 or more	28%



Example: Survey Comparison (Sample)

Table 1.3: Self-reported Progress and Enrollment Plans for Freshmen, by Peer Study Group Participation Status, 2015-16

% of 2015-16 Freshman who . . .	Peer Study Group		Total
	Yes n=212	No n=257	N=479
Reported struggling to maintain grades	36%	58%	47%
Are planning to enroll for the sophomore year at this school	89%	73%	80%

Note: A total of 1000 Freshmen were enrolled 2005-06, about ½ of whom were involved in Peer Study groups.

- Only about 1/3 of freshman in peer study groups reported struggling to maintain their grades compared to ½ of those not in study groups.
- Proportionately more study group participants are planning to enroll for sophomore year.



Example: Pre - Post and Change

Table 2. Changes in Attitudes about the Importance of a Free Press, among News Literacy Project Students in Chicago, New York and Washington, D.C., 2014-15, n=511

	Pre	Post	Change
% who <i>agree</i> that having a free press is important	53%	42%	
% who <i>strongly agree</i> having a free press is important	37%	52%	+15
% who <i>agree/strongly agree</i> that having a free press is important	90%	94%	



Graph Basics

- ▶ Know and understand your data - PLUS you need a good sense of how the reader will visualize the graph.
- ▶ Beware poor choices or deliberately deceptive choices that provide a distorted picture of numbers and relationships.
- ▶ Minimize or eliminate any element that does not aid in conveying what the numbers mean.



CHART I

COMPARATIVE CONCENTRATION OF INCOME IN THE MAJOR WESTERN NATIONS (CIRCA 1980)

Pre-Tax Income Distribution in Industrial Nations



Note: Figures for household income generally show a greater gap than those for family income cited for the United States and Canada in the story and definitions of "household" vary somewhat among countries. Figures are for various years in the late 1970's and early 1980's.

Sources are individual governments and the World Bank.

Source: *Los Angeles Times*, October 21, 1984

Note: The ratios for Japan changed significantly in the late 1980s.

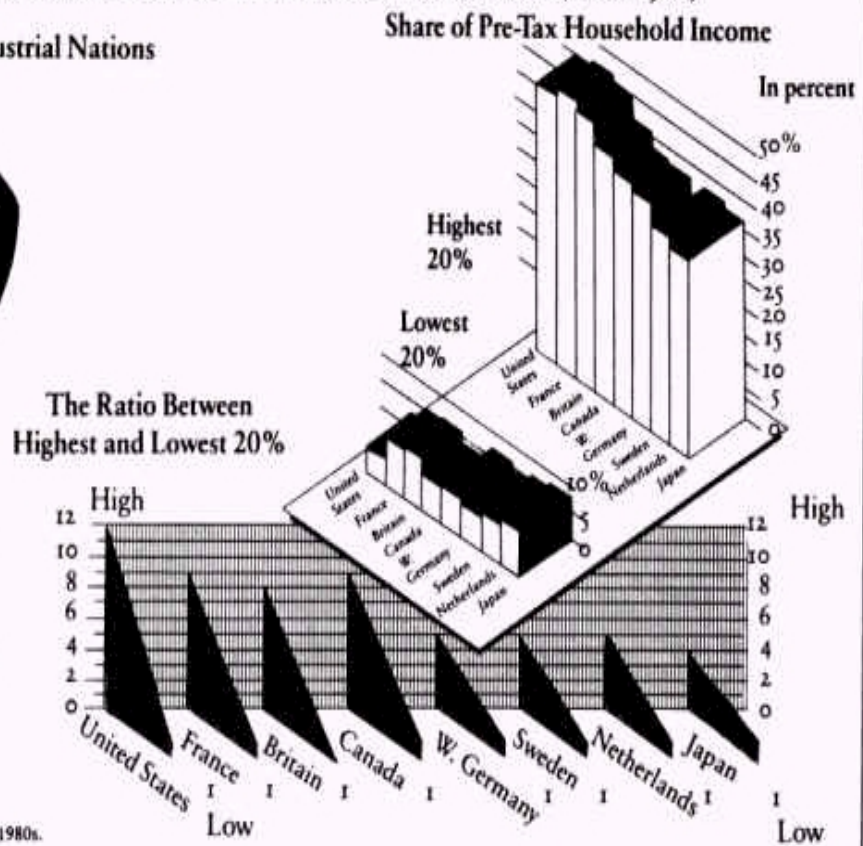


Chart I: Extraneous Features

- A completely irrelevant map of the world.
- Two entirely different kinds of 3-D charts displayed at two different perspectives.
- Country names are repeated three times.
- To display 24 numeric data points, 28 numbers are used to define the scales.
- The countries are sorted in no apparent order (not even alphabetically).
- Note the use of the letter "I" to separate the countries on the bottom chart.



