Third Edition

8455



28



5 17 35 1 28 45









STATISTICS FOR RESEARCH

WITH A GUIDE TO SPSS

GEORGE ARGYROUS





Extended contents

Pref	Preface	
Part 1 An introduction to statistical analysis		1
1	Variables and their measurement	3
	Learning objectives	3
	The conceptualization and operationalization of variables	5
	Scales of measurement	9
	Levels of measurement	11
	Univariate, bivariate, and multivariate analysis	16
	Descriptive statistics	19
	Exercises	22
2	Setting up an SPSS data file	24
	Learning objectives	24
	Obtaining a copy of SPSS	24
	Alternatives to SPSS	25
	Options for data entry in SPSS	26
	The SPSS Data Editor	27
	Assigning a variable name	30
	Setting the data type	31
	Setting the data width and decimal places	33
	Defining variable labels	. 33
	Defining value labels	34
	Setting missing values	36
	Setting the column format and alignment	38
	Specifying the level of measurement	39
	Specifying the role of each variable	39
	Controlling the appearance of the Variable View	40
	Shortcuts for defining variables	42
	Generating variable definitions in SPSS	43
	The SPSS Viewer window	45
	Saving a data file	: 48
	Data entry	: 48
	Checking for incorrect values: Data cleaning	50

	Working with a large data set Summary Exercises	51 53 53
Part	2 Descriptive statistics: Graphs and tables	55
3	The graphical description of data	57
	Learning objectives	57
	Some general principles	58
	The SPSS Chart Builder	58
	Pie graphs	59
	Bar graphs	63
	Histograms and polygons	66
	Interpreting a univariate distribution	68
	Graphing two variables	70
	Common problems and misuses of graphs	73
	Exercises	77
4	The tabular description of data	79
	Learning objectives	79
	Listed data tables	80
	Simple frequency tables	80
	Relative frequency tables: Percentages, proportions, and rates	83
	Cumulative frequency tables	87
	Class intervals	89
	Percentiles	94
	Frequency tables using SPSS	94
	Valid cases and missing values	97
	Improving the look of tables	97
	Choosing between graphs and tables	98
	Exercises	99
5	Using tables to investigate the relationship between variables:	
	Crosstabulations	101
	Learning objectives	101
	Crosstabulations as descriptive statistics	101
	Types of data suitable for crosstabulations	104
	Crosstabulations with relative frequencies	105
	Crosstabulations using SPSS	108
	Interpreting a crosstabulation: The pattern and strength of a relationship	109
	Interpreting a crosstabulation when both scales are at least ordinal	111
	Summary	114
	Exercises	114

6	Measures of association for crosstabulations: Nominal data	118
	Learning objectives	118
	Measures of association as descriptive statistics	119
	Measures of association for nominal scales	122
	Properties of lambda	126
	Lambda using SPSS	127
	Limitations on the use of lambda	131
	Standardizing table frequencies	133
	Exercises	134
7	Measures of association for crosstabulations: Ranked data	137
	Learning objectives	137
	Data considerations	137
	Concordant pairs	138
	Discordant pairs	141
	Measures of association for ranked data	142
	Gamma	142
	Somers' d	145
	Kendall's tau-b	147
	Kendall's tau-c	147
	Measures of association using SPSS	147
	Summary	153
	Exercises	153
8	Multivariate analysis of crosstabs: Elaboration	157
	Learning objectives	157
	Direct relationship	158
	Elaboration of crosstabs using SPSS	160
	Partial gamma	162
	Spurious or intervening relationship?	. 163
	Conditional relationship	164
	Summary	168
	Exercises	168
Part	3 Descriptive statistics: Numerical measures	171
9	Measures of central tendency	173
	Learning objectives	173
	Measures of central tendency	173
	The mode	175
	The median	176
	The mean	178
	Choosing a measure of central tendency	180

	Measures of central tendency using SPSS: Univariate analysis Measures of central tendency using SPSS: Bivariate and	182
	multivariate analysis	185
	Summary	187
	Exercises	187
10	Measures of dispersion	191
	Learning objectives	191
	The range	192
	The interquartile range	193
	The standard deviation	194
	Coefficient of relative variation	197
	Index of qualitative variation	198
	Measures of dispersion using SPSS	203
	Summary	204
	Exercises	205
11	The normal curve	206
	Learning objectives	206
	The normal distribution	206
	Using normal curves to describe a distribution	210
	z-scores	212
	Normal curves in SPSS	219
	Exercises	222
12	Correlation and regression	225
	Learning objectives	225
	Scatter plots	226
	Linear regression	227
	Pearson's product moment correlation coefficient	236
	Explaining variance: The coefficient of determination	237
	Plots, correlation, and regression using SPSS	239
	The assumptions behind regression analysis	245
	Spearman's rank-order correlation coefficient	245
	Spearman's rho using SPSS	247
	Correlation where the independent variable is categorical: Eta	249
	Summary	250
	Exercises	250
13	Multiple regression	255
	Learning objectives	255
	Introduction to multiple regression	257
	Multiple regression with SPSS	259

