Writing about multivariate analysis

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Overview

- Structure of an academic paper
- Creating a logical sequence of tables
- Describing multivariate results
- Designing effective statistical tables and charts
- Creating effective slides
  - Including charts of MV results
- Presenting a chart “live”
- Writing good speaker’s notes

Writing = communicating

- Shift in perspective of author
  - From data preparation and analysis
  - To exposition and communication
- Consider your audience
  - Who are they and what do they want to know?
  - How familiar are they with your topic and methods?

Avoid a “teaching statistics” voice

- DON’T make readers
  - Guess what your 8 letter variable names mean ☹
  - Test your hypotheses based on raw materials.
  - Calculate net effects of interactions or polynomials.
  - Slog through a general explanation of how a well-established statistical method was derived.

How to avoid a “teaching statistics” voice

- DO: Ask and answer your research question, using multivariate results as evidence.
  - Translate “variables” into concepts.
  - Explain how the method fits your question & data.
  - Report results of inferential statistical tests.
  - Discuss results of statistical calculations related to your main hypotheses.

Structure of a legal argument

- Opening statement
  - Raises major questions to be addressed during the trial.
  - Introduces characters and events in question.
- Evidence portion of trial
  - Describes and justifies investigative methods.
  - Cites previous cases and whether they apply to current case.
  - Presents individual facts, ties them to other evidence to demonstrate patterns or themes.
  - Submits exhibits such as diagrams or physical evidence.
- Closing statement
  - Summarizes conclusions based on complete body of evidence, restating critical points but with less detail than in the evidence portion of trial.

Structure of an academic paper

- Introduction
  - Parallels opening argument.
  - Introduce the overarching questions.
- Data & methods and results
  - Mirrors evidence portion of trial.
  - Explain why a simpler method won't suffice for your data & research question.
  - Systematically introduce and explain evidence from tables, charts, maps, or other diagrams--building a logical sequence of analyses.
- Discussion & conclusion
  - Parallels closing argument.
  - Summarize findings & connect back to initial questions and previous studies of related topics.

Creating a logical sequence of tables

- Descriptive statistics
  - Univariate statistics to describe sample composition.
  - Report unweighted sample size.
- Bivariate and three-way associations
  - Means, cross-tabs, and correlations to show associations
    - Between key predictor and outcome.
    - Between key predictors and potential confounders or mediators.
  - Report levels of outcome for comparison with other studies.
  - Demonstrate that a multivariate model is needed.
    - See Table 14A on p. 1-2 of exercises.
- Multivariate results

Describing results of multivariate analyses

Results sections nuts & bolts

- Name the specific variables and hypotheses.
- Incorporate units into prose description.
- Report numbers in tables.
- Interpret numbers in text.
- Describe direction, magnitude, and statistical significance.

Organizing your results

- Use good expository writing techniques.
  - Write one paragraph for one major point or series of related points.
  - Start with a introductory sentence to orient readers to the topic of that paragraph.
  - Write sentences to present numeric evidence.
  - Include transition and summary sentences to orient readers about how the paragraphs (& evidence therein) relate to one another.
- See *Chance* article about using expository writing to communicate statistics.

Today's research question

- Do differences in socioeconomic status explain observed racial differences in birth weight in the United States?
  - Birth weight = outcome variable (dependent var.)
    - Continuous version = birth weight in grams
    - Categorical version = low birth weight (<2,500 grams)
      - Coded 1 = LBW; 0 = normal BW
  - Racial group = key predictor (independent var.)
  - Socioeconomic status (SES) = mediator.

Introducing multivariate results

- Start with a topic sentence about why a MV model, worded in terms of your specific topic. Mention
  - Outcome variable
  - General concepts embodied by predictors
    - Key predictor
    - *Confounders or mediators*
  - Type of statistical model
- "Ordinary least squares regression was used to assess the extent to which *socioeconomic characteristics and health behaviors* explain observed birth weight differences across racial/ethnic groups."

What to report for associations

- Direction
  - For categorical variables, which category has higher value?
  - For continuous variables, is the trend up, down, or level?
- Magnitude
  - How big is the difference or trend?
- Statistical significance
  - Is the association statistically significant?

Direction and magnitude - bivariate

- Poor: "Age and mortality are correlated."
  - Positively or negatively correlated?
  - How strongly?
- Better: "As children age from 0 to 5 years old, their mortality chances decrease."
  - Direction but not magnitude.
- Best: "Mortality rates for infants are more than 20 times as high as for 5 year-olds."
  - Direction and magnitude.

Direction and magnitude – MV coeffs

- Poor version 1: "Beta was 10.7."
  - What is the research question? What concepts are involved? Measured in what units?
- Poor version 2: "Mother's age and birth weight were correlated."
  - No information about direction or magnitude.
- Better: "Birth weight increased with mother's age."
  - Direction but not size: How much did it increase?
- Best: "For each additional year of mother's age at the time of her child's birth, birth weight increased by 10.7 grams."
  - Concepts, units, direction, and magnitude.

Interpretation depends on types of variables in your models

- Type of dependent variable:
  - Continuous dependent variable
    - Ordinary least squares (OLS)
  - Categorical dependent variable
    - Logistic regression model
- Type of independent variable:
  - Continuous
  - Categorical

Continuous predictors in OLS

- The unstandardized coefficient on a continuous predictor in an OLS model measures
  - The absolute difference in the dependent variable for a one-unit increase in the independent variable.
  - Effect size is in original units of dependent variable.
- Mother's age (years) is a continuous predictor.
  - β_{age} = difference in birth weight (grams) for each one-year increase in age.
  - β_{age} = 10.7 (Model III, table 14.3; p. 336)
  - "Mean birth weight increased by 10.7 grams for each one-year increase in mother's age (p<.01)."

Categorical predictor in OLS

- The coefficient on a categorical predictor in an OLS model measures
  - The absolute difference in the dependent variable for the category of interest compared to the reference category.
- Race is a categorical predictor, with non-Hispanic white as the reference category.
  - $\beta_{MexAmer}$ = difference in birth weight (grams) for Mexican American infants compared to non-Hispanic whites = -23 (Model III, table 14.3; p. 336).
  - "Mexican American infants weighed on average 23 grams less than non-Hispanic white infants, but the difference was not statistically significant."