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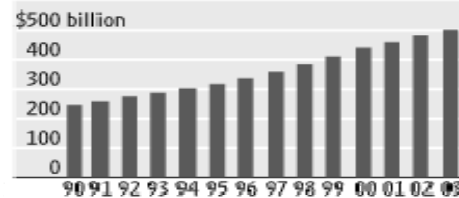
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Wall Street Journal Data Distortion

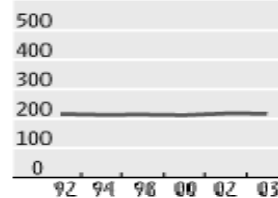
Money for Nothing

Education spending rises but test scores are flat

Total Funding for K-12



Reading Scores



Notes: Appropriations do not include funding for special education. Reading scores are the average for fourth-graders, according to the National Assessment of Educational Progress. A score of 200 implies an ability to understand, combine ideas and make inferences based on short, uncomplicated passages about specific or sequentially related information.

Source: U.S. Department of Education Budget Service and NAEP

[Wall Street Journal editorial](#), "No Politician Left Behind, Lack of money isn't the problem with education."

http://ilt.ilstu.edu/jpda/charts/bad_charts1.htm#Junk



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Data Distortion Examples

- The data on spending is not adjusted for inflation or the growth in the number of pupils.
 - In theory, 500 is the maximum score on the NAEP scale-scored math tests, but no student ever reaches this standard.
- * The average score for high school seniors on the same scale is just over 300.



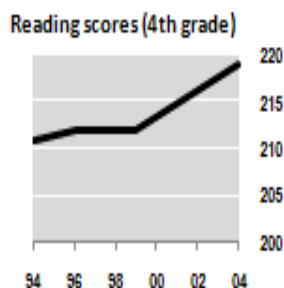
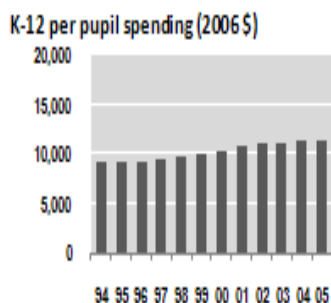
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Data Distortion Adjustments

- Including [more recent data](#), and adjusting the reading score scale, we get a much different picture:



http://iilt.ilstu.edu/jpda/charts/bad_charts1.htm#Junk



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More Graph Basics

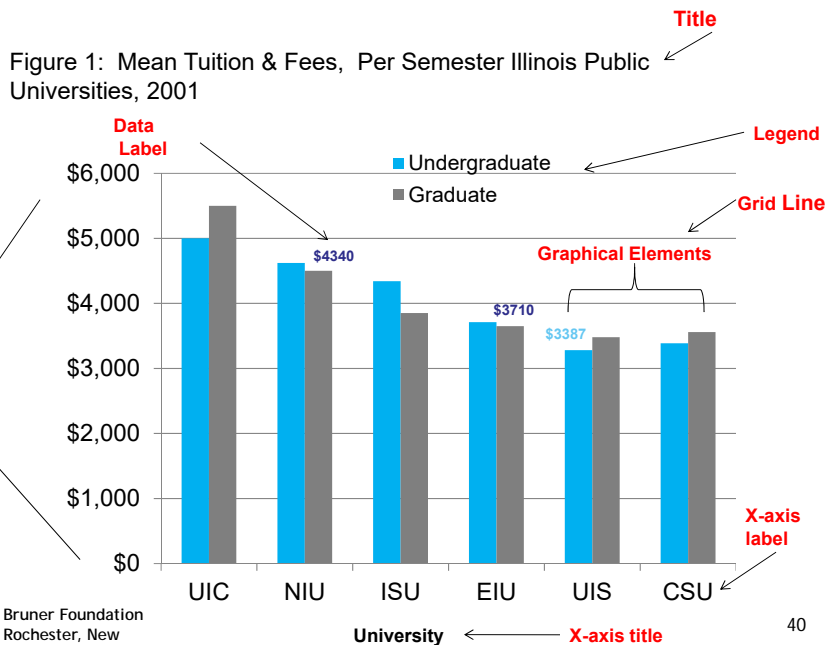
- ▶ There are 3 main types of graphs.
 - Pie Charts (composition)
 - Bar Graphs (description, comparison)
 - Line Graphs (trends over time)
- ▶ There are 3 parts to a graph: labels, scales, graphical elements.
 - Label - titles, axes, legends, data series
 - Scales especially for Y
 - Graphical elements (e.g., the bar in the bar graph).



