Cancer Epidemiology
Cancer Epidemiology

Volume I
Host Susceptibility Factors

Edited by
Mukesh Verma, PhD

Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, Maryland
Preface

Population studies facilitate the discovery of genetic and environmental determinants of cancer and the development of new approaches to cancer control and prevention. Furthermore, epidemiology studies play a central role in making health policies. Cancer epidemiology may address a number of research areas such as:

- familial predispositions to colon cancer and breast cancer study to determine whether families who carry a genetic predisposition to breast cancer may also be at risk of colon cancer, and vice versa;
- prospective examination of whether baseline dietary intakes and serum levels of carotenoids and vitamin A are associated with subsequent risk of lung cancer;
- analysis of the relationship between serum levels of sex-steroid hormones and genetic polymorphisms in biosynthesis enzymes in a prospective cohort of pre-menopausal women;
- analysis of the role of HLA-Class II similarity/dissimilarity between sexual partners and the role in HIV transmission, using the multicenter hemophilia cohort study population for the data set;
- multiple comparisons and the effect of stratifying data on study power.

This two-volume set compiles areas of research that cover etiological factors or determinants that contribute in the development of cancer as well as describe the latest technologies in cancer epidemiology. Emphasis is placed on translating clinical observations into interdisciplinary approaches involving clinical, genetic, epidemiologic, statistical, and laboratory methods to define the role of susceptibility genes in cancer etiology; translating molecular genetics advances into evidence-based management strategies (including screening and chemoprevention) for persons at increased genetic risk of cancer; identifying and characterizing phenotypic manifestations of genetic and familial cancer syndromes; counseling individuals at high risk of cancer; investigating genetic polymorphisms as determinants of treatment-related second cancers; and pursuing astute clinical observations of unusual cancer occurrences that might provide new clues to cancer etiology. All the chapters in these two books are divided into three categories:

Volume 1:
- Cancer Incidence, Prevalence, Mortality, and Surveillance
- Methods, Technologies, and Study Design in Cancer Epidemiology
- Host Susceptibility Factors in Cancer Epidemiology

Volume 2:
- Modifiable Factors in Cancer Epidemiology
- Epidemiology of Organ-Specific Cancer

These chapters have been written in a way that allows readers to get the maximum advantage of the methods involved in cancer epidemiology. Several examples of specific organ sites would be helpful in understanding cancer etiology.

Mukesh Verma, Ph.D.
# Contents

Preface ......................................................... v
Contributors ..................................................... ix
Contents of Volume II ....................................... xi

## PART I: CANCER INCIDENCE, PREVALENCE, MORTALITY AND SURVEILLANCE

1. Cancer Occurrence ........................................... 3
   Ahmedin Jemal, Melissa M. Center, Elizabeth Ward, and Michael J. Thun

2. Cancer Registry Databases: An Overview of Techniques of Statistical Analysis and Impact on Cancer Epidemiology ..................................................... 31
   Ananya Das

3. Breast Cancer in Asia ......................................... 51
   Cheng-Har Yip

   Dana Sloane

5. Epidemiology of Multiple Primary Cancers ....................... 85
   Isabelle Soerjomataram and Jan Willem Coebergh

6. Cancer Screenings, Diagnostic Technology Evolution, and Cancer Control ......................................................... 107
   Fabrizio Stracci

   Alireza Mosavi-Jarrabi and Mohammad Ali Mohagheghi

## PART II: METHODS, TECHNOLOGIES AND STUDY DESIGN IN CANCER EPIDEMIOLOGY

8. Evaluation of Environmental and Personal Susceptibility Characteristics That Modify Genetic Risks ........................................... 163
   Jing Shen

9. Introduction to the Use of Regression Models in Epidemiology ........................................... 179
   Ralf Bender

10. Proteomics and Cancer Epidemiology ................................... 197
    Mukesh Verma

11. Different Study Designs in the Epidemiology of Cancer: Case-Control vs. Cohort Studies ............................................. 217
    Harminder Singh and Salabeddin M. Mahmud

12. Methods and Approaches in Using Secondary Data Sources to Study Race and Ethnicity Factors ........................................... 227
    Sujha Subramanian

