Data Presentation Techniques to Support the Planning Cycle

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Post-Training Webinar
By jointly considering person, place, and time, epidemiology embraces the idea that health and disease are byproducts of the intersection between individuals and their environment.

In addition, epidemiology guides both study design and analysis, which in turn guide the statistics we report.

In MCH epidemiology, our goal is to best support the planning cycle with relevant data.
Planning your Analysis

After defining the right question(s) and laying out the conceptual/theoretical framework, the challenge is to develop a **systematic analysis plan** in order to effectively utilize, analyze, interpret and summarize data.

Without a systematic approach, it is likely that data will not be successfully translated into the information needed by program planners, managers, stakeholders and policy-makers.
Linking Presentation Techniques to an Analysis Plan

As part of developing an analysis plan, try to visualize or describe what it is you want to communicate and link presentation techniques to the analysis plan (tables, charts/graphs, text/narrative) before even looking at data.

The organization and format of these table, charts and text may differ depending on your audience, your goal, and the type of results displayed (i.e., descriptive statistics, bivariate comparisons, results of multivariable methods, etc).
Communicating Results – Steps for Success

1. Start with the **message** you are trying to convey and the **scope** of the analysis

**Assessment:** Many indicators with a set of person, place and/or time variables

**Identifying Strategies for Prioritized Problem:** One indicator with many person, place, time variables; communicating associations between risk/protective factors and problem

**Performance Monitoring:** One or multiple indicators over time, overall and possibly stratified by person/place variables

**Quality Improvement:** One or many indicators across many timepoints, overall and possibly stratified

**Evaluation:** Communicating associations between program activities and outcomes
Communicating Results – Steps for Success

2. Consider your audience
   - Stakeholders
   - Politicians
   - General Public
   - Scientific Community

3. Consider the form of the data
   - Prevalence estimates (“row percents”)
   - Distributions (“column percents”)
   - Measures of effect (conveying significance)
   - Impact measures
Communicating Results – Steps for Success

4. Determine if text, table, chart (what type?), or all are needed to communicate the message

5. For visuals, determine where to display each variable, which should be featured (and how?) and the best design for the remaining objects (axes, legends, labels, etc)

6. For text, determine how best to interpret and communicate results and implications of results

7. Check back to Step #1 to make sure your final product communicates the message you want to convey

*Modified from* Stephen Few’s Whitepaper “Communicating Numbers”
http://www.perceptualedge.com/articles/Whitepapers/Communicating_Numbers.pdf
Presenting Data in Tables

Convey large amount of data in systematic way

Effective tables include:

- Table number and title that clearly identifies the data displayed
- Clear and concise column and row headings
- Decimal alignment
- Expanded forms of abbreviations used in the tables as footnotes
- Additional explanatory footnotes as needed
- Documentation of source and year of data

Presenting Data in Charts/Graphs

Summarize data and highlight main points

Line Charts:
- Trend
- Continuous variables
- “Survival” Data

Bar Charts (vertical and horizontal):
- Prevalence data for discrete groups
- Distributions/Proportions (100% stacked bars)
- Trend

Pie Charts:
- Distributions/Proportions
- Population Attributable Fractions (PAFs)
Analytic Design Principles (Tufte)

1. Comparisons
2. Causality, Mechanism, Structure, Explanation
3. Multivariate Analysis
4. Integration of evidence
5. Documentation
6. Content Counts Most of All

Principle 1: Comparisons

*Show appropriate comparisons, contrasts, differences*

To define and describe the overall magnitude of a problem in your target population, you need univariate statistics for your target population plus relevant comparison group(s)
Principle 1: Comparisons – Column vs Row Percents in Tables

Table 1. Distribution (%) of Selected Maternal Characteristics Among Low Birth Weight and Non-Low Birth Weight Infants, Cook County, Illinois, 1989–1991

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>LBW Infants (n = 5,365)</th>
<th>Non-LBW Infants (n = 35,283)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age, years*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>23.1</td>
<td>26.1</td>
</tr>
<tr>
<td>20–35</td>
<td>76.9</td>
<td>73.9</td>
</tr>
<tr>
<td>Maternal education, years*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing data</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>&lt;12</td>
<td>39.5</td>
<td>32.5</td>
</tr>
<tr>
<td>12</td>
<td>37.0</td>
<td>37.6</td>
</tr>
<tr>
<td>&gt;12</td>
<td>22.5</td>
<td>29.0</td>
</tr>
<tr>
<td>Adequacy of prenatal-care utilization (13)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing data</td>
<td>7.2</td>
<td>3.3</td>
</tr>
<tr>
<td>None or inadequate</td>
<td>31.6</td>
<td>29.5</td>
</tr>
<tr>
<td>Intermediate</td>
<td>15.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Adequate</td>
<td>17.7</td>
<td>25.4</td>
</tr>
<tr>
<td>More than adequate</td>
<td>28.1</td>
<td>18.2</td>
</tr>
</tbody>
</table>

Abbreviation: LBW, low birth weight.
* P < 0.05.