Logit models

- β = log relative-odds
  - Logit = ln(p/(1-p) = ln(odds of the event you are studying)
  - Compares the odds of your outcome for different values of the independent variable.
  - β is a measure of relative difference.
    - Multiples of odds of the event (outcome).
    - See table 8.3 (p. 2 of handout) for wording about ratios that avoids jargon!

Example: Logit model of LBW

- LBW = birth weight <2,500 grams
- Log-odds = $\log(p_{LBW}/(1-p_{LBW}))$
- Log relative odds = comparison of odds for different values of the independent variable.
- Exp(β) = relative odds of low birth weight for different values of the independent variable.

Relative odds for categorical independent variables

- Relative odds of the outcome for the category of interest compared to the reference category.
- "Infants born to smokers had 1.4 times the odds of low birth weight as those born to non-smokers ($p<.01$)."
  - Note that the reference category is explicitly mentioned in the sentence.

Relative odds for continuous independent variables

- Continuous indep variable
  - Relative odds of the outcome for a one-unit increase in the independent variable.
- "Odds of LBW decreased by about 0.8% for each 1 year increase in mother's age (NS)."
  - See Table 8.3 (in handout) for how to calculate % difference or change from a ratio.

Writing about statistical significance

Statistical significance

- In a table, report detailed statistical results for all variables in the model.
  - Coefficient
  - Test statistic, confidence interval (CI), or std error
  - *p*-value or symbols for p<.05 and p<.01
- In text, summarize if possible.
  - If model includes only statistically significant coefficients, state that up front, not for each coefficient.
  - If only some coefficients are statistically significant, report associated test statistic, CI, or *p*-value.

Approaches to presenting inferential statistical test information

- Standard error for coefficient
- Test statistic
  - *t*-statistic for OLS coeffs
  - *z*-statistic for logit coeffs
- Confidence interval
- *p*-value
- Symbol indicating significance level

- See Table 10.3 (page 3 of handout) for a comparison of strengths and weaknesses of these approaches for different formats and audiences.

Example sentences

- Effect size w/ p-value.
  - "Boys weighed 25 grams more than girls (p=.03)."
- Effect size w/ 95% confidence interval.
  - Often used in public health and medical journals.
  - "Boys weighed 25 grams more than girls (95% CI: 17-33)."
- Effect size, having previously stated that will only discuss effects w/ p<.05.
  - "Boys weighed 25 grams more than girls."

# p<.05 "rule"

- Many journals prefer that only statistically significant results be reported in the text.
  - The standard criterion for "statistically significant" is p<.05.
- Can list factors that were not statistically significant.
  - "Neither income nor age were significant predictors of length of stay in the multivariate model." or
  - "When other factors were taken into account, neither income nor age were significant predictors of length of stay."
- Particularly useful to mention lack of significance if have already shown a significant bivariate association of each predictor with the outcome.
- See chapter 3 for guidelines on what to do if *p*>.05.

Statistical significance in discussion

- May be important to discuss results that were not statistically significant in the discussion and conclusions section.
  - If variable was a "key" predictor or focus of your analysis.
  - If association was statistically significant in previous literature.
- Put your findings in context.
- Discuss possible reasons for discrepant findings.
  - Different time, place.
  - Different subgroup(s).
  - Different study design
    - Biases.
  - Introduction of important confounder or mediator in the model.

Take-home points

- Combine correct statistical analysis with good expository writing.
  - Topic sentence for each paragraph.
  - Transition sentences to tie together paragraphs.
- Estimate the model(s) necessary to answer your research question.
- Keep reader oriented to the research question.
  - Write about concepts, not variables.
  - Show how pieces of evidence relate to each other & to your hypotheses.

Exercises for prose description of results

- Bivariate example:
  - Residential mobility experiment
    - Key predictor = mover vs. stayer
  - Practice writing sentences about associations in Table 14A (page 1 of exercises handout)
  - Question: Why are we concerned with the bivariate associations?
- Multivariate example:
  - Practice writing sentences about coefficients in
    - College GPA as a function of own & roommates' SAT scores.
      - Table 9A page 2 of exercises handout.
    - OR your own draft table
    - OR a table you brought from published literature

See checklist on 3rd page of exercises handout

Creating effective tables and charts

Make tables self-explanatory

- Readers should be able to interpret every # without reference to the text.
  - Title states purpose of table: W's & major variables.
  - Row labels convey information about variables.
  - Column labels convey information about models.
  - Notes define acronyms, symbols, and data source.

Writing an effective title

- Pertain specifically to contents of that table.
  - How is it different from other tables or charts in the paper?
  - What relationships are shown in that table?
- Include all "the W's":
  - "What" is the topic of your table? Mention:
    - Outcome variable(s).
    - Key predictors. Use summary phrases.
  - "Who, when, where"?
    - If source name is too long, use acronym then define in a footnote.
  - "How"? Mention type of model, if relevant.
    - E.g., logistic regression, OLS regression.

Labeling variables within tables

- All variables
  - Use phrases, not acronyms.
    - "Income 100-185% of FPL," not "NRPOOR"
    - "Mother's age (yrs.)" not "MAGEYR"
- Continuous variables
  - Specify units ($, years, deaths per 100,000, etc.)
- Categorical variables
  - Label dummy variables after their contents
    - "Male," not "Gender"
  - Indicate value of reference category.

