Data analysis process

Data collection and preparation

- Collect data
- Prepare codebook
- Set up structure of data
- Enter data
- Screen data for errors

Exploration of data

- Descriptive Statistics
- Graphs

Analysis

- Explore relationship between variables
- Compare groups

Collecting data

- Survey
- Using existing data

Three steps to

PREPARING A DATA FILE

Step 1: Setting your options: Edit>Options

- General tab
  - Variable lists
  - Output notification
    - Raise viewer window
    - Scroll to new output
  - Output
    - No scientific notation
  - Session journal
    - Append
    - Browse – set folder
- Data tab
  - Calculate values immediately
  - Display format for new numeric variables (make 0)
- Output labels
  - Values and labels
- Charts tab
  - Formatting charts
- Pivot Tables tab
  - academic

Step 2: setting up the structure of the data file

Variable tab – SPSS codebook

- Label versus name
- Types of variables
- Values of a variable
- Missing values
- Type of measurement

Step 3: enter the data

- Data view
  - Entering data
  - Opening an existing data set

- Using Excel
  - Variable names in the first row
  - Converting to SPSS format

Other useful things to know:

- Merging files
  - Adding cases
  - Adding variables
- Sorting the data file
- Splitting the data file
- Selecting cases
- Using sets (useful for large data files with scales)
- Data file information

Two step to

SCREENING AND CLEANING THE DATA

Two steps:

Step 1: checking for errors

- Categorical variables
  - Analyze>descriptive statistics>frequencies
  - Statistics: min/max
- Numerical variables
  - analyze>descriptive statistics>descriptives
  - Options: mean, std dev, min, max

Step 2: finding and correcting the errors

- Method 1: sort cases
- Method 2: edit>find

Other useful thing for screening

Case summaries

1. Analyze>reports>case summaries
2. Choose variables, limit cases to first 100
3. Statistics: number of cases
4. Options: uncheck subheadings for totals

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Descriptive statistics and graphs

EXPLORATION OF DATA

Descriptive statistics

Categorical:

Frequencies

Numerical:

Descriptives:

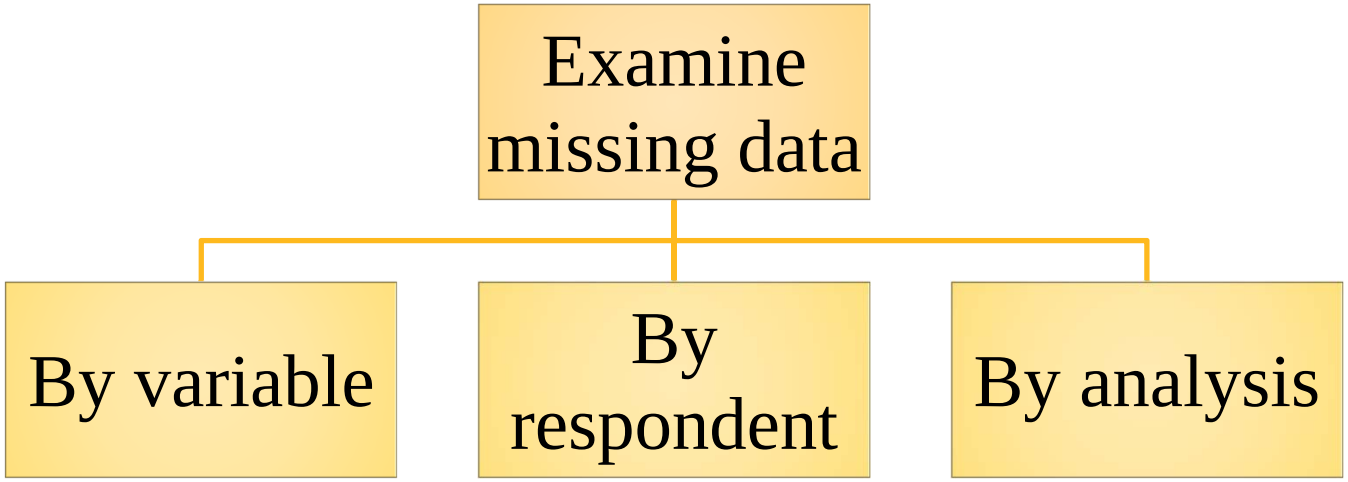
- mean
- standard deviation
- minimum
- maximum
- skewness (symmetry)
- kurtosis (peakness)

Missing Data

Two potential problems with missing data:

1. Large amount of missing data – number of valid cases decreases – drops the statistical power
2. Nonrandom missing data – either related to respondent characteristics and/or to respondent attitudes – may create a bias

Missing Data Analysis



If no problem found, go directly to your analysis

If a problem is found:

- Delete the cases with missing data
- Try to estimate the value of the missing data

Amount of missing data by variable

- Use Analyze > Descriptive Statistics > Frequencies
- Look at the frequency tables to see how much missing
- If the amount is more than 5%, there is too much. Need analyze further.