Table 1. LBW Rates by Selected Maternal Characteristics, Cook County, Illinois, 1989-1991

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% LBW (n=40,648)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age, years*</td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>11.9</td>
</tr>
<tr>
<td>20–35</td>
<td>13.7</td>
</tr>
<tr>
<td>Maternal education, years*</td>
<td></td>
</tr>
<tr>
<td>Missing data</td>
<td>16.0</td>
</tr>
<tr>
<td>&lt;12</td>
<td>15.6</td>
</tr>
<tr>
<td>12</td>
<td>13.0</td>
</tr>
<tr>
<td>&gt;12</td>
<td>10.5</td>
</tr>
<tr>
<td>Adequacy of prenatal-care utilization (13)*</td>
<td></td>
</tr>
<tr>
<td>Missing data</td>
<td>24.9</td>
</tr>
<tr>
<td>None or inadequate</td>
<td>14.0</td>
</tr>
<tr>
<td>Intermediate</td>
<td>9.0</td>
</tr>
<tr>
<td>Adequate</td>
<td>9.6</td>
</tr>
<tr>
<td>More than adequate</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Abbreviation: LBW, low birth weight.
* P < 0.05.

From Collins, et al. (2009). Transgenerational Effect of Neighborhood Poverty on Low Birth Weight Among African Americans in Cook County, Illinois, AJE
Principle 1: Comparisons – Column vs Row Percents in Charts

Principle 1: Comparisons – Column vs Row Percents in Charts

Fig 1: Distribution of maternal lifelong residential environment by race; Cook County, IL; 1956-1975, 1989-1991
Principle 1: Comparisons – Column vs Row Percents in Charts

Distribution of Teen Births (15- to 19-Year-Olds) by Race and Hispanic Ethnicity, Colorado, 2006

http://www.cdc.gov/TeenPregnancy/Colorado.htm
Birth Rates (live births) per 1,000 Women Aged 15–19 Years, by Race and Hispanic Ethnicity: Colorado and United States, 2006

http://www.cdc.gov/TeenPregnancy/Colorado.htm
Prevalence (%) of unintended pregnancy by selected maternal characteristics, MOPRA, 2005

**Principle 1: Comparisons – One indicator/outcome, many subgroup comparisons**

HP 2010: 30%
Principle 1: Comparisons – Highlight Value of Interest

Death rates among children 1–19 years of age, by OECD country

SOURCE: CDC/NCHS, *Health, United States, 2010*, Figure 26. Data from the World Health Organization.
Principle 2: Causality, Mechanism, Structure, Explanation

Show causality, mechanism, explanation, systematic structure

Highlight policies, interventions, risk factors, or changes in human behavior that:

- May have caused an association or trend
- May be changed in an effort to address a problem or reverse a trend
Principle 2: Suggesting Causality

SIDS Rate and Sleep Position
U.S. Infants 1985 - 2006


Sleep Position Source: NICHD
NISP Household Survey
SIDS Rate Source: National Center for Health Statistics, CDC
Updated 05/27/2009

• AAP SIDS Statement 1992
• Back to Sleep Campaign 1994
Much of the high infant mortality rate in the United States is due to the high percentage of preterm births.

NOTES: IMR is infant mortality rate. Excludes births at less than 22 weeks of gestation.
Principle 2: Suggesting Causality

*Estimated by calculating the proportion of deaths attributable to racial disparity (28.2%) and subtracting this proportion of deaths from the actual observed rates.
Principle 3: Multivariable Analysis

Show more than 1 or 2 variables

- Use stratification to show differences across groups
- Use regression modeling when appropriate to capture multivariable nature of problem
- Use and communicate adjustment procedures
Individual-Level Risk Factors for Childhood Obesity

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watches &gt;2 Hrs TV</td>
<td>2.5</td>
</tr>
<tr>
<td>Watches No TV</td>
<td>1.5</td>
</tr>
<tr>
<td>No Participation in Sports</td>
<td>3.5</td>
</tr>
<tr>
<td>No Participation in Clubs-Organizations</td>
<td>2.5</td>
</tr>
<tr>
<td>Inadequate Exercise</td>
<td>1.5</td>
</tr>
</tbody>
</table>

*Adjusted for Socio-Demographic & Community Risk Factors

Data Source: National Survey of Children’s Health, Florida and US 2003/4

Note: The scale is different for ratio measures <1 (protective factors) versus those >1; see Appendix B for an example
Principle 3: Multivariable Analysis-Presenting Predicted Values from Models

Prevalence of Late Preterm Birth for High and Low Risk Non-Hispanic White and African-American Women

High risk = Age 35+, less than HS education, 3+ previous livebirths, smoker
Low risk = Age 20-34, more than HS education, 1-2 previous livebirths, non-smoker

Prevalence estimates from a multivariable log binomial regression model (see Appendix A for code used to generate these data)
Information about relationships between risk factors and MCH outcomes is reported using an approach called “adjustment”. This approach accounts for differences among women that might distort what we see. For example, the relationship between cigarette smoking and infant mortality might be distorted unless we “adjust” for the fact that smokers are often younger and have less education than non-smokers.
Principle 4: Integration of Evidence

Completely integrate words, numbers, images, diagrams

- Integrate information about multiple outcomes or about multiple risk markers/risk factors for one outcome to improve understanding
- Blend graphical representations of data with short narrative to help with interpretation
- Use clear titles, direct labels and footnotes
- Avoid legends as much as possible or put them inside the chart to maximize the chart area and keep the labels closer to the data
Principle 4: Integration of Evidence - Multiple dimensions of one indicator

Child Mortality at Record Low; Further Drop Seen
By DONALD G. McNEIL Jr.
Published: September 13, 2007 in the New York Times

- Quantification of problem
- Trend
- Geographic Variation
- External Comparisons
- Cause of Death
Principle 4: Integration of Evidence - Multiple indicators with common dimensions

