CONTENTS

STUDIES

REVIEWS

Todd L. VanPool, Robert D. Leonard: Quantitative Analysis in Archaeology, Wiley-Blackwell, 2010, 350 pages, ISBN-10: 1405189509.

About the authors

Todd L. VanPool is an Assistant Professor at University of Missouri, Department of Anthropology, and Robert D. Leonard taught for 17 years at the University of New Mexico, Department of Anthropology, currently being retired.

Evaluation of the book

Many books on statistics were dedicated to the field of social sciences, but so far, not so many to archaeology in particular. This is not the first book written on the subject of quantitative methods, but it is one of the first to explain these methods to archaeologists, with clear examples taken from this domain. It is a useful textbook compilation of quantitative methods that archaeologists should get familiar with in order for them, and more importantly others, to make sense of their large data sets.

This book is part of a developing trend in archaeological research, started in the 50s and elaborated in the 70s, mostly in the U.S.[1] The most comprehensive compilations were published by Fletcher and Lock (however, slightly selective)[2], Shennan[3] and Drennan[4] (focuses more on sampling and multivariate analysis). In Romania, few archaeologists use statistics to explain their findings. In general, apart from a few histograms and pie charts, the data is not explored further. So perhaps this modest review will shed some light on what can truly be done with statistics.

The book aims to present conceptual and statistical principles by showing not only the theoretical background, with equations and clear, understandable figures, but also how to apply them and exercise them with very clear examples from real-life archaeological sites. It is more exhaustive than the previously published books on

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[1] See Aldenderfer 1998 for an extensive literature list.

[2] Fletcher, Lock 1991; 2005 edition adds a chapter on SPSS statistics.

[3] Shennan 1997.

[4] Drennan 2009.

the subject, with chapters following the same layout in a coherent and sequential manner.

Summary

The first four chapters provide a clear and basic starting point for data analysis. The first chapter deals with introductory notions about why statistical analysis in archaeology is important, followed by a second one where archaeological data is explained – what and how you measure, pointing out basic quantification characteristics, such as scales of measurement, accuracy and precision, population and samples. The 3rd chapter unfolds the important feature of how to display everything in a clear way, talking about frequency distributions, histograms, stem and leaf diagrams, ogives, bar charts and exploratory data analysis. The 4th chapter deals with descriptive statistics – how to describe numerically statistical population in order to continue with some fun, more complex tests. So measures of central tendency (mean, median, mode), measures of dispersion (range, interquartile range, variance and standard deviation), calculating estimates of the mean and standard deviation, coefficients of variation, box plots, characterizing nominal and ordinal scale data are unearthed in this part of the book. Chapter 5 introduces probability with its theoretical determinations, empirical determinations, and complex events. It speaks about ways to determine the likelihood of an event and binomial distributions, ending with an emphasis on probability in archaeological contexts. Chapter 6 acquaints us with the normal distribution of a population, with its characteristics and variables, making the transition to the next chapter which deals with hypothesis testing and the null hypothesis. The errors that one might make are partly also discussed here. This is vital, as it proves or disproves one`s ideas about the archaeological record. Chapter 8 continues to deal with hypothesis testing, introducing confidence limits, the T-test with its degrees of freedom and the one tailed test, with emphasis on the standard error and comparing sample means to the mean of a probability distribution. Chapter 9 takes it up a notch with showing how to calculate the power of a statistical test in order to avoid errors, and includes a final sketch of the information regarding hypothesis testing contained in the last 3 chapters. Chapter 10 familiarizes us

with variance analysis (ANOVA I model for the analysis of fixed effects and ANOVA II model for identifying the impacts of random effects) and the f-distribution. A calculation procedure for the models and the way of identifying the sources of significant variation in these two are also provided. Chapter 11 deals with regression and multivariate analysis: constructing a regression equation, evaluating the statistical significance of the regression model and using it to predict values, and the analysis of residuals, all presented in a very clear way. Chapter 12 discusses correlation, with an accent on Pearson`s product-movement correlation coefficient and Spearman`s rank order correlation coefficient. Chapter 13 handles analysis of frequencies: the Chi-square test, analysis of small samples with Fisher`s exact test and Yate`s continuity correction and the median test. Chapter 14 lays out a few facts related to nonparametric and multivariate analysis. Shown here is a brief explanation of nonparametric tests for comparing groups (Wilcoxon two-sample test, Kruskal-Wallis nonparametric ANOVA), multivariate analysis and the comparison of means (two-way ANOVA, Nested ANOVA). Chapter 15 devises the factor analysis and principal component analysis explaining in greater detail their objectives and how to design them. Regarding factor analysis, the assumptions and conceptual considerations are exemplified. Chapter 16 deals with sampling, research designs and the archaeological record. How to select samples and how big they should be is also divulged. The book is ended with a few notes of encouragement.

The accuracy of the text is beyond reproach. Giving the learner a solid statistical foundation through methods and exercises, the book sets up basic statistical principles of common use in archaeology in a way that mostly anybody can understand.

In my personal opinion, *Quantitative Methods for Archaeologists* is an excellent compilation, brilliantly laid out. However, it contains a lot of mathematical formulas that might get the untrained reader a bit scared. It is definitely not an easy read, requiring a bit of concentration and the will to learn. But with its conversational style, it can be viewed as a clearly explained and well written scientific text. In the digital age, with programs that deal with all the mathematical calculations, the book will unlikely be outdated, because one still

needs to understand if not how it all works, then at least what statistical test will actually give the best results for what type of data. In other words, it gives you the theoretical underpinnings for the various analytic approaches.

Literature

Aldenderfer 1998	Mark Aldenderfer, *Quantitative Methods in Archaeology: A Review of Recent Trends and Developments*, Journal of Archaeological Research, 6 (2), 1998, p. 91-120.
Drennan 2009	Robert Drennan, Statistics For Archaeologists, Dordrecht, 2009.
Fletcher, Lock 1991	Mike Fletcher, Gary Lock, Digging Numbers: Elementary Statistics for Archaeologists, Oxford, 1991.
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