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Graph Specifics

- ▶ Title defines what is in the graph, or states the conclusion you want the reader to reach.
- ▶ Axis Titles should be brief -- do not use if the info is clear from the table title.
- ▶ Axis Scale/Data Labels - define magnitude:
 - Avoid using too many numbers
 - If you label the value of each individual data point do not label the Y axis.

If it seems necessary to label every value in a graph - consider using a table.



Graph Specifics - Continued

- ▶ Legends required for multiple data series.
 - Inside or on the bottom is best location (NOT outside)
- ▶ Gridlines - if used at all should use as little ink as possible.
- ▶ The amount of ink given to non-data elements should be limited.
- ▶ Plot area borders or shading are unnecessary.
- ▶ AVOID using any un-necessary 3-D effects.

Keep graphs simple, but don't underestimate your reader. If it's better said than shown, then say it.



Rules for Pie Charts

- ▶ Avoid using pie charts
- ▶ Use pie charts only for data that add up to some meaningful total.
- ▶ Never use three-dimensional pie charts
- ▶ Avoid forcing comparisons across more than one pie chart.
- ▶ These rules go for donut charts too, just because you CAN do it easily, doesn't mean you should.



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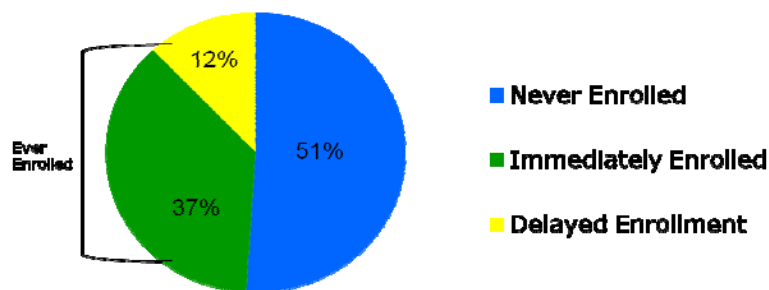
http://ilt.ilstu.edu/jpda/charts/bad_charts1.htm#Junk

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Pie Charts Show Composition of a Whole Group

**Figure 1:
College Enrollment Among HS Graduates
from Graduating Classes 2003-2009**

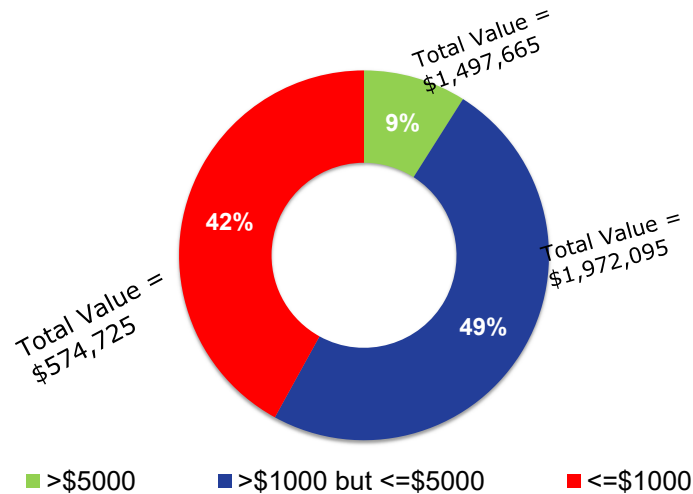


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About half of all scholarship recipients received awards ranging between \$1000 and \$5000.