By NICHOLAS BAKALAR
New York Times, Jan 25, 2010

Tricking Excel to do this: http://peltiertech.com/Excel/Charts/ArbitraryGridlines.html
Infant Mortality in 2001-2003: North Carolina and the U.S. by Cause of Death

If North Carolina could have reduced its mortality due to prematurity to that of the U.S., 220 fewer infants would have died in 2001-2003, and the state infant mortality rate would have been reduced from 8.2 to 7.6 per 1,000 live births.
From 1970 to 2006 the proportion of first births to women aged 35 years and over increased nearly eight times (1,2). In 2006, about 1 out of 12 first births were to women aged 35 years and over compared with 1 out of 100 in 1970. According to preliminary data, the proportion for 2007 was the same as in 2006 (3). In 2006, only 21% of first births were to mothers under age 20, down from 36% in 1970 (Figure 2).

Figure 2. Percentage of first births, by age of mother: United States, 1970–2006

Principle 5: Documentation

**Thoroughly describe the evidence**

- Provide a detailed title
- Indicate authors and sponsors
- Document data sources and years
- Show complete measurement scales
- Acknowledge error (confidence intervals) in estimates when appropriate
- Communicate statistical significance when appropriate
Principle 5: Documentation - Importance of Clear Titles

### TABLE 2 Individual, Condition-Related, and System-Related Characteristics of CSHCN Aged 12 to 17 Years (N = 16 876) Who Reside in High-, Medium-, and Low-Performance States With Regard to Transition Services. 2005–2006 National Survey of CSHCN

<table>
<thead>
<tr>
<th></th>
<th>High-Performance States (N = 4244)</th>
<th>Medium-Performance States (N = 10 989)</th>
<th>Low-Performance States (N = 1643)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Weighted %</td>
<td>95% CI</td>
</tr>
<tr>
<td><strong>Individual characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>186</td>
<td>5.5</td>
<td>4.3–6.9</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>160</td>
<td>11.3</td>
<td>9.2–13.7</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>3898</td>
<td>17.5</td>
<td>16.8–18.3</td>
</tr>
<tr>
<td>Household education level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>100</td>
<td>9.8</td>
<td>7.1–13.3</td>
</tr>
<tr>
<td>High school</td>
<td>637</td>
<td>14.8</td>
<td>13.2–16.6</td>
</tr>
<tr>
<td>More than high school</td>
<td>3497</td>
<td>15.8</td>
<td>15.2–16.6</td>
</tr>
<tr>
<td>Family household structure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-parent household (2 biological/adoptive parents)</td>
<td>2324</td>
<td>16.3</td>
<td>15.3–17.2</td>
</tr>
<tr>
<td>2-parent household (2-parent step-families)</td>
<td>601</td>
<td>17.5</td>
<td>15.4–19.8</td>
</tr>
<tr>
<td>1-parent household (mother only)</td>
<td>940</td>
<td>13.0</td>
<td>11.7–14.4</td>
</tr>
<tr>
<td>Other family household structures</td>
<td>259</td>
<td>15.0</td>
<td>12.4–18.1</td>
</tr>
<tr>
<td>Family poverty level, % FPL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–99</td>
<td>386</td>
<td>12.4</td>
<td>10.6–14.4</td>
</tr>
<tr>
<td>100–199</td>
<td>884</td>
<td>14.6</td>
<td>13.1–16.3</td>
</tr>
<tr>
<td>200–399</td>
<td>1579</td>
<td>17.2</td>
<td>16.0–18.5</td>
</tr>
<tr>
<td>≥400</td>
<td>1395</td>
<td>15.3</td>
<td>14.2–16.5</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSA</td>
<td>1828</td>
<td>14.3</td>
<td>13.5–15.1</td>
</tr>
<tr>
<td>Non-MSA</td>
<td>636</td>
<td>18.4</td>
<td>16.6–20.4</td>
</tr>
<tr>
<td>&lt;500 000 in nonmetropolitan areas</td>
<td>375</td>
<td>6.9</td>
<td>6.2–7.6</td>
</tr>
<tr>
<td>&lt;500 000 in metropolitan areas</td>
<td>376</td>
<td>43.0</td>
<td>40.5–45.8</td>
</tr>
<tr>
<td>&lt;500 000 in nonmetropolitan and metropolitan areas</td>
<td>1029</td>
<td>62.8</td>
<td>60.5–65.0</td>
</tr>
<tr>
<td>Condition-related characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Principle 5: Documentation - Measurement Scales

Always start y-axis at zero for bar charts; use points instead of bars or use hash marks if y-axis must start at a number other than zero to zoom in on relevant data.

Use same scale across or within charts, otherwise proportions can be distorted.

