What Analysis to Use?

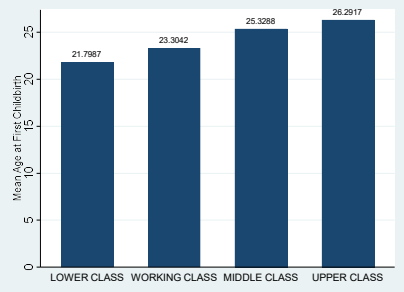
Univariate Descriptive Statistics

- Univariate descriptive statistics – describe one variable at a time
- Univariate statistics we learned:
  - Central tendency measures: mean, median, mode
  - Variability measures: range, interquartile range, standard deviation, variance, variation ratio
- Univariate graphs:
  - Construct: bar graph, pie chart, histogram, box-and-whisker plot
  - interpretation only: frequency polygon, cumulative frequency polygon, stem-and-leaf plol

Bivariate Analysis: Three Scenarios

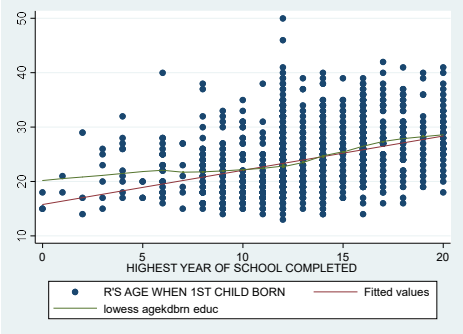
1. A relationship of two variables when one (X) in interval/ratio, and the other (G) is nominal/ordinal
   - Independent samples t-test (2 groups, $X_{G1} \neq X_{G2}$?)
   - ANOVA (3+ groups, $X_{G1} \neq X_{G2} \neq X_{G3}$…?)
   - Graphs: bivariate bar graph (means by group)

g



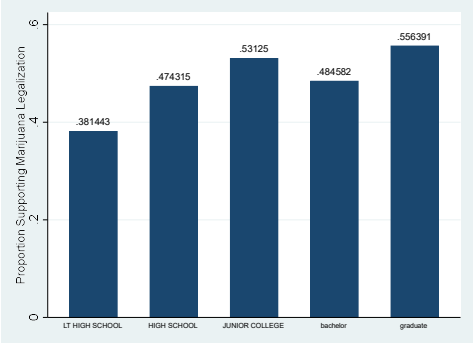
Bivariate Analysis: Three Scenarios

2. A relationship of two variables when both are interval/ratio:
   - Correlation coefficient (relationship: X↔Y?)
   - Bivariate regression (cause & effect: X → Y?)
   - Graphs: scatterplot, lowess, linear fit



Bivariate Analysis: Three Scenarios

3. A relationship of two variables when both are nominal/ordinal
   - Chi-square test (relationship: X↔Y?)
   - Graph: bivariate bar graph (proportions by group)



Type of Test	Main Characteristics	Null Hypoth.
One Sample Mean	Mean and standard deviation (or data to calculate them) are provided for <u>one sample</u> only; and some known or hypothetical population mean or provided. [One variable only.]	H0: μ = number
Two Independent Samples	A comparison of <u>two</u> groups where observations are independent, <u>not naturally divided into pairs.</u> [A relationship between an interval/ratio and nominal variable with 2 categories.]	H0: $\mu_1 = \mu_2$
ANOVA: 3+ Samples	Simultaneous comparison of <u>three or more</u> groups. [A relationship between an interval/ratio and nominal/ordinal variable with 3+ categories.]	H0: $\mu_1 = \mu_2 = \mu_s$
Correlation Coefficient	A test for a relationship between two interval/ratio variables when we do not see one as dependent and the other as independent (no cause/effect).	H0: $\rho = 0$
Regression Slope	A test for a relationship between an interval/ratio dependent variable and an independent variable (testing a causal argument).	H0: $\beta = 0$
Chi-Square	A test for a relationship between two nominal/ordinal variables.	H0: $O_i = E_i$

Types of Bivariate Analysis by Level of Measurement

(One variable only → one sample t-test)

Variable 1 / Variable 2	Nominal/ordinal	Interval/ratio
Nominal/ ordinal	• Chi-square	• Two samples t-test (2 categories) • ANOVA (3+ categories)
Interval/ ratio	• Two samples t-test (2 categories) • ANOVA (3+ categories)	• Correlation (relationship) • Regression (cause/effect)

Decision Tree for Bivariate Analysis