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Rules for Bar Charts

- ▶ Minimize the ink. Do not use 3-D effects.
- ▶ Sort the data on the most significant variable.
- ▶ Use rotated bar charts (i.e., horizontal) if there are more than 8 - 10 categories
- ▶ Place legends inside or below the plot area
- ▶ Keep the gridlines faint.
- ▶ With more than one data series beware of scaling distortions.

Bar charts often contain little data, a lot of ink and rarely reveal ideas that cannot be presented more simply in a table.

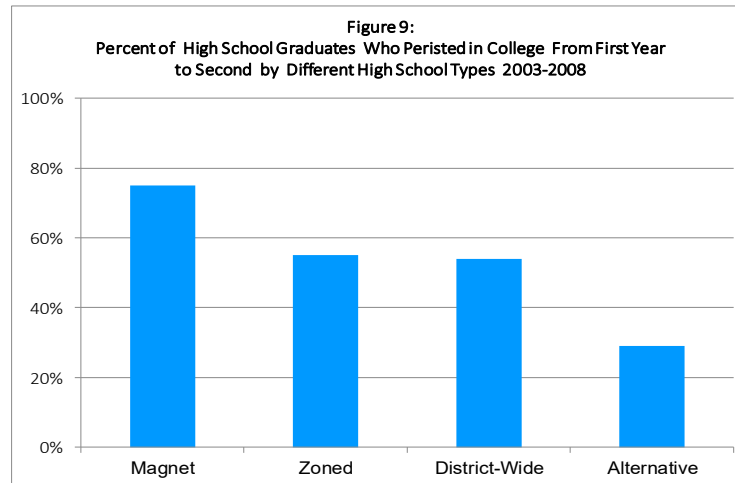


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Bar Graphs Show Frequencies Horizontal or Vertical

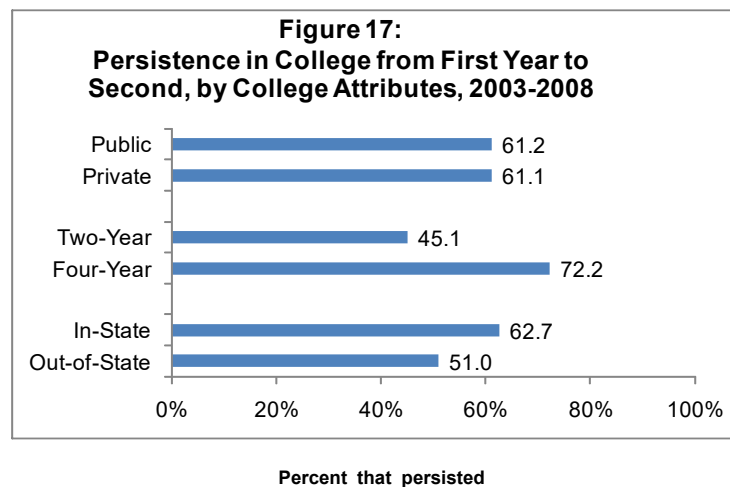


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Bar Graphs Show Frequencies Horizontal or Vertical

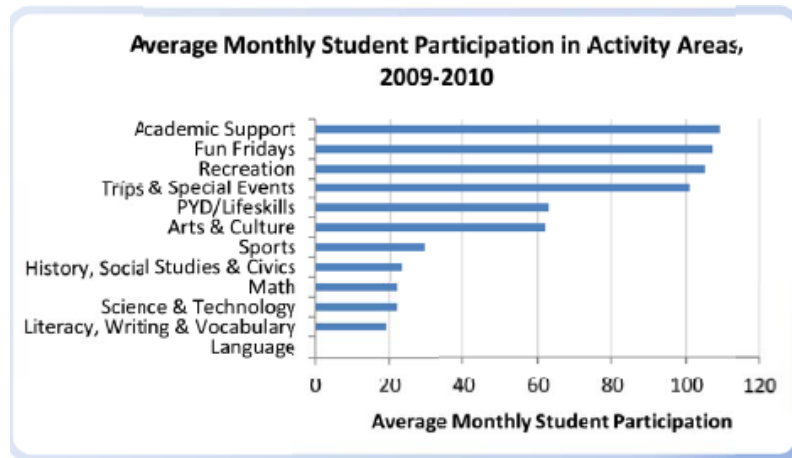


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Bar Graphs Show Frequencies Horizontal or Vertical