Missing data by respondent

1. Use transform>count
2. Create NMISS in the target variable
3. Pick a set of variables that have more missing data
4. Click on define values
5. Click on system- or user-missing
6. Click add
7. Click continue and then ok
8. Use the frequency table to show you the results of NMISS

Missing data patterns

- Use Analyze>descriptive statistics>crosstabs
- Look to see if there is a correlation between NMISS (row) and another variable (column)
- Use column percents to view the % of missing for the value of the variable

What to do about the missing data?

- Proceed anyway
- In SPSS Options:
  - Exclude case listwise – include only cases that have all of the variables
  - Exclude cases pairwise – excludes only if the variables in the analysis is missing
  - Replace with mean – use at your own risk

Assessing Normality

- Skewness and kurtosis
- Using Explore:
  - Dependent variable
  - Label cases by – id variable
  - Display – both
  - Statistics – descriptives and outliers
  - Plots – descriptive: histogram, normality plots with test
  - options – exclude cases pairwise

Outliers

1. histogram

2. boxplot

Other graphs

- Bar charts
- Scatterplots
- Line graphs

Manipulating data

- Recoding
- Calculating
- When to create a new variable versus creating a new one.

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Analysis

Explore relationships among variables

- Crosstabulation/Chi Square
- Correlation
- Regression/Multiple regression
- Logistic regression
- Factor analysis

Compare groups

- Non-parametric statistics
- T-tests
- One-way analysis of variance ANOVA
- Two-way between groups ANOVA
- Multivariate analysis of variance MANOVA

Crosstabulation

Aim: for categorical data to see the relationship between two or more variables

Procedure:

- Analyze>Descriptive statistics>Crosstab
- Statistics: correlation, Chi Square, association
- Cells: Percentages – row or column
- Cluster bar charts

Correlation

Aim: find out whether a relationship exists and determine its magnitude and direction

Correlation coefficients:

- Pearson product moment correlation coefficient
- Spearman rank order correlation coefficient

Assumptions:

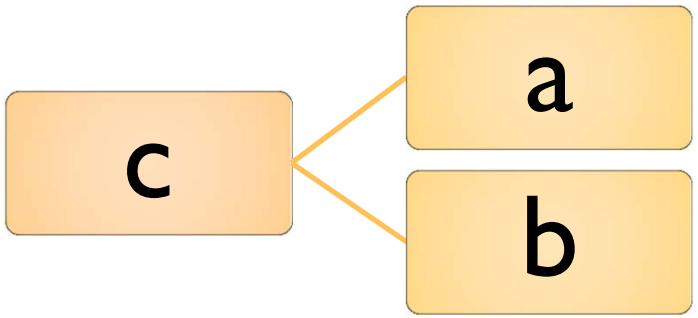
- relationship is linear
- Homoscedasticity: variability of DV should remain constant at all values of IV

Partial correlation

Aim: to explore the relationship between two variables while statistically controlling for the effect of another variable that may be influencing the relationship

Assumptions:

same as correlation



Regression

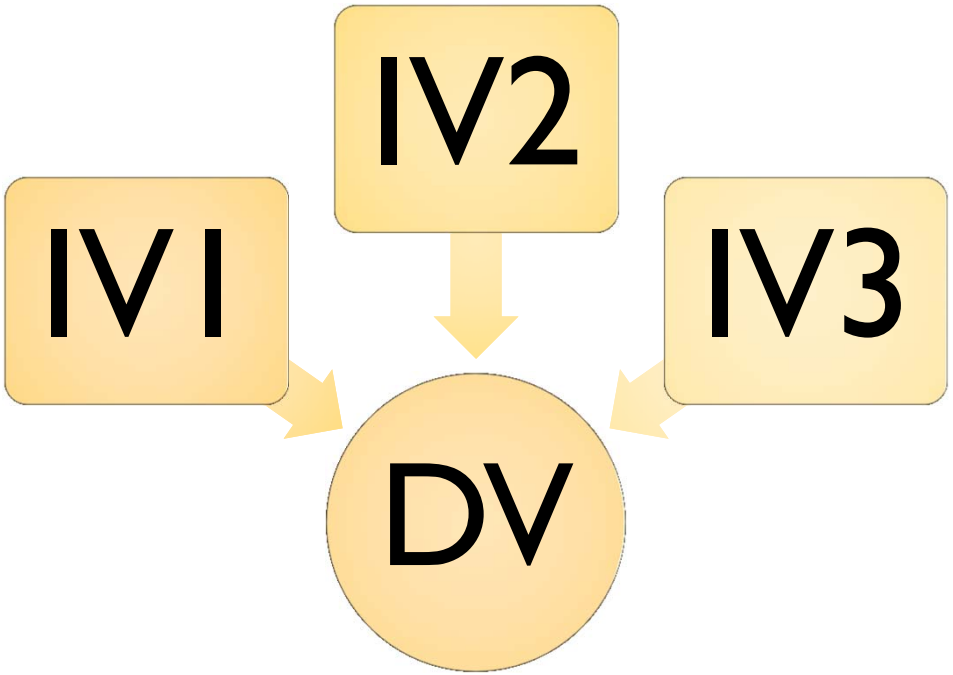
Aim: use after there is a significant correlation to find the appropriate linear model to predict DV (scale or ordinal) from one or more IV (scale or ordinal)