Principle 5: Documentation - Measurement Scales

**Figure**
Trends in postpartum IUD insertion and postpartum tubal sterilization

A. Trends in postpartum intrauterine device (IUD) insertion
B. Trends in postpartum tubal sterilization


Principle 5: Documentation - Line Chart Guidelines

- Lines should only be used when variable is on an ordinal or continuous scale
- Do not connect the points on a line if there are missing values in between existing data
- Intervals should be equally sized
  - Exception: Extreme outliers can be lumped at the lower or upper end (ie income)
- Tick marks on the x-axis should accurately reflect the distance between the values

http://www.perceptualedge.com/articles/visual_business_intelligence/line_graphs_and_irregular_intervals.pdf
Principle 5: Documentation - Line Chart Guidelines

Inappropriate to connect points across years with no data

From *Health, United States, 2010*: http://www.cdc.gov/nchs/data/hus/hus10.pdf#
Principle 5: Documentation - Line Chart Guidelines

Omit the line altogether when data are missing along the line
Principle 5: Documentation - Line Chart Guidelines

Intervals and tick marks should be equally sized and accurately reflect distance between values.
Principle 5: Documentation - Communicating Statistical Significance

Down Syndrome (Trisomy 21) 1999–2004

State rate = 12.7
Statistically Significant ↑ or ↓

Figure A11.4-7 Area Map
Principle 6: Content Counts Most of All

Analytical presentations ultimately stand or fall depending on the quality, relevance and integrity of content

- Charts/tables should be content focused, not process focused
- Simple design, rich content
- Eliminate anything that doesn’t contribute to content, including boxes, legends, “chart junk”
Principle 6: Content Counts Most of All
Small Multiples

From: “Obesity Rates Hit Plateau in U.S., Data Suggest”
By Pam Belluck New York Times, Published: January 13, 2010
Principle 6: Content Counts Most of All - Small Multiples

**Minimize the time it takes audience to figure out format**

- By keeping the quantitative scale consistent, graphic is easier for audience to read
- Audience doesn’t need to figure out format again with each new display of information
- Especially useful when there is a fourth dimension that would make a single chart too busy or difficult to interpret
Principle 6: Content Counts Most of All - Small Multiples

Marquette and Menominee Delta
Local Health Departments, Michigan 2010
Social Determinants of Health

No Health Care Coverage
2006 - 2008

Marquette
17.9%
13.2% Michigan Rate

Menominee Delta
26.4%*

Age 18 to 64
Michigan BRFS Aggregated Data

County Poverty Rate
2008

14.2%
Marquette County
13.2% National Rate

13.8%
Delta County

'Small area income and poverty estimates
U.S. Census Bureau

County Unemployment Rate
April 2010

10.7%
Marquette County
9.5% National Rate

13.6%
Delta County

Source: U.S. Bureau of Labor Statistics

*Statistical Significant at 95% CL
(Higher than Michigan Average)

Michigan Department of Community Health

Jennifer M. Granholm, Governor
Janet Otszewski, Director

Principle 6: Content Counts Most of All - Small Multiples

The abortion ratio is defined by the number of abortions per 1,000 abortions and live births.


Principle 6: Content Counts Most of All - Minimize “Ink-to-Data Ratio”

*Reduce optical clutter*

- Remove boxes around text, legends and figures
- Eliminate gridlines in favor of data labels, or
- De-emphasize gridlines with white breaks in bars
- Minimize axis labels
  
  Example: Label every other year on x-axis

- Remove tick marks for categorical data

*In cases where all of the above is generated by the graphing software by default, do not hesitate to edit it out wherever possible*
Minimizing “Ink-to-Data Ratio” - De-emphasizing gridlines

By NICHOLAS BAKALAR
New York Times, Jan 25, 2010

Tricking Excel to do this:
http://peltiertech.com/Excel/Charts/ArbitraryGridlines.html
Minimizing “Ink-to-Data Ratio” - Direct Labeling instead of Legend

In ‘11 and ‘12, 90% of women with abnormal screens received a diagnosis within 70 days.
Principle 6: Content Counts Most of All - Minimize Chartjunk

“Chartjunk” = Visual elements in charts that are not necessary to comprehend the information and distract viewer from information

- Background colors or graphics
- Pictures
- Clip art or animations
- 3-D effects – distort images

Minimize Chartjunk: 3-D Distortion

Causes of Maternal Death & Effective Interventions

- Hemorrhage (oxytocin) 25%
- Sepsis (aseptic delivery/antibiotics) 15%
- Eclampsia (magnesium sulfate) 15%
- Obstructed labor (partograph/skilled attendant/cesarean section) 12%
- Unsafe abortion (access to family planning/safe abortion) 8%
- Other direct causes 8%
- Indirect causes (incl. HIV, malaria, anemia) 20%


http://confutata.com/2010/03/12/safe-birth-is-a-human-rights-issue/
Minimize Chartjunk: Use of Color

- Color should be used only if it conveys additional information.

- In general, use soft colors in graphs and reserve bolder, brighter colors for points that you want to stand out.

- If color is used to distinguish two different categories, make sure they are different enough in intensity to be distinguished in black and white and for the color blind.

- Gradations of one color should only be used with ordered variables, not nominal variables.

http://www.perceptualedge.com/articles/Whitepapers/Communicating_Numbers.pdf

Minimize Chartjunk: Ineffective Use of Color

Data: Global Maternal Mortality

The top ten countries with the best maternal mortality ratio*

- Ireland - 1
- Bosnia/Herzegovina - 3
- Denmark - 3
- Greece - 3
- Italy - 3
- Sweden - 3
- Australia - 4
- Austria - 4
- Czech Republic - 4
- Germany - 4

The top ten countries with the worst maternal mortality ratio*

- Sierra Leone - 2100
- Niger - 1800
- Afghanistan - 1800
- Chad - 1500
- Somalia - 1400
- Angola - 1400
- Rwanda - 1300
- Liberia - 1200
- Nigeria - 1100
- Malawi - 1100

*Maternal mortality ratio is the annual number of deaths of women from pregnancy-related causes per 100,000 live births in 2005.