	Testing for the significance of the multivariate model	262
	Alternative methods for selecting variables in the regression model	263
	Stepwise regression	264
	Extending the basic regression analysis: Hierarchical regression	266
	Extending the basic regression analysis: Adding categorical	
	independent variables	268
	The assumptions behind multiple regression	270
	Exercises	277
Part	4 Inferential statistics: Tests for a mean	2 79
14	Sampling distributions	281
	Learning objectives	281
	Random samples	283
	The sampling distribution of a sample statistic	285
	The central limit theorem	290
	Generating random samples using SPSS	291
	Summary	293
	Exercises	294
15	Introduction to hypothesis testing and the one-sample z-test for a mean	295
	Learning objectives	295
	Step 1: State the null and alternative hypotheses	300
	Step 2: Choose the test of significance	302
	Step 3: Describe the sample and derive the p-value	304
	Step 4: Decide at what alpha level, if any, the result is	
	statistically significant	306
	Step 5: Report results	309
	Error types in hypothesis testing	311
	What does it mean when we 'fail to reject the null hypothesis'?	312
	What does it mean to 'reject the null hypothesis'?	313
	The debate over one-tailed and two-tailed tests of significance	316
	Summary	319
	Appendix: Hypothesis testing using critical values of the test statistic	319
	Exercises	320
16	The one-sample t-test for a mean	322
	Learning objectives	322
	The Student's t-distribution	323
	The one-sample t-test for a mean	323
	The one-sample t-test using SPSS	329
	Summary	331
	Exercises	331

17	Inference using estimation and confidence intervals	334
	Learning objectives	334
	The sampling distribution of sample means	335
	Estimation	336
	Changing the confidence level	341
	Changing the sample size	344
	Estimation using SPSS	345
	Confidence intervals and hypothesis testing	347
	Exercises	348
18	The two-sample t-test for the equality of means	350
	Learning objectives	350
	Dependent and independent variables	352
	The sampling distribution of the difference between two means	353
	The two-sample <i>t</i> -test for the equality of means	356
	The two-sample t-test using SPSS	359
	Presenting the results of multiple tests	362
	Exercises	364
19	The <i>F</i> -test for the equality of more than two means:	
	Analysis of variance	366
	Learning objectives	366
	The one-way analysis of variance F-test	370
	ANOVA using SPSS	374
	Comparing means using general linear models	380
	Exercises	381
20	The two-dependent-samples t-test for the mean difference	384
	Learning objectives	384
	Dependent and independent samples	384
	The two-dependent-samples t-test for the mean difference	386
	The two-dependent-samples <i>t</i> -test using SPSS	389
	Exercises	393
Part	5 Inferential statistics: Tests for frequency distributions	397
21	One-sample tests for a binomial distribution	399
	Learning objectives	399
	Data considerations	400
	The sampling distribution of sample percentages	401
	The z-test for a binomial percentage	402
	Estimating a population percentage	404
	The z-test for a binomial percentage using SPSS	408

	The runs test for randomness The runs test using SPSS Exercises	411 415 418
22	One-sample tests for a multinomial distribution Learning objectives The chi-square goodness-of-fit test The chi-square goodness-of-fit test using SPSS The chi-square goodness-of-fit test for normality Summary Exercises	420 420 421 425 430 432 433
23	The chi-square test for independence Learning objectives The chi-square test and other tests of significance Statistical independence The chi-square test for independence The distribution of chi-square The chi-square test using SPSS Problems with small samples Problems with large samples Presenting the results of multiple chi-square tests Appendix: Hypothesis testing for two percentages Exercises	435 435 437 437 443 444 451 452 455 456 459
24	Frequency tests for two dependent samples Learning objectives The McNemar chi-square test for change The McNemar test using SPSS The sign test Summary Exercises	461 461 462 464 466 467 468
Part	6 Inferential statistics: Other tests of significance	469
25	Rank-order tests for two or more samples Learning objectives Data considerations The rank sum and mean rank as descriptive statistics The z-test for the rank sum for two independent samples Wilcoxon's rank-sum z-test using SPSS The Wilcoxon signed-ranks z-test for two dependent sample The Wilcoxon signed-ranks test using SPSS	471 471 472 473 477 482 es 484 488

	Other non-parametric tests for two or more samples	488
	Appendix: The Mann-Whitney U-test	491
	Exercises	492
26	The t-test for a correlation coefficient	495
	Learning objectives	495
	The t-test for Pearson's correlation coefficient	496
	Testing the significance of Pearson's correlation coefficient using SPSS	497
	The <i>t</i> -test for Spearman's rank-order correlation coefficient	499
	Testing the significance of Spearman's correlation coefficient	#O1
	using SPSS	501
	Testing for significance in multiple regression	502
	Presenting results of multiple bivariate correlations	503
	Exercises	504
Part	7 Advanced topics	505
27	Statistical power	507
	Learning objectives	507
	Calculating statistical power	509
	Effect size	510
	Prospective power analysis	511
	Retrospective power analysis	513
	Factors affecting statistical power	514
	Summary	515
28	Generating new variables in SPSS: The Recode, Compute, and	
	Multiple Response commands	517
	Learning objectives	517
	Recoding variables	518
	Using Recode to convert a string variable to a numeric variable	524
	Some issues with recoding	526
	Computing new variables	526
	The SPSS Multiple Response command	535
	Summary	540
Apr	endix	541
	Table A1 Area under the standard normal curve	541
	Table A2 Critical values for t-distributions	543
	Table A3 Critical values for F-distributions ($\alpha = 0.05$)	544
	Table A4 Critical values for chi-square distributions	545

Table A5 Sampling errors for a binomial distribution (95% confidence level)	546
Table A6 Sampling errors for a binomial distribution (99% confidence level)	546
Key equations	547
Glossary	554
Answers	560
Index	580