Assumptions:

- sample size needs to be large enough
- multicollinearity and singularity
- outliers
- normality
- linearity
- homoscedasticity

Types:

- standard
- hierarchical
- stepwise



Logistic regression

Aim: create a model to predict DV (categorical – 2 or more categories) given one or more IV (categorical or numerical/scale)

Assumptions:

- sample size large enough
- multicollinearity
- outliers

Procedure note:

- use Binary Logistic for DV of 2 categories (coding 0/1)
- use Multinomial Logistic for DV for more then 2 categories

Factor analysis

Aim: to find what items (variables) clump together. Usually used to create subscales. Data reduction.

Factor analysis:

exploratory

confirmatory

SPSS -> Principal component analysis

Three steps of factor analysis

1. Assessment of the suitability of the data for factor analysis
2. Factor extraction
3. Factor rotation and interpretation

1. Assessment of the suitability

1. Sample size: 10 to 1 ratio
2. Strength of the relationship among variables (items) – Test of Sphericity
3. Linearity
4. Outliers among cases

Step 2. Factor extraction

1. Commonly used technique principal components analysis
2. Kaiser's criterion: only factors with eigenvalues of 1.0 or more are retained – may give too many factors
3. Scree test: plot of the eigenvalues, retain all the factors above the "elbow"
4. Parallel analysis: compares the size of the eigenvalues with those obtained from randomly generated data set of the same size

Step 3: factor rotation and interpretation

1. Orthogonal rotation
    1. uncorrelated
    2. Easier to interpret
    3. Varimax
2. Oblique rotation
    1. Correlated
    2. Harder to interpret
    3. Direct Oblimin

Checking the reliability of a scale

- Analyze>Scale>Reliability
- Items
- Model: Alpha
- Scale label: name new subscale to be created
- Statistics:
  - descriptives: item, scale, scale if item deleted
  - Inter-item: correlations
  - Summaries: correlations

Analysis

Explore relationships among variables

- Crosstabulation/Chi Square
- Correlation
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Compare groups

- Non-parametric statistics
- T-tests
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Nonparametric tests

Non-parametric techniques	Parametric techniques
Chi-square test for goodness of fit	None
Chi-square test for independence	None
Kappa measure of agreement	None
Mann-Whitney U Test	Independent samples t-test
Wilcoxon Signed Rank Test	Paired samples t-test
Kruskal-Wallis Test	One-way between groups ANOVA
Friedman Test	One-way repeated measures ANOVA

T-test for independent groups

- Aim: Testing the differences between the means of two independent samples or groups
- Requirements:
  - Only one independent (grouping) variable IV (ex. Gender)
  - Only two levels for that IV (ex. Male or Female)
  - Only one dependent variable (DV - numerical)
- Assumptions:
  - Sampling distribution of the difference between the means is normally distributed
  - Homogeneity of variances – Tested by Levene's Test for Equality of Variances
- Procedure:
  - ANALYZE>COMPARE MEANS>INDEPENDENT SAMPLES T-TEST
  - Test variable – DV
  - Grouping variable – IV
  - DEFINE GROUPS (need to remember your coding of the IV)
  - Can also divide a range by using a cut point

Paired Samples T-test

- Aim:used in repeated measures or correlated groups designs, each subject is tested twice on the same variable, also matched pairs
- Requirements:
  - Looking at two sets of data – (ex. pre-test vs. post-test)
  - Two sets of data must be obtained from the same subjects or from two matched groups of subjects
- Assumptions:
  - Sampling distribution of the means is normally distributed
  - Sampling distribution of the difference scores should be normally distributed
- Procedure:
  - ANALYZE>COMPARE MEANS>PAIRED SAMPLES T-TEST

One-way Analysis of Variance

- Aim: looks at the means from several independent groups, extension of the independent sample t-test
- Requirements:
  - Only one IV (categorical)
  - More than two levels for that IV
  - Only one DV (numerical)
- Assumptions:
  - The populations that the sample are drawn are normally distributed
  - Homogeneity of variances
  - Observations are all independent of one another
- Procedure:

