

# **Oral Health Epidemiology: Principles and Practice**

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*Dedicated to:*

*The fearless spirit of the inquisitive mind in search of  
truth to unravel the mysteries of life and the Universe*



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# Preface

Sound substantive knowledge about questions and methods used to address those questions, tempered by reasoned analysis and considered inferences are the responsibility of epidemiologists as a service to science. Epidemiology draws important understanding from other disciplines to study the distribution and determinants of health-related states and their outcomes in populations. The oral epidemiologists' charge is to adapt epidemiological techniques for answering questions related to health states in the oral and craniofacial region of the body. In the following chapters, we will traverse several exciting and varied terrains on this fascinating journey.

It may be argued that because, by definition, epidemiology is a study of health states in populations, it has little role in basic sciences, which are mostly concerned with narrowly focused laboratory-based projects assessing causal relationships. However, epidemiological concepts have major applications in basic science, general clinical research, and public health as well. The phenomenal growth of molecular applications in everyday health care, genome- and stem cell-based reorientation of medical applications and developments in neurobiology to name a few events, have changed the paradigm of epidemiology from being viewed as being remote to basic science. In current day practice, scientific studies, whether those are laboratory-aided computational biology studies, clinical trials, population-based observational studies, hospital-based clinical studies, or computer-based in-silico simulation studies, all use epidemiological principles.

The range of disciplines that oral epidemiology covers is vast, which makes it a truly inter-/multi-/trans-disciplinary subject. Although several excellent books exist that discuss epidemiologic methods and analysis, none deal with oral health issues to serve as a ready-reckoner and quick general reference for oral health students, practitioners, and researchers to help assimilate and organize scientific information for drawing logical inferences. This book was conceived to fill this lacuna in this growing field. It is expected to stir interest among a variety of persons associated with oral and craniofacial health research who think of epidemiology holistically, as a basic and necessary science of not only public health, but for all clinical and

basic science research. I am hoping that this book will appeal to a wide readership.

This book, in general, refrains from presenting descriptive data about disease burden that are found in several other books and reports dealing with various aspects of oral and craniofacial health. Instead, this book emphasizes the application of epidemiological principles in oral health studies, and aims to encourage the reader to think critically about different aspects of studies that may impact their results and interpretation by approaching application of epidemiological principles in oral and craniofacial health research from a conceptual stand point. Although mathematics is the language of science, there exists a serious risk of getting lost in the myriad formulas and symbolism, especially for those who have left the subject behind and spent a substantial part of their scientific lives in applied biological and clinical fields and in the company of peri-basic mathematical skills only. This need not necessarily be viewed as an unbreakable wall because I believe, as Kurt Gödel said “either mathematics is too big for the human mind or the human mind is more than a machine,” leaning towards the second of the two options of Gödel. Therefore, this book has kept mathematical formulas to a minimum, and tried to explain the concepts and implications of those formulae in a way that may be easily decipherable for the non-mathematically oriented intelligent professional. The key to epidemiology is logical and critical thinking—the complex analytical tools come in as important support systems for good epidemiological practice.

During the process of developing this book, I changed jobs to join the NIDCR at the National Institutes of Health in Bethesda, MD, USA. I wish to point out that *I have contributed to this book in a personal capacity. The views expressed in this book are my own and do not necessarily represent the views of the National Institutes of Health or the United States government.* I must acknowledge that what is good in this book is a function of multi-factorial inputs from different persons at different times, and I alone bear the responsibility for errors, omissions, and for what may not be well developed in the book.

An individual usually does not accomplish much in isolation. I would like to extend my gratitude to all those persons whose influences have helped me put life in perspective of reality and kindled the spark of inquisitiveness, opening up the ability to delve into the reality and bask in the wonderful, consistently sustained “high” through science that no recreational drug can provide! Notable among these many guides are Drs. R.K. Bali, J.D. Beck, B. Bera, D.J. Caplan, M.P. Chayya, P.K. Dayal, Mr. R. Dhingra, Drs. B.B. Dutta, J.L. Ebersole, J.E. Eichner, J.S. Kaufman, J.V. Kumar, D.E. Parker, L.L. Patton, R.R. Paul, T.E. Rams, G.D. Slade, D.C. Shugars, D.W. Smith, R.G. Rozier, R.P. Strauss, and C. Poole. I have also learnt much about life, science, and art from long and meaningful discussions with family and friends notably: Subrata Bhattacharjee, Meeta Chatterjee; Oscar Arevalo, Martha Bardour, Steven Browning, Nancy Colvin, Pawan Gulati, Upma Gulati, Younis



Khan, Prashant V.K. Nair, Sarvesh Passi, Jay G. Ray, Amit Roy, Pramod Sinha, and Victor Voss. There are many others who have influenced my thinking in several ways. Some helped run fantasies to the ground which brought forth realities of life very vividly by defining intangibles; whereas others helped keep the dreams going—fuelling new visions and expanding horizons. Among the latter is my mother-in-law, Prity Chatterjee who never fails with her warmth and blessings. And, there has been Mike Brown, keeping a tight control on the book, bearing with the several delays, wielding the stick, and tolerating the reactions—to him my special thanks because without him and his hard working and tolerant team, this book would not have happened.

The obvious, due to its ubiquitous nature, often goes unrecognized—for me, the buried foundation bedrock of outcomes in my life has been the spark of curiosity and self-reliance ignited by my father Salil K. Chatterjee; the constant unfailing support from my mother Meera Chatterjee, and my wife Sharmila Chatterjee, who have borne all my unapologetic whims and oddities unconditionally—to them I remain indebted.

*God does not play dice.*

—Albert Einstein  
(Nobel Laureate: Physics, 1921)

*Reason and understanding concern two levels of concept. Dialectics and feelings are involved in reason.*

*Every error is caused by emotions and education (implicit and explicit); intellect by itself (not disturbed by anything outside) could not err.*

*Intuition is not proof; it is the opposite of proof. We do not analyze intuition to see a proof but by intuition we see something without a proof.*

—Kurt Gödel  
(Albert Einstein Award: Theoretical Physics, 1951)

যদি তোর ডাক শূনে কেউ না আসে তবে একলা চলো রে

*If they answer not to thy call walk alone,  
If they are afraid and cower mutely facing the wall,  
O thou of evil luck,  
Open thy mind and speak out alone.*

—Rabindra Nath Tagore  
(Nobel Laureate: Literature, 1913)