Labeling columns of model results

- Specify type of measure of effect size
  - Unstandardized or standardized coefficient
  - Log-odds or odds ratio
- Specify type of inferential statistical information
  - *t*-statistic or *p*-value or standard error
  - If a confidence interval, what width? (95% or 99%…)
- Create column spanners to group and name results for each model.
  - "Age only," "Age & SES,"
  - Males, females
  - Different statistical specifications (logit, probit…)

Example tables

- Detailed tables don't reproduce well on slides, so take a moment to look at some in the handout of exercises:
- Table 14A (page 1)
  - Bivariate
- Table 9A (page 2)
  - Multivariate

Make charts self-explanatory

- As with tables, readers should be able to interpret every # without reference to the text.
  - Title states purpose of chart: W's & major variables.
  - Axis labels convey information about variables and measures.
    - Units for all continuous variables
    - Categories for all categorical variables
  - Legend defines line styles, bar colors, etc.
  - Notes
    - Define acronyms, symbols, and data source.
    - List other variables included in multivariate models

Charts to present multivariate results

- Show net effect of an interaction
- Show net effect of polynomial
  - Linear and square term
- Show confidence intervals
- Show how coefficient on a key predictor changes across nested models
- Examples later, under “speaking about MV”

- Can be valuable complement to tables in the paper version as well.

Exercises for creating effective tables

- Critique a really bad table of multivariate results
  - Page 4 of exercises handout.
- Or critique a table you brought
  - Draft table from your own MV analysis
  - Table from the published literature
- Use a red pen to mark errors/changes.
- Exchange answers with your neighbor.

- See checklist of criteria for planning & evaluating tables on page 4 of exercises handout.

Coffee break!

Please come back
in 20 minutes

Speaking about multivariate analysis

Planning your presentation

- Time considerations
  - How much time have you been allotted?
  - Are you the only speaker or part of a panel or session?
  - Will there be time for Q&A?
- Audience considerations
  - Level of statistical proficiency
  - Familiarity with your topic.
  - Academic or applied audience?
    - How will they use your results?

Tradeoffs between time and pacing

- Audience receives material at same pace.
  - Set tempo to meet needs of average listener.
- Don’t talk too fast to scrunch in lots of stuff.
  - Reduce range and depth of material.
  - Don’t rush your key points.
  - Essential for a non-quantitative or mixed audience.

Structure of an academic talk

- Introduction
  - Parallels opening argument.
  - Introduce the overarching questions.
  - Discuss theory and previous studies.
- Data & methods and results
  - Mirrors evidence portion of trial.
  - Explain why a simpler method won't suffice for your data & research question.
  - Systematically introduce and explain evidence from tables, charts, maps, or other diagrams--building a logical sequence of analyses.
- Discussion & conclusion
  - Parallels closing argument.
  - Summarize findings & connect back to initial questions and previous studies of related topics.

Tell a clear story about research question

- What question(s) are you addressing?
- With what data and what methods? Why?
- What did you find?
  - Statistical results are evidence for answering your question.
  - Keep listeners oriented as to topic, not just β's!
- How do results align with hypothesis?
- What do the results imply for future research?

Creating effective slides

Guidelines for slide titles

- Give each slide a short, declarative title.
- Make each title fit the specific slide.
  - Do not label all of your results slides “Results” :(
  - DO convey the particular topic presented.
    - “Race and birth weight”
    - “Race and SES”
- Alternatively, title slide with
  - A rhetorical question about the topic
  - The associated conclusion

Wording and organization of text slides

- Write succinct text for slide
  - Aim for ≤ 6 bullets per slide.
  - Use short phrases to convey key points.
    - Complete sentences aren't necessary.
- Use indenting to
  - Group related material.
  - Present facts to support points.

Design considerations

- Use readable type size
  - 40 point for titles
  - At least 24 point for contents
    - Text bullets
    - Table title, labels, and contents
    - Chart titles, axis labels, and legends
- Use color for emphasis
  - Underscore key terms or conclusions
  - Identify statistically significant findings

How many slides?

- Figure on ~1 minute per slide
  - Short text slides take less time.
  - Tables, charts, diagrams, maps, detailed quotations, or other images require more time.
  - Take the time to explain layout of exhibits before you state associated question or conclusion.
- Rehearse speech
  - Can you cover the slides in allotted time without rushing?

Introduction

- "Low birthweight, which is defined as a weight of less than 2500 grams or 5.5 lbs., is a widely recognized risk factor for infant mortality and a variety of other short- and long-term developmental problems throughout childhood and even into adulthood (Institute of Medicine, 1985).
- In 1999, U.S. infants born weighing less than 2500 grams (5.5 pounds) were 24 times as likely as normal birthweight infants to die before their first birthday (Mathews, MacDorman and Menacker, 2002).

Consequences of low birthweight

- Low birthweight (LBW): <2500 grams (5.5 lbs.)
- LBW infants more likely to:
  - Die before their first birthday.
    - 24 times as likely as normal-weight infants to die in infancy.
  - Have other health problems in
    - Infancy.
    - Childhood.
    - Adulthood.
  - Have developmental problems.

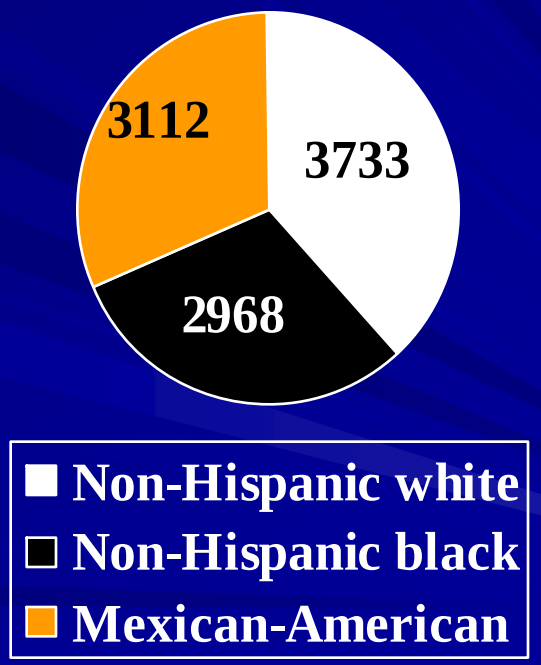
Data

- The data were taken [illegible]88-1994 National Health and Nutritic[illegible]urvey (NHANES III), which is a cro[illegible]ation-based, nationally represe[illegible]he United States. To allow for an ad[illegible] Mexican-Americans to study [illegible]t group was oversampled in the NH[illegible]III.
- Our study sample included [illegible]813 infants, including 3733 non-Hispanic white infants, 2968 non-Hispanic black infants, and 3112 Mexican-American infants.