  ANALYZE>COMPARE MEANS>One-Way ANOVA
  - Dependent List – DV
  - Factor – IV

Two-way Analysis of Variance

- Aim: test for main effect and interaction effects on the DV
- Requirements:
  - Two IV (categorical variables)
  - Only one DV (continuous variable)
- Procedure:

  ANALYZE>General Linear Model>Univariate
  - Dependent List – DV
  - Fixed Factor – IVs

MANOVA

Aim: extension of ANOVA when there is more than one DV (should be related)

Assumptions:

- sample size
- normality
- outliers
- linearity
- homogeneity of regression
- multicollinearity and singularity
- homogeneity of variance-covariance matrices

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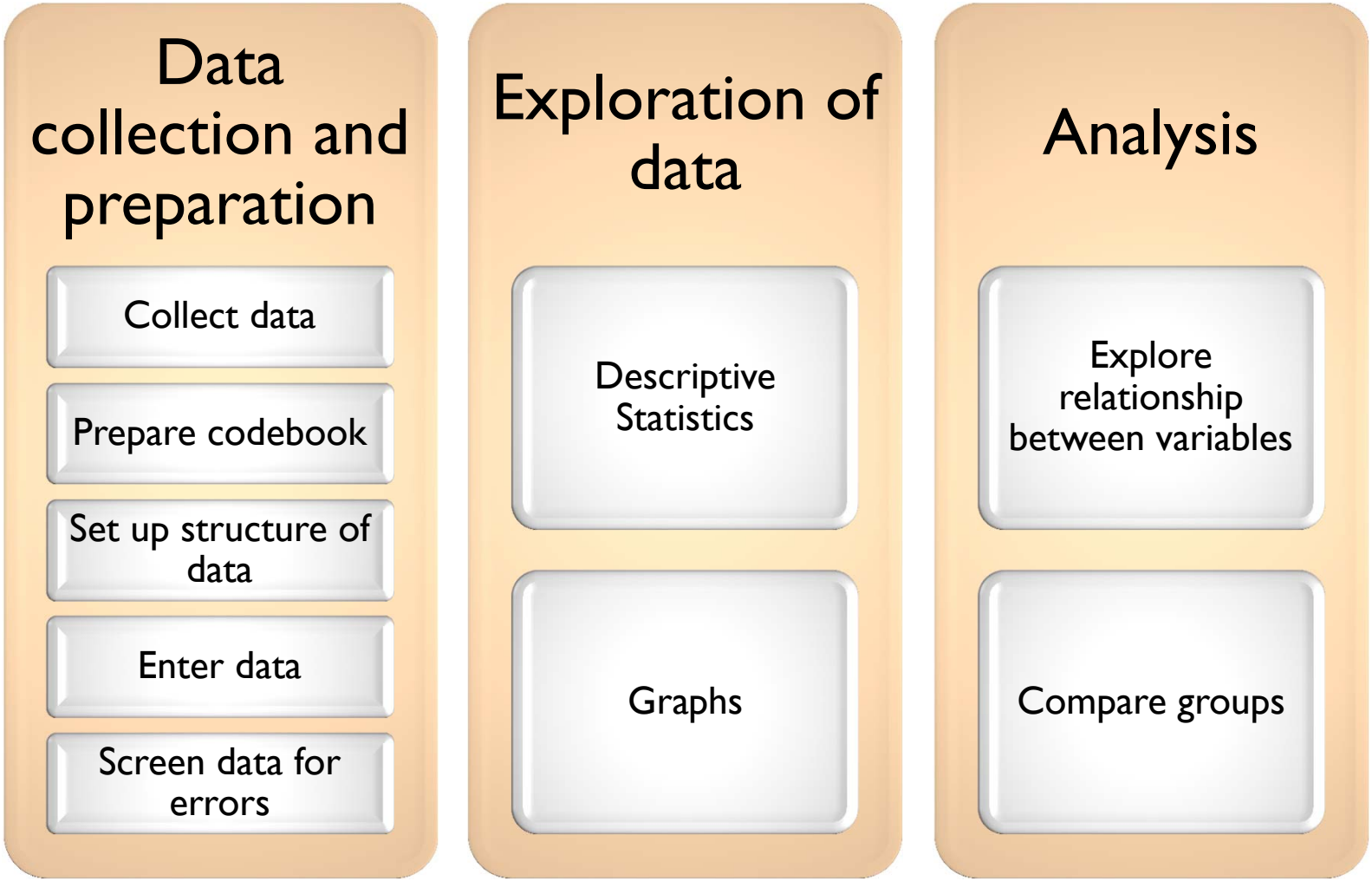

THANK YOU!