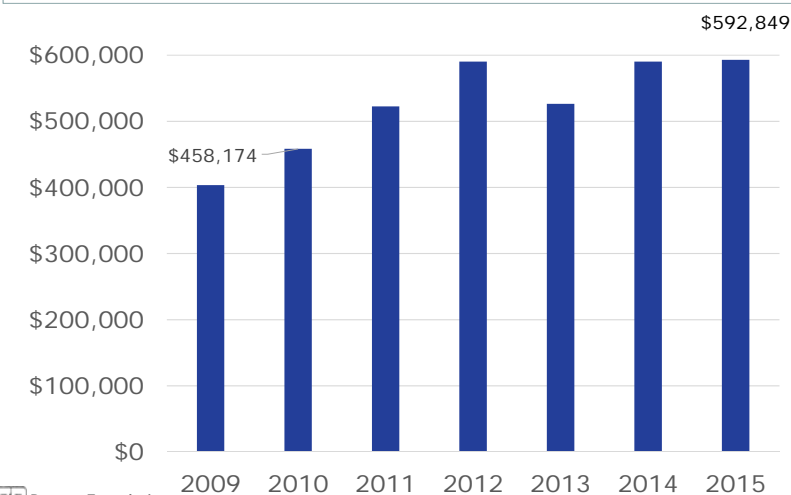


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Substantial and Increased Scholarship Activity: Awards 2009 - 2015



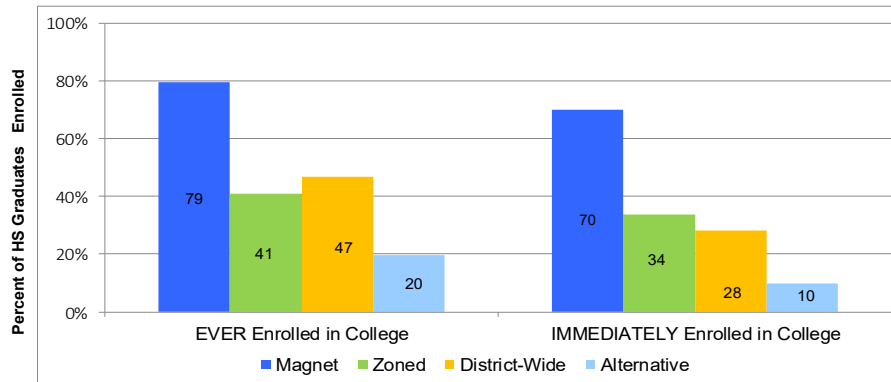
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Bars Can be “Clustered” to Show Differences or Change

Figure 3b
College Enrollment Among Students from Different Types of High Schools, 2003-2009



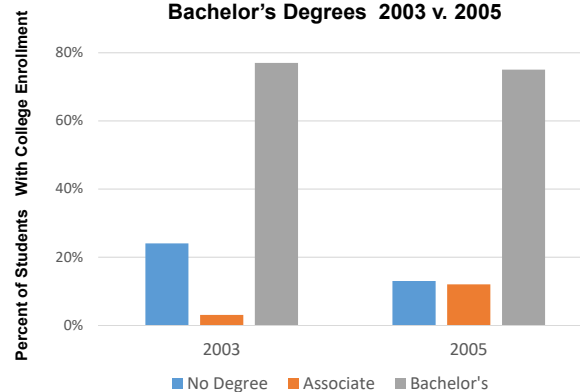
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Bars Can be “Clustered” to Show Differences or Change

Figure 4b
Proportion of HS Graduates with College Enrollment, Who Earned No Degree, Associate Degrees or Bachelor's Degrees 2003 v. 2005



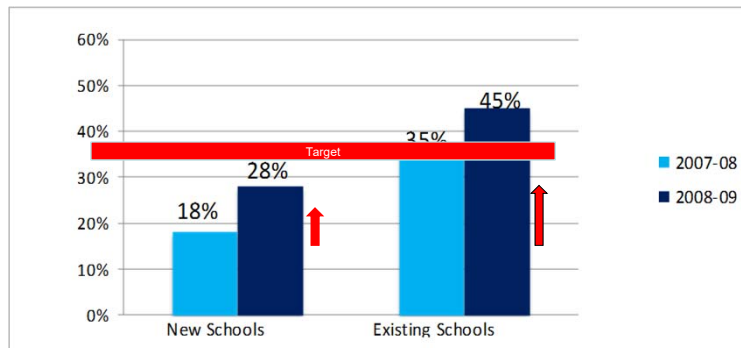
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Bar Graphs Can: Show Change Over Time, Show Targets, Be Enhanced

