MedicalBiostatistics.com

From: Indrayan's Text Book MEDICAL BIOSTATISTICS

Ready Guide to Statistical Methods

Last column refers to the Medical Biostatistics (III Edition) by A. Indrayan

(Chapman & Hall/CRC Press, 2012)

Summary Tables

SUMMARY-1: Methods to compute some confidence intervals

Parameter of Interest	Conditions	95% CI
Proportion (π)	Large n, $p \neq 0$ and $p \neq 1$	Equation 12.11
	Small n, any p	Figure 12-4
	Any n, p = 0 or 1 (bound)	Table 12-4
Mean (μ)	Large n, σ known, almost any underlying distribution	Equation 12.14
	Small n, σ known or unknown, underlying nonGaussian	Table 12-5 (CI for median)
	Any n, σ unknown, underlying Gaussian	Equation 12.15
	Large n, σ unknown, underlying nonGaussian	Equation 12.15
	Small n, σ known, underlying Gaussian	Equation 12.14
Median	Gaussian distribution	Equation 12.18
	NonGaussian Conditions	Table 12-5
Difference ($\pi_1 - \pi_2$)	Large n_1, n_2—Independent samples	Equation 12.20
	Large n_1, n_2—Paired samples	Equation 12.23
Difference ($\mu_1 - \mu_2$) (σ unknown)	Independent samples	
	Large n_1, n_2—Any underlying distribution	Equation 12.21
	Small n_1, n_2—Underlying Gaussian	Equation 12.21
	Paired samples	Same as for one sample after taking the difference
Relative risk	Large n_1, n_2—Independent samples	Equation 14.4
	Large n_1, n_2—Paired samples	Same as for OR
Attributable risk	Large n_1, n_2—Independent samples	Same as for $\pi_1 - \pi_2$
	Large n_1, n_2—Paired samples	Equation 14.12
Number needed to treat	Large n_1, n_2—Independent samples	Section 14.1.3
Odds ratio	Large n_1, n_2—Independent samples	Equation 14.18
	Large n_1, n_2—Paired samples	Equation 14.21
Regression coefficient	Large n	Section 16.3.1
Regression line	Large n	Section 16.3.1
Logistic coefficient	Large n	Section 17.2.2

SUMMARY-2: Statistical procedures for test of hypothesis on proportions

Parameter of Interest and Setup	Conditions	Main Criterion	Equation/Section
Small Sized Tables			
One dichotomous variable	Independent trials		
	Any *n*	Binomial	Use Equation 13.1
	Large *n*	Gaussian *Z*	Equation 13.3
One polytomous variable	Independent trials		
	Large *n*	Goodness-of-fit chi-square	Equation 13.5
	Small *n*	Multinomial	Use Equation 13.6
Two dichotomous variables (2×2)	Two independent samples		
	Large *n*	Chi-square or Gaussian *Z*	Equation 13.8 or Equation 13.9
	Small *n*	Fisher exact	Equation 13.11
	Detecting a medically important difference—Large *n*	Gaussian *Z*	Equation 13.10
	Equivalence test	TOSTs	Section 13.2.3
	Matched pairs		
	Large *n*	McNemar	Equation 13.12
	Small *n*	Binomial	Equation 13.13
	Crossover design		
	Large *n*	Chi-square	Section 13.2.2
	Small *n*	Fisher exact	Equation 13.11
Bigger Tables, No Matching	**The Case of Small *n* Not Discussed in This Text**	**Large *n* Required**	
Association	2×*C* tables	Chi-square	Equation 13.15
Trend in proportions	2×*C* tables	Chi-square for trend	Equation 13.16
Dichotomy in repeated measures	Many related 2×2 tables	Cochran *Q*	Equation 13.18
Association	*R*×*C* tables	Chi-square	Equation 13.15
Association	Three-way tables		
	Test of full independence	Chi-square	Equation 13.19
	Test of other types of independence (log–linear models)	G^2	Three-way extension of Equation 13.22
***I*×*I* Table**	Matched pairs	McNemar–Bowker	Section 13.3.2
Stratified	Stratified into many 2×2 tables	Mantel-Haenszel chi-square	Equation 14.26

SUMMARY-3: Procedures for test of hypothesis on relative risk (RR) and odds ratio (OR)

Parameter of Interest and Setup	Conditions	Main Criterion	Equation/Section
Relative and Attributable Risks	**The Case of Small *n* Not Discussed in This Text**	**Large *n* Required**	
ln(RR)	Two independent samples	Gaussian Z or Chi-square	Equation 14.5 or Equation 13.8
RR	Matched pairs	As for OR Gaussian Z or McNemar	Section 14.2.2 Equation 14.22 or Equation 14.23
	Stratified	Mantel–Haenszel chi-square	Equation 14.26
AR	Two independent samples	Chi-square or Gaussian Z	Equation 13.8 or Equation 13.9
	Matched pairs	McNemar	Equation 13.12
Odds Ratio	**The Case of Small *n* Not Discussed in This Text**	**Large *n* Required**	
ln(OR)	Two independent samples	Chi-square	Equation 13.8
OR	Matched pairs	Gaussian Z or McNemar	Equation 14.22 or Equation 14.23
	Stratified	Mantel–Haenszel chi-square	Equation 14.26