NHANES III data

- 1988-1994 National Health and Nutrition Examination Survey.
  - Nationally representative sample of U.S. infants
    - Oversample of Mexican-Americans.
  - Cross sectional.
  - Population-based.
- N= 9813.

Racial composition of sample



Previous studies of race & birthweight

Article	Type of study & data source	RR† of LBW: black/white	Comments
Smith & Jones (1999)	Sample survey; birth certificates	2.2*	Nationally representative; controlled education.
Williams (2000)	Retrospective survey; maternal questionnaires	3.8*	Study in State X; no controls for SES
Travis et al. (1990)	Prospective study; medical records	1.5	Enrolled women in prenatal care clinics in NYC. Low SES only.

† RR: Relative risk.

* denotes p<.05.

Dependent variables

- Birth weight.
  - Reported by mother at time of survey.
  - Asked in pounds or grams.
    - Converted to grams for analysis.
- Low birth weight
  - Questionnaire asked “low birth weight”
    - “Low” not defined on questionnaire.
  - For analysis, defined LBW: <2,500 grams

Independent variables

- Socioeconomic status:
  - Mother's education (years).
    - Low SES indicator: % < high school education.
  - Mother's age at child's birth (years).
    - Low SES indicator: % teen mother.
  - Family income/poverty.
    - IPR = Family income in $ compared against poverty level for family of same size and age composition.
    - Low SES indicator: % poor.
- Maternal smoking.
  - Did she smoke cigarettes while pregnant?

Model Specifications

- Linear regression of birth weight in grams (g.).
- Logistic regression of low birth weight (<2,500 g.).
- All models weighted to national level with sampling weights from NHANES III.

- Model I
  - Race/ethnicity and gender.
- Model II
  - Model I + Socioeconomic status (SES).
    - SES: maternal age, education, family income-to-poverty ratio.
- Model III
  - Model II + maternal smoking.

Adapting tables or charts from paper

- Stick to 1 or 2 major points per slide.
  - Focus each slide on one part of a detailed table.
- Break a complex table into simpler tables or charts.
  - Bivariate: Relation of one independent variable with your dependent variable.
  - Multivariate: Show how odds ratio or coefficient for key variable changes across models.
  - Footnote to list other variables controlled in model.

Conveying statistical significance

- Make it easy to see inferential statistical test results.
  - Answers, not just raw materials.
- In tables, identify statistically significant results with
  - symbols (e.g. “**”)
  - color
- In charts, use symbols and/or confidence intervals.
- Avoid standard errors except for long seminars for statistical audience.
  - Can include detailed statistical results in handouts.

Estimated coefficients from an OLS regression of birth weight (grams) by mother's race/ethnicity, socioeconomic status, and smoking characteristics, United States, 1988–1994

Variable	Coefficient	*t*-statistic
Intercept	3,042.8	77.18**
Race/ethnicity (ref. = non-Hispanic white)		
Non-Hispanic Black	–168.1	–5.66**
Mexican American	–104.2	–2.16**
Mother's education (ref. = >HS)		
Less than high school (<HS)	–54.2	–2.35**
High school graduate (= HS)	–62.0	–3.77**
Interactions: race and education		
Non-Hisp. black × <HS	–38.5	–0.88
Mexican American × <HS	99.4	1.72
Non-Hisp. black × = HS	18.4	0.47
Mexican American × = HS	93.7	1.49
F-statistic (df)	65.59 (13)	
Adjusted R^2	0.083	

AAAACK!

Model also includes controls for gender, family income-to-poverty ratio, mother's age and smoking.
F-test comparing models showed interaction between race*mother's education p<.05.

Net effects of interaction

Predicted difference in birth weight (grams) by race/ethnicity and mother's educational attainment, U.S., 1988–1994

Mother's education	Race/ethnicity		
	Non-Hispanic White	Non-Hispanic Black	Mexican American
Incomplete H.S.	–54.2	–260.8	–59.0
High school, no higher	–62.0	–211.7	–72.5
College+	Ref.	–168.1	–104.2

Model also controls for gender, family income-to-poverty ratio, mother's age & smoking.

Yellow denotes p<.05.