Percent of CSI Participants with High Attendance
(100 or more hours), by Year



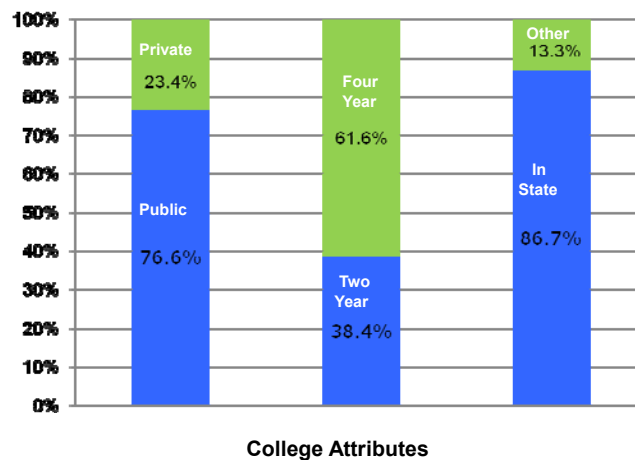
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Stacked Bars Show Distributions

Figure 12 Types of Colleges First Attended
for HS Graduates 2003-2009



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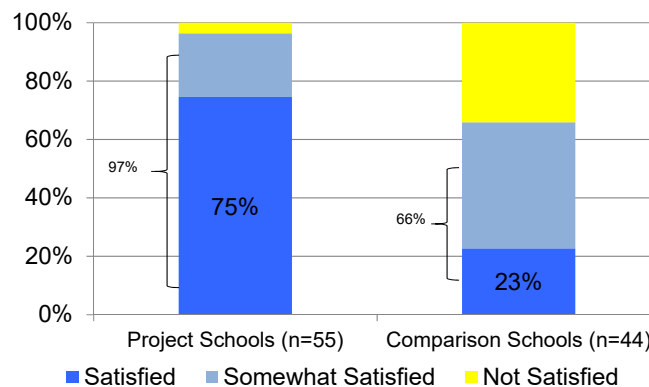
54

Stacked Bar Charts: Advice

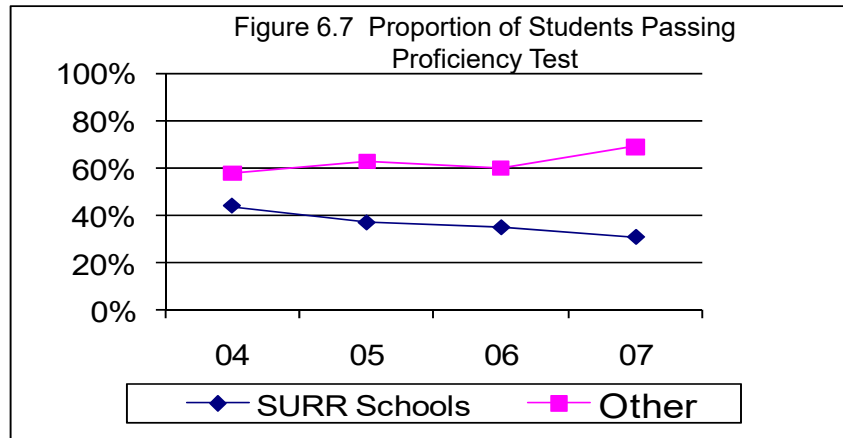
- Use with caution especially when there is no implicit order to the categories.
- Stacked bar charts work best when the primary comparisons are to be made across the data series represented at the bottom of the bar.



