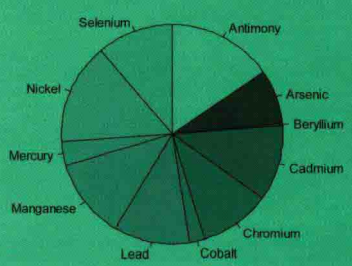
JOSEPH OFUNGWU

Statistical Applications for Environmental Analysis and Risk Assessment

STATISTICS IN PRACTICE



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STATISTICAL APPLICATIONS FOR ENVIRONMENTAL ANALYSIS AND RISK ASSESSMENT

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WILEY

Published by John Wiley & Sons, Inc., Hoboken, New Jersey
Published simultaneously in Canada

Library of Congress Cataloging-in-Publication Data:

Ofungwu, Joseph.
Statistical applications for environmental analysis and risk assessment / Joseph Ofungwu. – First edition.
pages cm – (Statistics in practice)
Includes bibliographical references and index.
ISBN 978-1-118-63453-0 (hardback)
1. Environmental risk assessment–Statistical methods. I. Title.
GE145.O38 2014
363.7′02–dc23

2013047836

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

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To Divine Providence

PREFACE

Although the subject of environmental statistics has been around for decades, the average environmental professional is far from comfortable with statistics, in my experience. This should be concerning because the protection of public health and ecological well-being falls largely on these professionals, and statistics should be a prominent part of their arsenal. It is fair to say that the environmental profession revolves around data. The environmental engineer, geologist, or scientist routinely collects data from soil, sediment, water, ambient air or other environmental media, for analysis and interpretation to determine the potential presence and concentrations of environmental contaminants. Based on the results of the data analysis and professional judgment, the practitioner makes a recommendation to the appropriate environmental protection authority that remedial action is necessary to reduce contaminant concentrations and minimize exposure risks, or that the exposure risks are minimal, warranting no further action. More often than not, the environmental regulatory authority concurs.

As it turns out, environmental data samples are rarely well-behaved, with nondetects, outliers, skewness, sustained and/or cyclical trend as habitual offenders in many data samples. Without functional familiarity with at least the basic statistical analysis principles and practices, how can we make sense of data such as these? Even more worrying, risk management decisions are often legalistic, based on numbers produced by statistical and associated analyses, where even a single mishandled outlier could possibly result in serious consequences for public and environmental health.

One reason for the lukewarm attitude toward statistics is the lack of regular access to competent software, as manual computation of most statistical procedures is now considered "ancient." An insufficient statistics or math background is another reason. Not surprisingly, cost is mainly to blame for the lack of software access. The freely available, high-quality software system, R, along with others such as ProUCL and VSP used in this book, has come to the rescue in this regard. Although these systems have been in existence for over a decade, many in the environmental profession have still not heard the "good news." The allure of a zero-cost, high-powered software package should be irresistible. No excuse to wait any longer!

ACKNOWLEDGMENTS

I owe a debt of gratitude to Steve Quigley, the Associate Publisher at Wiley, for his enthusiastic support and encouragement through the numerous twists and turns that finally brought this book to closure. Many thanks to Sari Friedman at Wiley, unfailingly courteous and professional. The book production was superbly orchestrated, thanks to Danielle LaCourciere and Faraz Sharique Ali for their expertise. I also wish to express my sincere appreciation to the many reviewers of the book proposal whose comments and criticisms alike helped shape the final product.

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