Replace some tables with charts

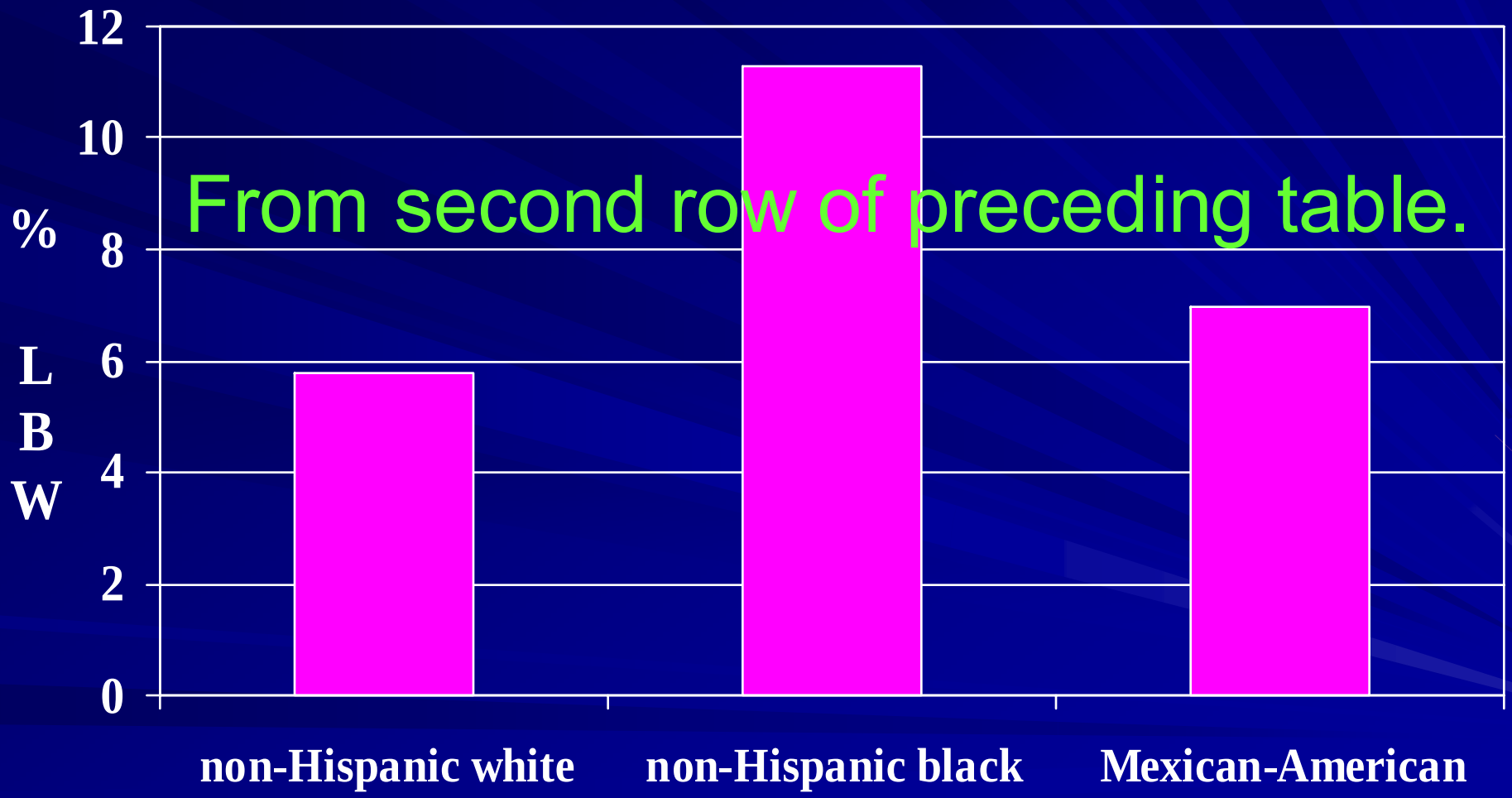
- Charts make it easier to see patterns without asking viewers to do a lot of mental arithmetic.
  - Direction
  - Magnitude
  - Statistical significance
- Focus each slide on one aspect of results.
  - Write title to match.

Birth weight and socioeconomic characteristics by race/ethnicity, U.S., 1988–1994 NHANES III

	Non-Hispanic white	Non-Hispanic black	Mexican American	All
Birth weight				
Mean (grams)	3,426.8	3,181.3	3,357.3	3,379.2
% Low birth weight	5.8	11.3	7.0	6.8
Socioeconomic characteristics				
% Teen mother	9.4	22.9	18.4	12.5
% Mother <high school	14.7	30.1	58.4	21.6
% Poor	14.7	48.5	50.7	23.9
Unweighted N	3,733	2,968	3,112	9,813

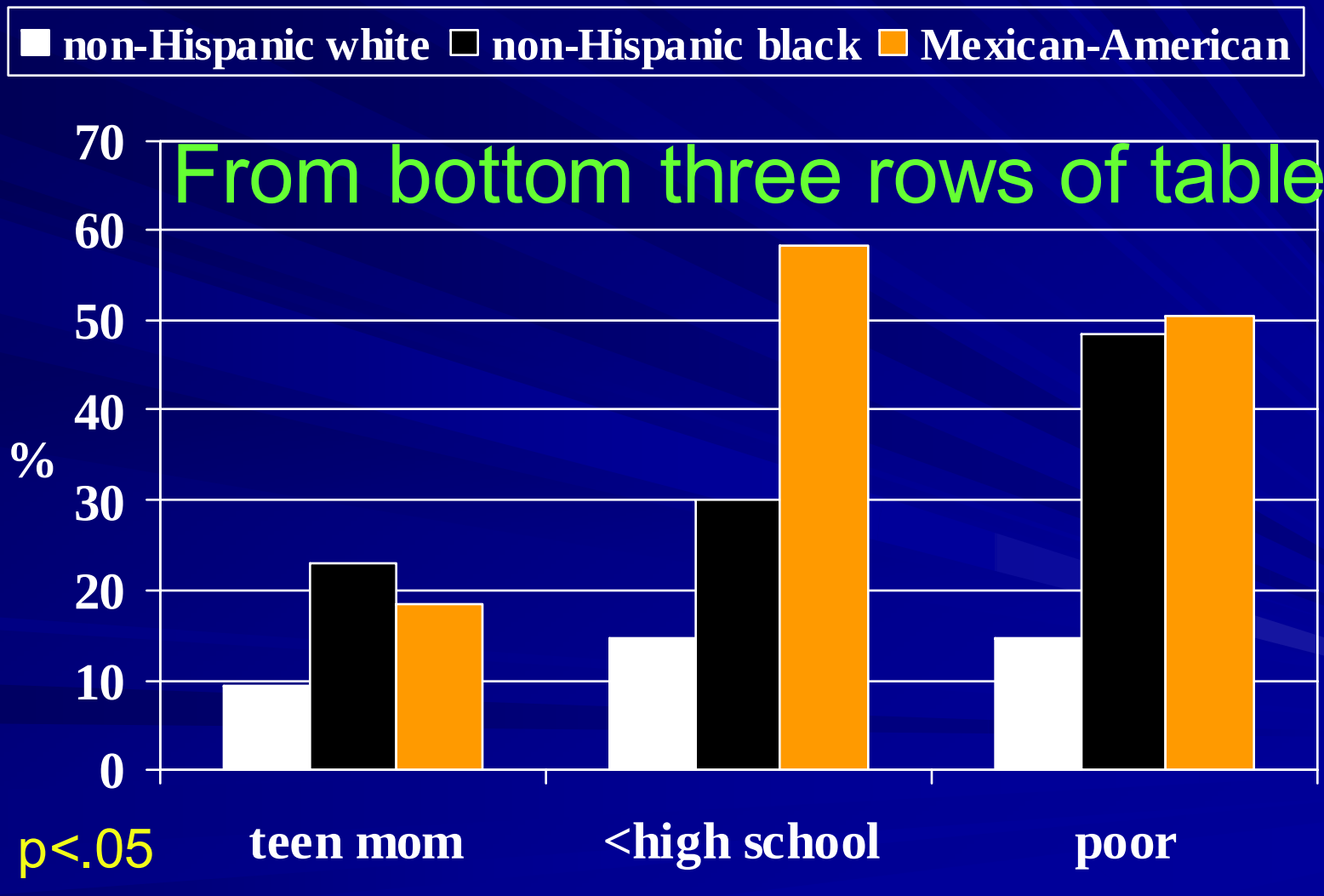
Statistics are weighted to population level using weights provided with the NHANES III (U.S. DHHS 1997). Differences across racial/ethnic origin groups were statistically significant for all variables shown ($p < 0.01$).