Figure 3: Survey Results:
Percent of Principals Who are Satisfied with K - 3 Literacy Achievement at Project Schools and Comparison Schools



Line Graphs Show Change Over Time

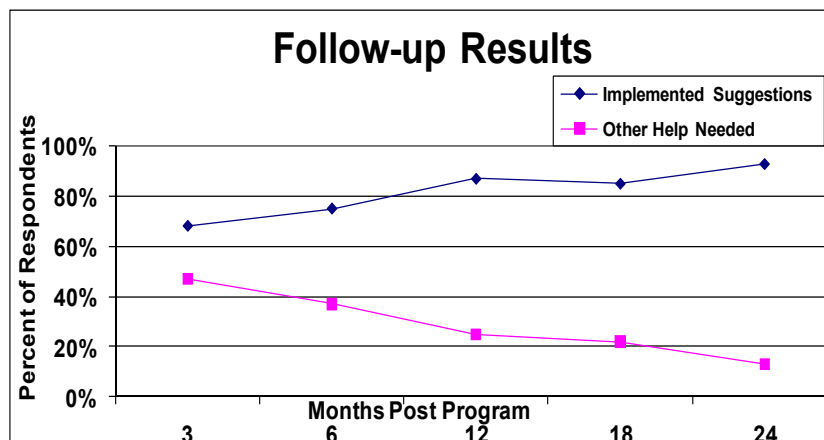


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Percent of Program Completers Who Implement Suggestions, Still Need Help, Over Time N=1252



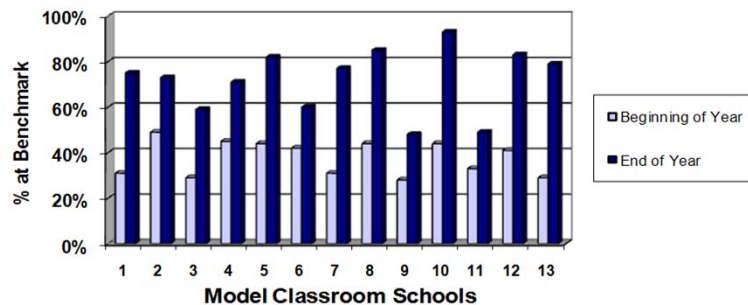
Rules for Time Series (Line) Graphs

- Time is almost always displayed on the X-axis from left to right.
- Display as much data with as little ink as possible
- Make sure the reader can clearly distinguish the lines for separate data series
- Beware of scaling effects
- When displaying fiscal or monetary data over-time, it is usually best to use deflated data (e.g., inflation-adjusted).



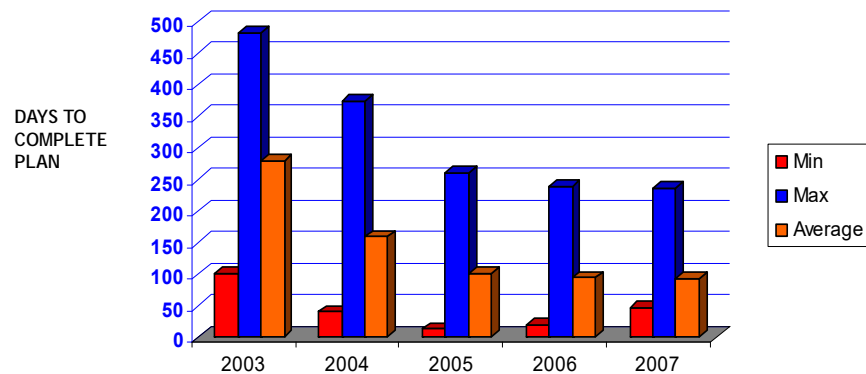
K Student Outcomes (2008-09)

Percentage of Kindergarten Students
in Model Classroom Schools
'At Grade Level' (school year 2008-2009, N=995)



FCPS Selected Findings

- While the numbers of plans have increased, time to develop them has substantially decreased.



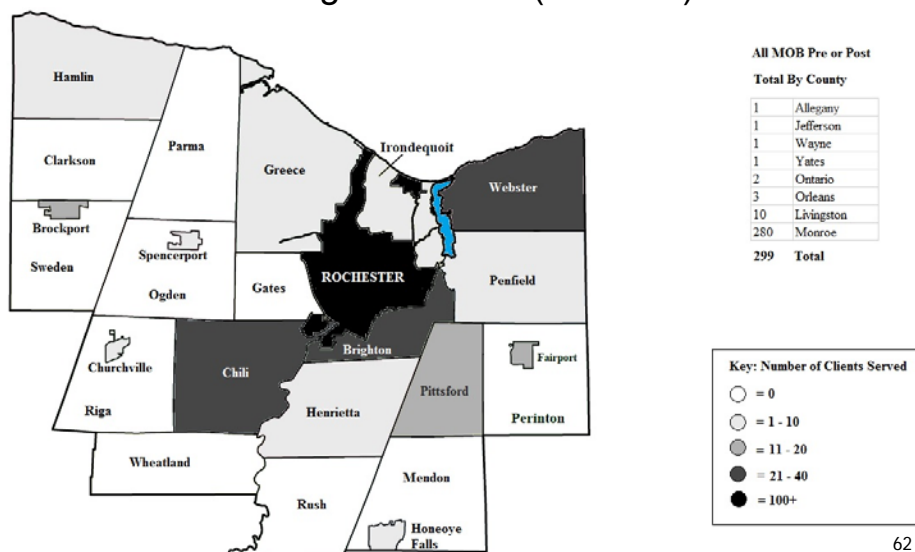
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Location of M.O.B. Participants, Falls Prevention Program Year 1 (2013-14)