http://worldfocus.org/blog/2008/12/02/birth-is-deadly-for-guatemalan-women/3035/
Minimize Chartjunk: Effective Use of Color

Childhood Lead Poisoning Risk Analysis
Philadelphia, Pennsylvania

Input Risk Factors: Density of Vacant Land, Distance to Vacant Land, Number of Children under 6, Median Age of Housing, Number of Houses before 1979, Distance to Properties with Housing Code Violations, Distance to Major Streets, Density of Public Housing, Number of Reported Cases of Childhood Lead Cases

Source: Multiple City of Philadelphia, 2004

http://www.cdc.gov/gis/mg_lead_poisoning.htm
Minimize Chartjunk

Condom Prices Around the World

Balancing Clarity and Detail/Documentation

Consider a layered approach to presenting results in order to allow audience to drill down from summary points to details:

1. Executive Summary
2. Detailed graphs and charts with annotation and accompanying narrative/pictures
3. Appendix with all underlying tables and statistical results, as well as methods and data source description

Prior to finalizing reports, always pilot materials with a few people who are unfamiliar with the data to make sure your message is getting across as anticipated; Revise as necessary
Example from the Field

ILLINOIS BREASTFEEDING BLUEPRINT: A PLAN FOR CHANGE

http://www.ilbreastfeedingblueprint.org
IL Breastfeeding Blueprint: Context

“In 2008, a group of collaborators began an initiative to increase breastfeeding rates and decrease disparities in Illinois. HealthConnect One, the Illinois Department of Human Services (Title V Maternal and Child Health and WIC Programs), and the University of Illinois School of Public Health committed to a multi-year effort to plan for strategic change in the way we support breastfeeding in Illinois.”
“First, we looked at the data, as data drives policy change…

At the same time, we reached out to a diverse group of stakeholders… parents, peer counselors, nurses, nutritionists, dieticians, lactation consultants and counselors, physicians, and other breastfeeding advocates…

The recommendations for the Illinois Breastfeeding Blueprint flowed both from the numbers and the voices of the stakeholders … [and] are intended as a strategic plan for the next five years.”
IL Breastfeeding Blueprint: Scope of Analysis Plan

Multiple indicators
- Breastfeeding initiation
- Breastfeeding duration
- Breastfeeding exclusivity

Person, Place and Time
- Race and income
- Comparisons of IL to other geographic areas
- Trends over time

Risk/Protective Factors
- Reasons for not breastfeeding
- Hospital practices to promote or discourage BF
Putting Problem in Context: Comparison to a Benchmark

*Healthy People* is a national initiative for promoting and improving the health of all Americans. Using data from 2007, the Centers for Disease Control and Prevention (CDC) provided a snapshot of how Illinois is doing compared to the new Healthy People 2020 objectives for breastfeeding:

We can see we have more to do to help Illinois women breastfeed successfully. On the following pages, we take a deeper look at new mothers in Illinois and at the hospitals that serve them.

<table>
<thead>
<tr>
<th>The 2010 CDC Breastfeeding Report Card: Data from the National Immunization Survey</th>
<th>Illinois 2007 (%)</th>
<th>HP2020 Objective (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding Initiation</td>
<td>70.2</td>
<td>≥ 81.9</td>
</tr>
<tr>
<td>Breastfeeding to 6 Months</td>
<td>36.0</td>
<td>≥ 60.5</td>
</tr>
<tr>
<td>Breastfeeding to 12 Months</td>
<td>16.4</td>
<td>≥ 34.1</td>
</tr>
<tr>
<td>Exclusive Breastfeeding to 3 Months</td>
<td>27.9</td>
<td>≥ 44.3</td>
</tr>
<tr>
<td>Exclusive Breastfeeding to 6 Months</td>
<td>11.2</td>
<td>≥ 23.7</td>
</tr>
<tr>
<td>Percent of Live Births Occurring at Baby Friendly Facilities</td>
<td>1.3</td>
<td>≥ 8.1</td>
</tr>
<tr>
<td>Percent of breastfed Infants Receiving Formula Before 2 Days of Age</td>
<td>28.1</td>
<td>≤ 15.6</td>
</tr>
</tbody>
</table>
Defining the Problem using Small Multiples

**Figure 16. The Breastfeeding Experience of Illinois Women, Whose Infants Were Born in 2008**

- **Shortly After Delivery**
  - Never Breastfed: 23%
  - Ever Breastfed: 77%

- **2 Weeks After Delivery**
  - Never Breastfed: 23%
  - Stopped Breastfeeding by 2 Weeks: 6%
  - Non-Exclusively Breastfeeding at 2 Weeks: 30%
  - Exclusively Breastfeeding at 2 Weeks: 41%

- **12 Weeks After Delivery**
  - Never Breastfed: 23%
  - Stopped Breastfeeding by 12 Weeks: 24%
  - Non-Exclusively Breastfeeding at 12 Weeks: 23%
  - Exclusively Breastfeeding at 12 Weeks: 24%
IN SUMMARY: Patterns of Breastfeeding Among Illinois Women

The pattern of breastfeeding over time among Illinois women differs by race/ethnicity.

Almost half of the Black women giving birth each year in Illinois, or approximately 13,000 mothers, never breastfeed their babies. To meet the 2020 Healthy People objective for breastfeeding initiation, we need to ensure that around 6,000 more black women start breastfeeding their babies each year.