Low birthweight by race/ethnicity



p<.05

Minority racial groups have lower SES



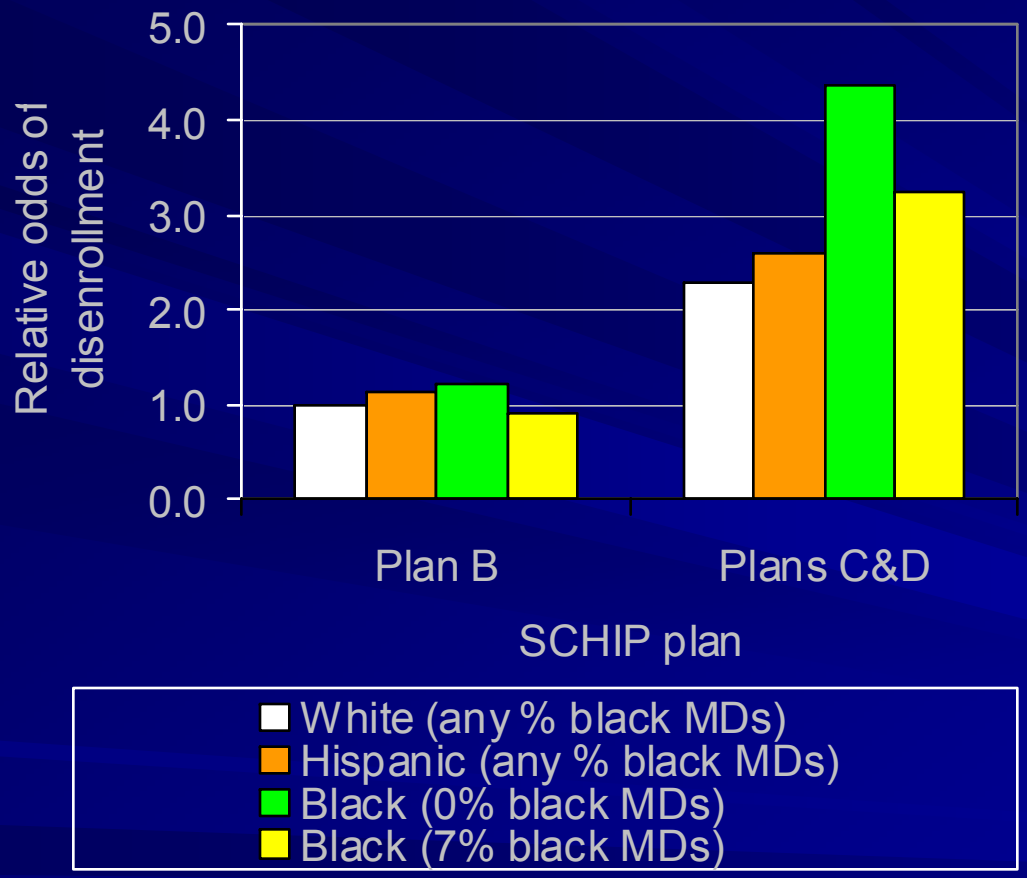
Multivariate table

Table 1. Multilevel discrete-time hazards models of disenrollment from SCHIP, New Jersey, January 1998–April 2000

	County Fixed Effects Model		Random Effects Model Family Factors Only		Random Effects Model Family + County Factors	
Variable	Log Rel. Haz	s.e.	Log Rel. Haz	s.e.	Log Rel. Haz	s.e.
Intercept	-5.581			(.142)	-5.455	(.159)
Family-Level Characteristics						
Black Race	0.047	(.150)	0	(.149)	0.198	(.165)
Hispanic Race	0.121	(.064)		063)	0.124	(.064)
Plans C &D (ref = Plan B)	0.82	(.142)	3	142)	0.825	(.142)
Interactions						
Black * Plans C/D	0.44	(.15	0.456	154)	0.451	(.154)
County-Level Characteristics						
% Black Physicians					.007	(.012)
Cross-Level Interaction						
Black * % Black Physicians					-0.039	(.019)
Random Effects						
Between-County Variance			0.012	(.007)	0.005	(0.006)
Scaled Deviance Statistic	30,824.5		30,948.4		30,895.4	

Model also controls for months enrolled, # and ages of enrolled children, language, and county poverty.

Relative risk of disenrollment by race, SCHIP plan & county physician racial makeup



Avoid making audience calculate net effect of cross-level interaction: e.g., RR of disenrollment for a black family in Plan C living in a county with a high share of black physicians =

$$EXP[\beta_{black+} + \beta_{Plan\ C} + \beta_{black\ \&\ Plan\ C} + (\beta_{\%black\ phys} * 7) + (\beta_{(\%black\ phys\ \&\ black\ family)} * 7)]$$

Compared to white families in Plan B.

Predicted Difference in Birth Weight by Income-to-Poverty Ratio (IPR)

Don't ask audience to compute

$81.4*IPR - 10.1*IPR^2$

for several values of IPR ☹

* Compared to IPR = 0.0

Based on a multivariate model that also controls for gender, race/ethnicity, income-to-poverty, maternal age, educational attainment, and smoking.