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JUL 26 2011

PUT GRAB BARS IN THE SHOWER
TIGHTEN LEGS ON DINING ROOM TABLE
PUT GRAB BARS ON BOTH SIDES
OF THE BATHROOM DOOR
PUT GRAB BARS ON BOTH SIDES
OF THE BACK HALL DOOR
PUT GRAB BARS ON THE DECK
DOOR
INSTALLED NEW BATHROOM FAUCETS
PUT A GRAB BAR NEXT TO THE
WHEEL CHAIR RAMP
HE HAS REPLACED MANY
LIGHT BULBS
THESE REPAIRS WERE
DONE OVER 4-5 YEARS
MY HUSBAND IS NOW BLIND, 80,
CONFINED TO BED AND
USING A WHEEL CHAIR
HE WORKED HARD + HELPED MANY

-3-

WE TRULY APPRECIATE ALL
THE WORK THE HANDY MAN
HAS DONE.

HE HAS ALWAYS BEEN
POLITE, COMPETENT AND
MADE US FEEL GOOD AND TREATED
SHOWN US WITH RESPECT.

THANK YOU SO MUCH.

Use items from participants
that you photograph. Be
sure to protect
confidentiality

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CONCLUSIONS



Use stock photos

- ▶ Marshall Fund resources have been used to provide important programs in multiple areas.
- ▶ Careful attention has been paid to donor intent.
- ▶ Programs and services have been promoted around the county. Distribution is not completely equitable, but there is widespread use.
- ▶ Services have contributed to desired outcomes.

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Beyond the Line Graph and Bar Chart:
Infographics of Community Change

Evaluation 2012: Evaluation i
October 20

How to move beyond:

- Find the story in your data.
- Make it visual.
- Strive to be *clear*, not *different*.
- Simplify!

Consider infographics! Graphic visual representations of information

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Math for Evaluators The Magic of Proportions

- 1) To calculate percentage divide the numerator into the denominator. Think Notre Dame (N/D) - but the denominator must be specified carefully.
 - ✓ Total percents include all possible.
 - ✓ Valid percents include only those for whom there is data.



Math for Evaluators The Magic of Proportions

	Frequency	Total Percent	Valid Percent
No, Not Really	62	29.7	33.5
Yes, Somewhat	66	31.6	35.7
Yes, Definitely	57	27.3	30.8
Total	185	88.6	100.0
System Missing	24	11.4	
TOTAL	209	100.0	





Math for Evaluators The Magic of Proportions

2) You can combine percentages for the parts of a whole group by adding.

3) Response "rate" is a special kind of percentage:

*Denominator must be adjusted for non-viable administration (e.g., returned mail)

*Desirable response rates (like targets) must be determined in advance.



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Math for Evaluators Showing Change

1) To calculate percent change:

$$[(\text{NEW VALUE} - \text{OLD VALUE}) / \text{OLD VALUE}] * 100$$

To check this for increases multiply: old value * 1-change value

* To check this for decreases multiply: old value * 1-change value

Use this when you are comparing two numbers. Label with units.

2) To calculate percentage point change:

$$(\text{Time 1\%} - \text{Time 2\%}) \text{ OR } (\text{Time 2\%} - \text{Time 1\%})$$

Label as percentage point change



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Math for Evaluators Showing Change: Examples



	2006	2007	Difference
Total Participants	174	190	
Plans Completed	125	167	
% Completing Plans	72%	88%	

Do the math:



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