The first two weeks after birth is critical for establishing breastfeeding regardless of race/ethnicity. A small but important percentage of white, black, Hispanic, and Asian mothers in Illinois stop breastfeeding very soon after they start.

While no group of new mothers in Illinois is meeting the Healthy People objective for exclusive breastfeeding at 3 months (12 weeks), black and Hispanic women are much farther from this goal than white and Asian women. Just over 1 in 10 black women and fewer than 2 in 10 Hispanic women are exclusively breastfeeding when their babies are 12 weeks old. About 8 in 10 white and Asian mothers are exclusively breastfeeding 12 weeks after giving birth.
Multivariable Analysis to Show Subgroups

The picture of racial/ethnic disparity changes when women’s income level is also considered.

The racial/ethnic disparity among higher income women was quite small and the *Healthy People 2020* objective for breastfeeding initiation was met by all higher income groups in Illinois—blacks, whites, Hispanics, and Asians.

Among low-income women, on the other hand, there are wide racial/ethnic disparities, with black low income women being the least likely to breastfeed.

It is also important to see that for both black and white low income women the rate of breastfeeding falls far below *The Healthy People 2020* objective.
“Place”: Choosing Appropriate Comparison Groups

<table>
<thead>
<tr>
<th>Breastfeeding-Related Maternity Care Practices</th>
<th>All States</th>
<th>Big 5 States California, New York, Illinois, Florida, and Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>State with Best Ranking in US</td>
<td>Illinois Rank in US (1 to 52, 1=best)</td>
</tr>
<tr>
<td>Total Score</td>
<td>VT</td>
<td>35</td>
</tr>
<tr>
<td>Labor and Delivery e.g. skin-to-skin contact, BF in first half hour</td>
<td>VT</td>
<td>43</td>
</tr>
<tr>
<td>Breastfeeding assistance e.g. BF information, assessment, documentation</td>
<td>VT</td>
<td>32</td>
</tr>
<tr>
<td>Mother-newborn contact e.g. separation, roaming-in</td>
<td>AK</td>
<td>37</td>
</tr>
<tr>
<td>Newborn feeding practices e.g. first feeding and supplemental feedings</td>
<td>VT</td>
<td>36</td>
</tr>
<tr>
<td>Breastfeeding support after discharge e.g. types of support, formula packs</td>
<td>RI</td>
<td>24</td>
</tr>
<tr>
<td>Nurse/birth attendant BF training and education e.g. staff education and assessment</td>
<td>MA</td>
<td>16</td>
</tr>
<tr>
<td>Structural/organizational factors related to BF e.g. policies</td>
<td>RI</td>
<td>22</td>
</tr>
</tbody>
</table>
Effective use of color
IL Breastfeeding Blueprint: Data Translation

Strategy Recommendations for five year plan:

- Hospitals/providers
- Local and state government
- CBOs
- Families
- Workplaces
- Insurers

See: http://www.ilbreastfeedingblueprint.org
Infographics – Chart Junk or Effective?

When our participants were counseled about all methods of birth control, 75% of the 9,256 women chose a Long-Acting Reversible Contraceptive method (LARC: IUD or Implant).

Young women under the age of 21 were also interested in the IUD and implant. Over 40% of young women 14-17 years chose the implant, and over 40% of young women 18-20 years chose an IUD.

http://www.choiceproject.wustl.edu/
Infographics – Chart Junk or Effective?

What We’ve Learned

Among women who chose a LARC method, 86% were still using the method at 1 year. For women who chose a non-long-acting method, only 55% were still using their method at 1 year.

Women using LARC methods had the highest satisfaction at their one-year follow-up. Women who stopped their method during the course of the study were considered not satisfied.

http://www.choiceproject.wustl.edu/

Also see Obesity Infographic from APHA (pdf doc)
REPRODUCTIVE AND SEXUAL HEALTH

Thanks to advances in HIV treatments, more people are managing their condition and living longer, which makes transmission prevention increasingly important. In addition, reproductive health services improve health and reduce costs by covering family planning, HIV and STD testing and treatment, and prenatal care.

RELATED DISPARITIES

AWARENESS OF HIV STATUS

In 2009, among people age 13 and older living with HIV, a higher percentage of women were aware of their HIV status than men.

<table>
<thead>
<tr>
<th>Disparities by Sex</th>
<th>Awareness of HIV Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>84.7%</td>
</tr>
</tbody>
</table>

REPRODUCTIVE HEALTH SERVICES

<table>
<thead>
<tr>
<th>Disparities by Education Level</th>
<th>Reproductive Health Services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Advanced Degree</td>
</tr>
<tr>
<td></td>
<td>85.2%</td>
</tr>
</tbody>
</table>

In 2006–10, 85.2% of sexually experienced women age 15–44 with an advanced degree received reproductive health services in the last 12 months, compared to 66.5% with less than a high school education.

2020 TARGETS

AWARENESS OF HIV STATUS

2020 Target: 90%

Increase the proportion of persons age 13 and older living with HIV who are aware of their HIV status.

<table>
<thead>
<tr>
<th>Year</th>
<th>Proportion of Persons Aged 13 and Older Living with HIV who are Aware of their HIV Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>81.9%</td>
</tr>
<tr>
<td>2020 Target</td>
<td>90.0%</td>
</tr>
</tbody>
</table>

Increase the proportion needed: 9.9%

REPRODUCTIVE HEALTH SERVICES

2020 Target: 86.5%

Increase the proportion of sexually experienced females age 15–44 who received reproductive health services in the past 12 months.