SUMMARY-4: Statistical procedures for test of hypothesis on means or locations

Setup	Conditions	Main Criterion	Equation/Section
One sample	Comparison with prespecified—Gaussian		
	σ known	Gaussian Z	Section 15.1.1
	σ not known	Student t	Equation 15.1
Comparison of two groups	Paired—Gaussian	Student t	Equation 15.3
	Paired—NonGaussian		
	Any n	Sign test	Equation 15.17a–c
	$5 \le n \le 19$	Wilcoxon signed-ranks W_S	Equation 15.18a
	$20 \le n \le 29$	Standardized W_S referred to Gaussian Z	Equation 15.18b
	$n \ge 30$	Student t	Equation 15.3
	Unpaired—Gaussian		
	Equal variances	Student t	Equation 15.6a
	Unequal variances	Student t	Equation 15.6b
	Unpaired—NonGaussian		
	n_1, n_2 between (4, 9)	Wilcoxon rank-sum W_R	Equation 15.19
	n_1, n_2 between (10, (29)	Standardized W_R referred to Gaussian Z	Equation 15.20
	$n_1, n_2 \ge 30$	Student t	Equation 15.6a or Equation 15.6b
	Crossover design Gaussian	Student t	Section 15.1.3
	Up-and-down trial		Section 15.1.4
	Detecting medically important difference	Student t	Equation 15.23
	Equivalence tests	Student t	Section 15.4.2
Comparison of three or more groups	One-way layout Gaussian	ANOVA F	Equation 15.8
	NonGaussian		
	$n \le 5$	Kruskal–Wallis H	Equation 15.21
	$n \ge 6$	H referred to chi-square	Equation 15.21
	Two-way layout Gaussian	ANOVA F	Section 15.2.2
	NonGaussian (one observation per cell)		
	$J \le 13$ and $K = 3$	Friedman S	Equation 15.22a or Equation 15.22b
	$J \le 8$ and $K = 4$	Friedman S	Equation 15.22a or Equation 15.22b
	$J \le 5$ and $K = 5$	Friedman S	Equation 15.22a or

			Equation 15.22b
	Larger *J, K*	*S* referred to chi-square	Equation 15.22a or Equation 15.22b
	Multiple comparisons		
	Gaussian		
	All pairwise	Tukey *D*	Equation 15.15
	With control group	Dunnett	Section 15.2.4
	Few comparisons	Bonferroni	Section 15.2.4
Repeated measures	Gaussian		Section 15.2.3

SUMMARY-5: Methods for studying the nature of relationship

Dependent Variable (y)	Independent Variables (xs)	Method	Equation/Section
Quantitative[a]	Qualitative	ANOVA	Section 15.2
Quantitative	Quantitative	Quantitative regression	Chapter 16
Quantitative	Mixture of qualitative and quantitative	ANCOVA	Section 16.3.2
Qualitative (dichotomous)	Qualitative or quantitative or mixture	Logistic	Sections 17.1 and 17.2
Qualitative (polytomous)	Qualitative or quantitative or mixture	Logistic—any two categories at a time	Section 17.3.2
	Quantitative	Discriminant	Section 19.2.3
Survival	Groups	Life table	Equation 18.8
		Kaplan–Meier	Equation 18.10
		Log–rank	Section 18.3.1
Hazard ratio	Mixture of qualitative and quantitative	Cox model	Section 18.3.2

Note: Large n required, particularly for tests of significance. Exact method for small n not discussed in this text.

[a] Quantitative are variables on metric scale without any broad categories. Fine categories are admissible.

SUMMARY-6: Main methods of measurement of strength of relationship between two variables

Type of Variables	**Measure**	**Equation/Section**
Both qualitative		
Binary categories	OR and several others	Section 17.5.1
Polytomous categories - nominal	Phi-coefficient	Equation 17.7a
	Contingency coefficient	Equation 17.7b
	Cramer *V*	Equation 17.7c
	Proportional reduction in error	Equation 17.8
Polytomous categories - ordinal	Kendall tau, Goodman–Kruskal gamma, Somer *d*	Section 17.5.1
Dependent qualitative and independent quantitative	Odds ratio	Section 17.1
Dependent quantitative and independent qualitative	R^2 from ANOVA	Equation 17.9
Both quantitative	η^2 from regression	Equation 16.7
For multiple linear	R^2 from regression	Use Equation 16.7
For simple linear	r	Equation 16.17
For monotonic	r_S	Equation 16.19
For intraclass	r_I	Equation 16.20 or 16.21
Agreement		
Qualitative	Cohen kappa	Equation 17.10
Quantitative	Limits of disagreement	Section 16.5.2
	Intraclass	Equation 16.20 or 16.21

SUMMARY-7: Multivariate methods in different situations (large *n* required)

Nature of the Variables	Objective	Types of Variables	Statistical Method	Section
A dependent set and an independent set	Relationship	Both quantitative	Multivariate multiple regression	Section 19.2.1
	Equality of means of dependents	Dependent quantitative and independent qualitative	MANOVA	Section 19.2.2
Dependent is one of many groups	Classify subjects into known groups	Independent quantitative	Discriminant analysis	Section 19.2.3
All variables interrelated (none is dependent)	Discover natural clusters of subjects	Qualitative or quantitative or mixed	Cluster analysis	Section 19.3.1
	Identify underlying factors that explain the interrelations	Quantitative	Factor analysis	Section 19.3.2

Note: Situations not mentioned in Summary Tables 1–7 are not discussed in this book.