13. Statistical Methods in Cancer Epidemiologic Studies .................. 239
    Xiaonan Xue and Donald R. Hoover

vii
14. Methods in Cancer Epigenetics and Epidemiology

Deepak Kumar and Mukesh Verma

PART III: HOST SUSCEPTIBILITY FACTORS IN CANCER EPIDEMIOLOGY

15. Mitochondrial DNA Polymorphism and Risk of Cancer

Keshav K. Singh and Mariola Kulawiec

16. Polymorphisms of DNA Repair Genes: ADPRT, XRCCI and XPD and Cancer Risk in Genetic Epidemiology

Jun Jiang, Xiuling Zhang, Huanming Yang and Wendy Wang

17. Risk Factors and Gene Expression in Esophageal Cancer

Xiao-chun Xu

18. Single Nucleotide Polymorphisms in DNA Repair Genes and Prostate Cancer Risk

Jong Y. Park, Yifan Huang and Thomas A. Sellers

19. Linking the Kaposi’s Sarcoma-Associated Herpesvirus (KSHV/HHV-8) to Human Malignancies

Inna Kalt, Shiri-Rivka Masa and Ronit Sarid

20. Cancer Cohort Consortium Approach: Cancer Epidemiology in Immunosuppressed Groups

Diego Serraino, Pierluca Piselli for the Study Group

21. Do Viruses Cause Breast Cancer?

James S. Lawson

22. Epidemiology of Human Papilloma Virus (HPV) in Cervical Mucosa

Subhash C. Chauhan, Meena Jaggi, Maria C. Bell, Mukesh Verma and Deepak Kumar

23. Epigenetic Targets in Cancer Epidemiology

Ramona G. Dumitrescu

24. Epidemiology of Lung Cancer Prognosis: Quantity and Quality of Life

Ping Yang

25. Hereditary Breast and Ovarian Cancer Syndrome: The Impact of Race on Uptake of Genetic Counseling and Testing

Michael S. Simon and Nancie Petrucelli

Index
## Contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARIA C. BELL</td>
<td>Cancer Biology Research Center, Sanford Research/USD and Department of Obstetrics and Gynecology, Sanford School of Medicine, The University of South Dakota, Sioux Falls, SD, USA</td>
</tr>
<tr>
<td>RALF BENDER</td>
<td>Institute for Quality and Efficiency in Health Care, Cologne, Germany</td>
</tr>
<tr>
<td>MELISSA M. CENTER</td>
<td>Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA, USA</td>
</tr>
<tr>
<td>SUBHASH C. CHAUHAN</td>
<td>Cancer Biology Research Center, Sanford Research/USD and Department of Obstetrics and Gynecology, Sanford School of Medicine, The University of South Dakota, Sioux Falls, SD, USA</td>
</tr>
<tr>
<td>JAN WILLEM COEBERGH</td>
<td>Comprehensive Cancer Centre South, AE Eindhoven, The Netherlands</td>
</tr>
<tr>
<td>ANANYA DAS</td>
<td>Department of Medicine, Mayo College of Medicine, Mayo Clinic, Scottsdale, AZ, USA</td>
</tr>
<tr>
<td>RAMONA G. DUMITRESCU</td>
<td>Georgetown University Medical Center, Lombardi Cancer Center, Washington, DC, USA</td>
</tr>
<tr>
<td>DONALD R. HOOVER</td>
<td>Department of Statistics and Institute for Health Care Policy and Aging Research, Rutgers University, New Brunswick, NJ, USA</td>
</tr>
<tr>
<td>YIFAN HUANG</td>
<td>Division of Cancer Prevention and Control, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL, USA</td>
</tr>
<tr>
<td>MEENA JAGGI</td>
<td>Cancer Biology Research Center, Sanford Research/USD and Dept of Obstetrics and Gynecology, Sanford School of Medicine, The University of South Dakota, Sioux Falls, SD, USA</td>
</tr>
<tr>
<td>AHMEDIN JEMAL</td>
<td>Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA, USA</td>
</tr>
<tr>
<td>JUN JIANG</td>
<td>Beijing Institute of Genomics, Chinese Academy of Sciences (BIG, CAS), China</td>
</tr>
<tr>
<td>INNA KALT</td>
<td>The Mina and Everard Goodman Faculty of Life Sciences, Bar-Ilan University, Ramat Gan, Israel</td>
</tr>
<tr>
<td>MARIOLA KULAWIEC</td>
<td>Department of Cancer Genetics, Roswell Park Cancer Institute, Buffalo, NY, USA</td>
</tr>
<tr>
<td>DEEPAK KUMAR</td>
<td>Department of Biological and Environmental Sciences, University of the District of Columbia, Washington, DC, USA</td>
</tr>
<tr>
<td>JAMES S. LAWSON</td>
<td>School of Public Health, University of New South Wales, Sydney, Australia</td>
</tr>
<tr>
<td>SALAHEDDIN M. MAHMUD</td>
<td>Department of Community Health Sciences, University of Manitoba, Winnipeg, MB, Canada</td>
</tr>
<tr>
<td>SHIRI-RIVKA MASA</td>
<td>The Mina and Everard Goodman Faculty of Life Sciences, Bar-Ilan University, Ramat Gan, Israel</td>
</tr>
<tr>
<td>MOHAMMAD ALI MOHAGHEGHI</td>
<td>The Cancer Research Center of the Cancer Institute, Tehran, Iran</td>
</tr>
<tr>
<td>ALIREZA MOSAVI-JARRAH</td>
<td>Dept. Of Epidemiology, School of Public Health, Shaheed Beheshti University of Medical Sciences, and The Cancer Research Center of the Cancer Institute, Tehran, Iran</td>
</tr>
<tr>
<td>JONG Y. PARK</td>
<td>Division of Cancer Prevention and Control, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL, USA</td>
</tr>
</tbody>
</table>
Nancie Petrucelli • Population Studies and Prevention Program, Karmanos Cancer Institute at Wayne State University, Detroit, MI, USA
Pierluca Piselli • Epidemiology Unit, National Institute for Infectious Diseases, IRCCS L. Spallanzani, Rome, Italy
Ronit Sarid • The Mina and Everard Goodman Faculty of Life Sciences, Bar-Ilan University, Ramat Gan, Israel
Thomas A. Sellers • Division of Cancer Prevention and Control, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL, USA
Diego Serraino • Virology Section, University Campus Bio-Medico, Spallanzani Hospital, Rome, Italy
Jing Shen • Dept of Environmental Health Sciences, Columbia University, New York, NY, USA
Michael S. Simon • Division of Hematology and Oncology, Karmanos Cancer Institute at Wayne State University, Detroit, MI, USA
Harinder Singh • Department of Medicine, University of Manitoba, Winnipeg, MB, Canada
Keshav K. Singh • Department of Cancer Genetics, Roswell Park Cancer Institute, Buffalo, NY, USA
Dana A. Sloane • Division of Gastroenterology, Washington Hospital Center, Washington, DC, USA
Isabelle Soerjomataram • Department of Public Health, Erasmus MC, Rotterdam, The Netherlands
Fabrizio Stracci • Department of Surgical and Medical Specialties, and Public Health, University of Perugia, Perugia, Italy
Sujha Subramanian • RTI International, Waltham, MA, USA
Michael J. Thun • Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA, USA
Mukesh Verma • National Cancer Institute, Bethesda, MD, USA
Wendy Wang • Division of Cancer Prevention, National Cancer Institute, National Institute of Health (DCP/NCI/NIH), USA
Elizabeth Ward • Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA, USA
Xiuqing Zhang • Beijing Institute of Genomics, Chinese Academy of Sciences (BIG, CAS), Beijing, China
Xiaochun Xu • Department of Clinical Cancer Prevention, The University of Texas M. D. Anderson Cancer Center, Houston, TX, USA
Xiaonan Xue • Department of Epidemiology and Population Health, Albert Einstein College of Medicine, Bronx, NY, USA
Huanming Yang • Beijing Institute of Genomics, Chinese Academy of Sciences (BIG, CAS), China
Ping Yang • Mayo Clinic, College of Medicine, Rochester, MN, USA
Cheng-Har Yip • Department of Surgery, University Malaya, Medical Centre, Kuala Lumpur, Malaysia
Contents of Volume II