<table>
<thead>
<tr>
<th>Year</th>
<th>Proportion of Sexually Experienced Females Age 15–44 who Received Reproductive Health Services in the Past 12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006–10</td>
<td>78.6%</td>
</tr>
<tr>
<td>2020 Target</td>
<td>86.5%</td>
</tr>
</tbody>
</table>

Increase the proportion needed: 10.0%
Infographics – Chart Junk or Effective?

**Physical Activity, Nutrition, and Obesity**

**Disparities by Educational Level**

In 2010, the rate of meeting physical activity guidelines for adults with advanced education degrees was more than 4x the rate for persons with less than a high school education.

**Physical Activity**

**Disparities by Sex**

In 2010, the rate of meeting physical activity guidelines for males was about 1.5x that for females.

**Vegetable Intake**

In 2001–04, college graduates on average consumed 1 Cup of vegetables per day, whereas persons with less than a high school education consumed 20% less.

**Get More Details**

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Infographics – Scale

http://en.wikipedia.org/wiki/Misleading_graph
Infographics – Chart Junk or Effective?

- If done well, can be effective

- All of the same design principles apply

- Online resource mentioned by course participant on-site: http://piktochart.com
OVERARCHING CONSIDERATIONS
Consider Your Audience Means Respect Your Audience

Don’t underestimate audience and “dumb-down” content, rather

**Educate as you inform**

- If you never show standard errors because your audience doesn’t understand them, your audience will never understand them.

- If the most appropriate results are adjusted results, communicate those and explain adjustment.
Consider Your Audience Means Respect Your Audience

Use “Plain Language”

A plain language document—one in which people can

- Find what they need
- Understand what they find
- Act appropriately on that understanding

“Plain language is not just about vocabulary or grade level. Writing to a certain grade level does not necessarily ensure that the message is in plain language or understood by the intended audience…”
Consider Your Audience Means Respect Your Audience

Plain language

- Organize information so the most important behavioral or action points come first
- Break complex information into understandable chunks
- Use simple language or define technical terms
- Provide ample white space so pages look easy to read
- Use short sentences and active voice

PLAIN LANGUAGE: A PROMISING STRATEGY FOR CLEARLY COMMUNICATING HEALTH INFORMATION AND IMPROVING HEALTH LITERACY
http://www.health.gov/communication/literacy/plainlanguage/PlainLanguage.htm
Closing Thoughts

Work with partners, including policy makers, program staff, clinicians, members of community during analysis phase and in the dissemination of results to ensure that:

1. Assumptions and analysis plan match needs
2. Results are useful and actionable
3. Data products are clear and linked with strategies or recommendations
Closing Thoughts

Analytic methods need not be simplistic in order to deliver a clear, simple message, so scientific rigor should be practiced regardless of purpose or audience.

*Clear communication* of analytic results about MCH health outcomes and associated factors takes time, but offers the possibility of improving outcomes through mobilizing resources for intervention.

MCH Epidemiology leaders have responsibility for planning analyses that will be useful, and effectively presenting and *translating* results.
Appendix A: Presenting Predicted Values from Multivariable Models in Charts

Example: Estimating predicted probability of late preterm birth (34-36 wks vs 37+ wks) for groups of women with different risk status, using a binomial regression

**SAS code for model:**
```
proc genmod data=analysis desc;
class agecat educat parity2/param=ref;
model latePTB=black agecat educat parity2 smoke/link=log dist=bin;run;
```

Use beta estimates from model above to determine highest/lowest risk value for each variable and write contrast/estimate statement to estimate the predicted probability for each group.

**Sample estimate statement:**
```
estimate 'Prevalence late PTB among highest risk African-Americans'
   intercept 1 black 1 agecat 0 0 1 educat 1 0 0 parity2 0 0 1 smoke 1/exp;
```
Appendix B: Creating Graphs for Generalized Logit Models in Log Scale

Slides created by:
Izumi Chihara, MD, MPH,
PhD Candidate in Maternal and Child Health Epidemiology,
University of Illinois at Chicago

Acknowledgements to:
Ms. Linda Chock, Hawaii WIC Chief
Dr. Donald Hayes, MCH Epidemiologist in Hawaii
Presenting results of a generalized logit model is challenging…


Purpose: To investigate the relationship between gestational weight gain and birthweight outcomes among low-income women using data collected by Hawaii’s Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Prepregnancy BMI (underweight, normal weight, overweight, obese) was an effect modifier for the relationship between gestational weight gain and birthweight.
## Distribution of key variables

<table>
<thead>
<tr>
<th>Weight gain during pregnancy (exposure)</th>
<th>proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate weight gain</td>
<td>17.8 %</td>
</tr>
<tr>
<td>Appropriate weight gain (Reference)</td>
<td>25.7 %</td>
</tr>
<tr>
<td>Excessive weight gain</td>
<td>56.5 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Birth weight (outcome)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low birth weight (LBW)</td>
<td>6.4 %</td>
</tr>
<tr>
<td>Normal birth weight (Reference)</td>
<td>85.9 %</td>
</tr>
<tr>
<td>High birth weight (HBW)</td>
<td>7.7 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prepregnancy BMI status (effect modifier)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt; 19.8)</td>
<td>14.1 %</td>
</tr>
<tr>
<td>Normal (19.8 BMI 26.0)</td>
<td>46.7 %</td>
</tr>
<tr>
<td>Overweight (26.0 &lt; BMI 29.0)</td>
<td>13.4 %</td>
</tr>
<tr>
<td>Obese (BMI &gt;29.0)</td>
<td>25.8 %</td>
</tr>
</tbody>
</table>
I would like to present 16 ORs