Explaining a chart “live”

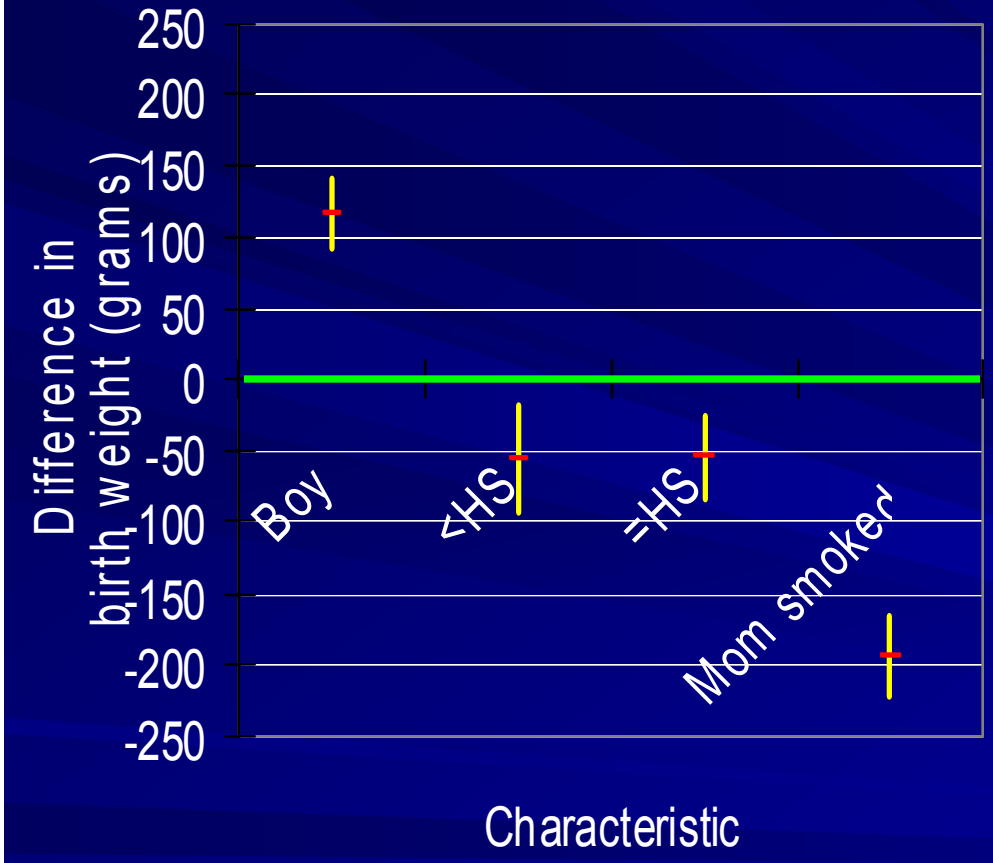
Explaining a chart so audience can follow

- Before you describe data from chart or table, give audience time to become familiar with it.
  1) Display the chart or table.
  2) State the purpose.
  3) Describe the layout.
- Then report and interpret the numbers or patterns you want to highlight.
- Repeat simple “take home” point(s) of chart.

State the purpose of the table or chart

- Where does it fit in the logical sequence of your story?
  - What questions is it intended to answer?
- Can restate purpose as rhetorical question or hypothesis.
- Pause briefly to give audience a chance to digest it.

Effects of Selected Maternal and Infant Characteristics on Birth Weight



- Speaker's notes – intro
  - "This chart shows the net effects of several maternal and infant traits on birth weight from a multivariate model that also controls for other demographic and socioeconomic traits."

Compared to non-Hispanic white, female infants, with a mother who completed at least some college and is a non-smoker. The model also controls for race, income-to-poverty ratio, and maternal age.

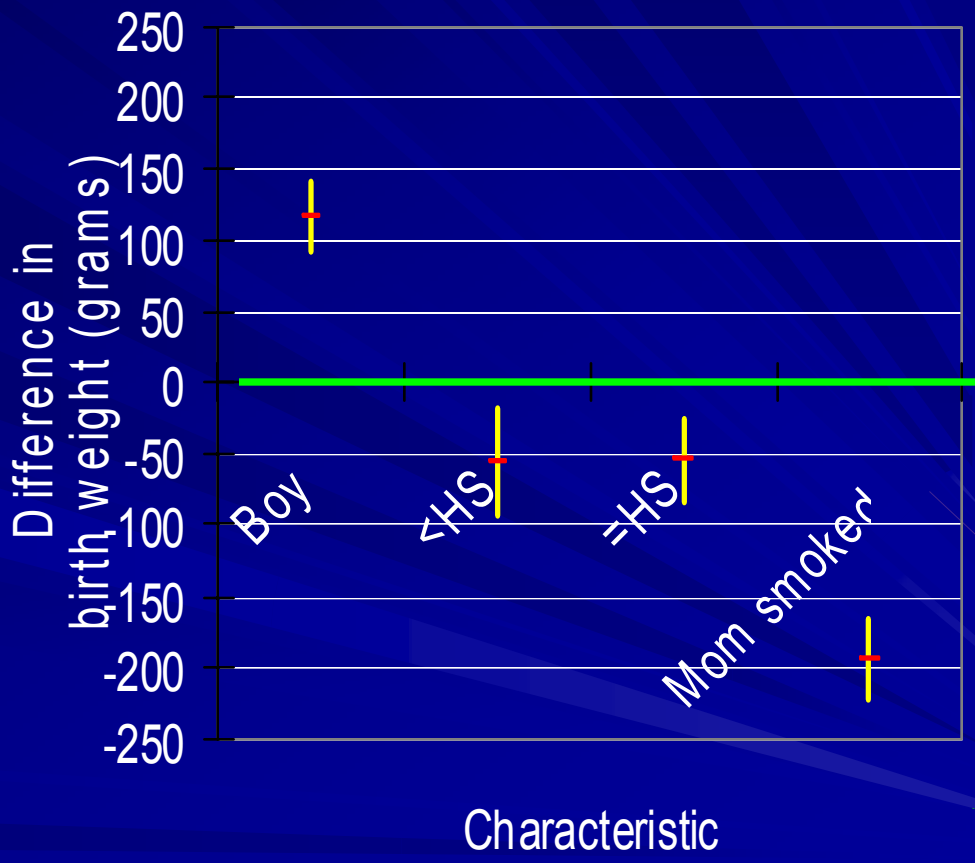
Explain the layout of the chart

- What is where? Point out location of each variable.
  - On a chart:
    - What is on each axis?
    - What is in the legend?
  - In a table:
    - What is in the rows?
    - What is in the columns?
- State the units of measurement or coding.
- Explain colors and symbols on axes & legend.