PART I: MODIFIABLE FACTORS IN CANCER EPIDEMIOLOGY
1. Environmental and Occupational Risk Factors for Lung Cancer
   Irene Brüske-Hohlfeld
2. Lifestyle, Genes, and Cancer
   Yvonne M. Coyle
3. Energy Balance, Physical Activity, and Cancer Risk
   Alecia Malin Fair and Kara Montgomery
4. Genetic Epidemiology Studies in Hereditary Non-Polyposis Colorectal Cancer
   Rodney J. Scott and Jan Lubinski
5. Parental Smoking and Childhood Leukemia
   Jeffrey S. Chang
6. Lung Cancer and Exposure to Metals: The Epidemiological Evidence
   Pascal Wild, Eve Bourgkard, and Christophe Paris
7. Breast Cancer and the Role of Exercise in Women
   Beverly S. Reigle and Karen Wonders
   Sai Yi Pan and Marie DesMeules
9. Contribution of Alcohol and Tobacco Use in Gastrointestinal Cancer Development
   Helmut K. Seitz and Chin Hin Cho
10. Role of Xenobiotic Metabolic Enzymes in Cancer Epidemiology
    Madhu S. Singh and Michael Michael
11. Genetic Polymorphisms in the Transforming Growth Factor-β Signaling Pathways and Breast Cancer Risk and Survival
    Wei Zheng

PART II: EPIDEMIOLOGY OF ORGAN-SPECIFIC CANCER
12. Molecular Epidemiology of DNA Repair Genes in Bladder Cancer
    Anne E. Kiltie
13. Breast Cancer Screening and Biomarkers
    Mai Brooks
14. Epidemiology of Brain Tumors
    Hiroko Ohyagi
16. Acquired Risk Factors for Colorectal Cancer
    Otto S. Lin
17. Aberrant Crypt Foci in Colon Cancer Epidemiology
   *Sharad Khare, Kamran Chaudhary, Marc Bissonnette, and Robert Carroll*

18. Determinants of Incidence of Primary Fallopian Tube Carcinoma (PFTC)
   *Annika Riska and Arto Leminen*

19. The Changing Epidemiology of Lung Cancer
   *Chee-Keong Tob*

20. Epidemiology of Ovarian Cancer
    *Jennifer Permuth-Wey and Thomas A. Sellers*

21. Epidemiology, Pathology, and Genetics of Prostate Cancer
    Among African Americans Compared with Other Ethnicities
    *Heinric Williams and Isaac J. Powell*

22. Racial Differences in Clinical Outcome After Prostate Cancer Treatment
    *Takashi Fukagai, Thomas Namiki, Robert G. Carlile, and Mikio Namiki*

23. Epidemiology of Stomach Cancer
    *Hermann Brenner, Dietrich Rothenbacher, and Volker Arndt*

Index