<table>
<thead>
<tr>
<th>Prepregnancy BMI Classification</th>
<th>GWG</th>
<th>LBW Adjusted OR (95% CI)</th>
<th>HBW Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt;18.5)</td>
<td>Inadequate</td>
<td>2.01 (1.27-3.21)</td>
<td>0.22 (0.03-1.72)</td>
</tr>
<tr>
<td></td>
<td>Appropriate</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Excessive</td>
<td>0.54 (0.34-0.87)</td>
<td>2.47 (1.15-5.28)</td>
</tr>
<tr>
<td>Normal weight (BMI 18.5-24.9)</td>
<td>Inadequate</td>
<td>1.81 (1.44-2.27)</td>
<td>0.47 (0.29-0.75)</td>
</tr>
<tr>
<td></td>
<td>Appropriate</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Excessive</td>
<td>0.86 (0.70-1.05)</td>
<td>2.22 (1.74-2.82)</td>
</tr>
<tr>
<td>Overweight (BMI 25.0-29.9)</td>
<td>Inadequate</td>
<td>1.53 (0.98-2.39)</td>
<td>1.02 (0.57-1.83)</td>
</tr>
<tr>
<td></td>
<td>Appropriate</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Excessive</td>
<td>0.73 (0.51-1.03)</td>
<td>2.66 (1.83-3.85)</td>
</tr>
<tr>
<td>Obese (BMI ≥30.0)</td>
<td>Inadequate</td>
<td>0.99 (0.61-1.59)</td>
<td>0.92 (0.62-1.36)</td>
</tr>
<tr>
<td></td>
<td>Appropriate</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Excessive</td>
<td>0.87 (0.59-1.28)</td>
<td>1.95 (1.45-2.63)</td>
</tr>
</tbody>
</table>

*Results were stratified by pregravid BMI classification and adjusted for maternal age, education, race/ethnicity, marital status, smoking status, and parity.*
Relationship between GWG and LBW

Adjusted Odds Ratios

- Underweight
- Normal weight
- Overweight
- Obese

Inadequate weight gain
Excessive weight gain

Adjusted Odds Ratios

0.5  1.0  2.0
Relationship between GWG and HBW

Adjusted Odds Ratios

- **Inadequate weight gain**
- **Excessive weight gain**

- Underweight
- Normal weight
- Overweight
- Obese
I will show the example for LBW vs. normal weight comparison here. You can follow the same steps to create the graphs for HBW vs. normal weight comparison. Please also follow my notes below.

Display the ORs for one outcome category (vs. reference) and their confidence intervals by effect modifier categories as shown.
Calculate the difference between each odds ratio and corresponding upper limit of the confidence interval. Also calculate the difference between each odds ratio and corresponding lower limit of the confidence interval. I have called them “Differences CI”.

In this example, $K_3 = B_3 - F_3$, $L_3 = G_3 - B_3$, $M_3 = D_3 - H_3$, $N_3 = I_3 - D_3$. 
In Excel, re-display the point estimates (AORs) and corresponding differences with upper and lower limits of the confidence intervals as shown above.
Select the cells as shown, and click on Insert, charts, scatter plot.
Right click on the graph, and select “Select Data”. On the left side (Legend Entries), Remove Series 1. Then, Click Add.
In order to add another series (for excessive weight gain), click “Add” under Legend Entries again.
Series name: Excessive weight gain
Series X values: = 'Horizontal in log LBW'!$C$10:$C$ = 0.70, 0.96, 0...
Series Y values: = 'Horizontal in log LBW'!$B$10:$B$ = 4, 3, 2, 1
Your plots should look like this.
Get rid of the grid lines (right-click on the gridlines, select “format gridlines” and choose from the menu) and vertical axis (click on it and delete).
On the graph, select the data series for excessive weight gain, then on Layout tab, select Error Bars – More Error Bar Option. Close the “Format Error Bars” box.
Both vertical and horizontal error bars have been created. Select the vertical bars and delete them.

Select the horizontal bars, right click, and choose “Format Error Bars.”
Under “Error Amount” towards the bottom, select “custom” and click on “Specify Values”.
In “Custom Error Bars” box, for “Positive Error Bars”, select the differences for Upper limit of CI (F10 to F13). For “Negative Error Bars”, select the Lower CI difference (E10 to E13). Then click OK. Close “Format Error bars”.
Your graph should look like this. Repeat the same process for the data series for Inadequate weight gain.
I will now make the axis to log scale. Right click on the axis, and click “Format axis.”

Under Axis Options, select “Logarithmic scale” and enter 2.7 for “Base”. If you want to be precise, enter 2.71828.
Inadequate weight gain

Excessive weight gain

I copied this graph to PowerPoint slide, and did the rest of formatting in PowerPoint.
Relationship between GWG and LBW

Adjusted Odds Ratios

- Underweight
- Normal weight
- Overweight
- Obese

- Inadequate weight gain
- Excessive weight gain
Relationship between GWG and HBW

Adjusted Odds Ratios

- Inadequate weight gain
- Excessive weight gain

- Underweight
- Normal weight
- Overweight
- Obese

0.05 0.2 0.5 1.0 2.0 4.0