Literally point to each as you mention them. AKA "the Vanna White technique."

Effects of Selected Maternal and Infant Characteristics on Birth Weight

- Speaker's notes – layout
  - "From left to right, we have boy, two categories of mother's education, and a dummy indicating that the mother smoked [point to each as you name it]."
  - "On the vertical axis [wave up and down] is predicted difference in birthweight compared to the reference category described in the footnote [point]."
  - "The red dash [point to] is the point estimate and the yellow vertical line [gesture] shows the 95% confidence interval.
  - "Finally, the green line at Y=0 [wave across] is the null hypothesis of no birthweight difference between groups."

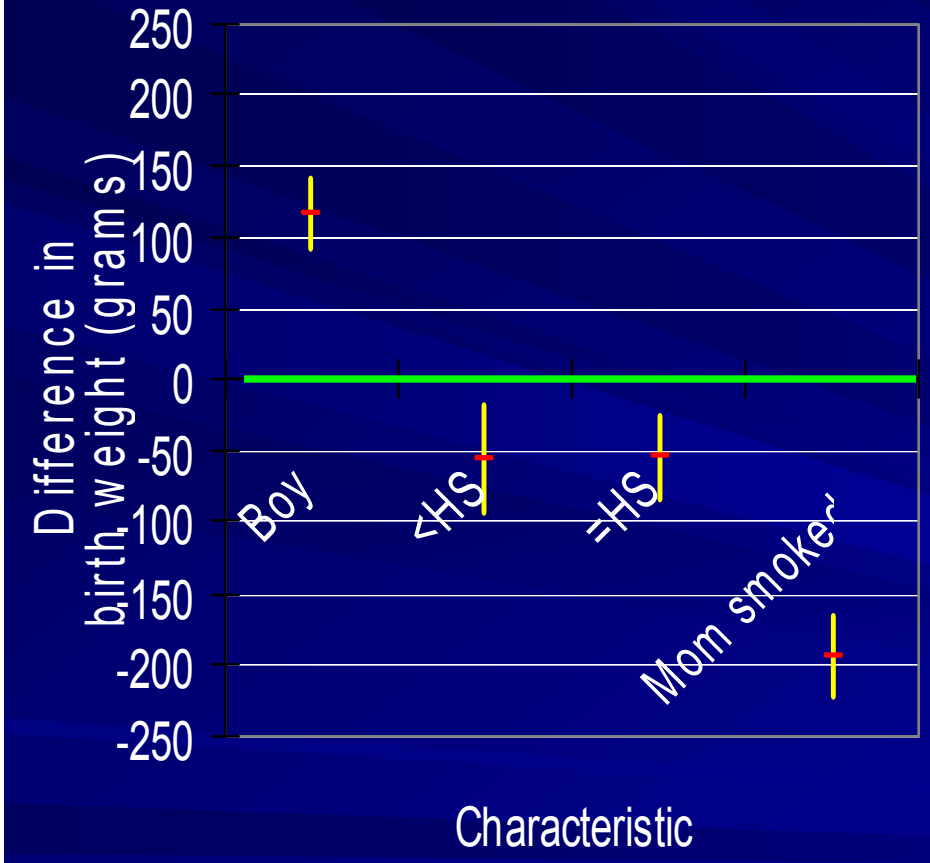


Compared to non-Hispanic white, female infants, with a mother who completed at least some college and is a non-smoker.

Explain the contents of the chart

- Be systematic.
  - Order of description:
    - Left to right
    - Top to bottom
  - If you find yourself jumping to disparate places in table or chart, restructure your chart to coordinate with sequence of your sentences:
    - Order of categories on x-axis or in table rows.
    - Which variable in legend vs. on x-axis.

Effects of Selected Maternal and Infant Characteristics on Birth Weight



- Speaker's notes – patterns
  - "As you can see, each of these traits retained a statistically significant association with birth weight in the multivariate model.
  - "Boys weighed statistically significantly more than girls, as we can see because the 95% CI does not overlap 0 [point to "boy" conf. int. and 0 ref. line].
  - "Infants born to mothers with high school or less weighed roughly 50 grams less than those born to more educated mothers [point to assoc. coeffs & CI].
  - "Finally, infants whose mothers smoked during pregnancy were a whopping 200 grams lighter than their peers [point to]."

Contents of speaker's notes

- Introductory sentence for slide
  - Paraphrase title
  - Restate title as a rhetorical question
- "Vanna White" notes for
  - Describing a chart or table
  - Coordinating with handouts
- Summary sentence if slide covered a lot of info
- Transition sentence to next slide
  - Explain where slide fits in the overall presentation or analysis.
- HINT: Print speaker's notes out with large type (~ 14 point), so you can read them!

Summary

- Speech ≠ paper
- Adapt contents and format to create effective slides
- Write associated narrative
- Tailor all elements to fit
  - Time allotted
  - Audience

Exercises for speaking about MV

- Create slides and speaker's notes about bivariate patterns shown in Table 14A (page 1 of exercises handout)
  - See page 5 of exercises handout for questions.
- Or mock-up slides and speaker's notes to present results from
  - Your own MV table and prose
  - MV results from an article you brought from the published PH literature

- See page 5 of exercises handout for checklist of criteria for speaking about MV.