Oral Health in America:  
A Report of the 
Surgeon General

Department of Health and Human Services

U.S. PUBLIC HEALTH SERVICE
Suggested Citation

The intent of this first-ever Surgeon General's Report on Oral Health is to alert Americans to the full meaning of oral health and its importance to general health and well-being. Great progress has been made in reducing the extent and severity of common oral diseases. Successful prevention measures adopted by communities, individuals, and oral health professionals have resulted in marked improvements in the nation's oral and dental health.

The terms oral health and general health should not be interpreted as separate entities. Oral health is integral to general health; this report provides important reminders that oral health means more than healthy teeth and that you cannot be healthy without oral health. Further, the report outlines existing safe and effective disease prevention measures that everyone can adopt to improve oral health and prevent disease.

However, not everyone is experiencing the same degree of improvement. This Surgeon General's report addresses the inequities and disparities that affect those least able to muster the resources to achieve optimal oral health. For whatever the reason, ignoring oral health problems can lead to needless pain and suffering, causing devastating complications to an individual's well-being, with financial and social costs that significantly diminish quality of life and burden American society.

For a third decade, the nation has developed a plan for the prevention of disease and the promotion of health, including oral health, embodied in the U.S. Department of Health and Human Services document, Healthy People 2010. This Surgeon General's Report on Oral Health emphasizes the importance of achieving the Healthy People goals to increase quality of life and eliminate disparities. As a nation, we hope to address the determinants of health—individual and environmental factors—in order to improve access to quality care, and to support policies and programs that make a difference for our health. We hope to prevent oral diseases and disorders, cancer, birth defects, AIDS and other devastating infections, mental illness and suicide, and the chronic diseases of aging.

We trust that this Surgeon General's report will ensure that health promotion and disease prevention programs are enhanced for all Americans. This report proposes solutions that entail partnerships—government agencies and officials, private industry, foundations, consumer groups, health professionals, educators, and researchers—to coordinate and facilitate actions based on a National Oral Health Plan. Together, we can effect the changes we need to maintain and improve oral health for all Americans.
Foreword

The growth of biomedical research since World War II has wrought extraordinary advances in the health and well-being of the American people. The story is particularly remarkable in the case of oral health, where we have gone from a nation plagued by the pains of toothache and tooth loss to a nation where most people can smile about their oral health. The impetus for change—to take on the challenge of addressing oral diseases as well as the many other health problems that shorten lives and diminish well-being—led to the postwar growth of the National Institutes of Health. In 1948 the National Institute of Dental Research—now the National Institute of Dental and Craniofacial Research—joined the National Cancer Institute and the National Heart, Lung, and Blood Institute as the third of the National Institutes of Health.

The Institute's research initially focused on dental caries and studies demonstrating the effectiveness of fluoride in preventing dental caries, research that ushered in a new era of health promotion and disease prevention. The discovery of fluoride was soon complemented by research that showed that both dental caries and periodontal diseases were bacterial infections that could be prevented by a combination of individual, community, and professional actions. These and other applications of research discoveries have resulted in continuing improvements in the oral, dental, and craniofacial health of Americans. Today, armed with the high-powered tools, automated equipment, and imaging techniques of genetics and molecular and cell biology, scientists have set their sights on resolving the full array of craniofacial diseases and disorders, from common birth defects such as cleft lip and palate to the debilitating chronic oral-facial pain conditions and oral cancers that occur later in life.

The National Institute of Dental and Craniofacial Research has served as the lead agency for the development of this Surgeon General's Report on Oral Health. As part of the National Institutes of Health, the Institute has had ready access to ongoing federal research and the good fortune to work collaboratively with many other agencies and individuals, both within and outside government. The establishment of a Federal Coordinating Committee provided a formal mechanism for the exchange of ideas and information from other departments, including the U.S. Department of Agriculture, Department of Education, Department of Justice, Department of Defense, Department of Veterans Affairs, and Department of Energy. Active participation in the preparation and review of the report came from hundreds of individuals who graciously gave of their expertise and time. It has been a pleasure to have had this opportunity to prepare the report, and we thank Surgeon General David Satcher for inviting us to participate.

Despite the advances in oral health that have been made over the last half century, there is still much work to be done. This past year we have seen the release of Healthy People 2010, which emphasizes the broad aims of improving quality of life and eliminating health disparities. The recently released U.S. General Accounting Office report on the oral health of low-income populations further highlights the oral health problems of disadvantaged populations and the effects on their well-being that result from lack of access to care. Agencies and voluntary and professional organizations have already begun to lay the groundwork for research and service programs that directly and comprehensively address health disparities. The National Institutes of Health has joined these efforts and is completing an agencywide action plan for research to reduce health disparities. Getting a healthy start in life is critical in these efforts, and toward that end, a Surgeon
General's Conference on Children and Oral Health, The Face of a Child, is scheduled for June 2000. Many other departmental and agency activities are under way.

The report concludes with a framework for action to enable further progress in oral health. It emphasizes the importance of building partnerships to facilitate collaborations to enhance education, service, and research and eliminate barriers to care. By working together, we can truly make a difference in our nation's health—a difference that will benefit the health and well-being of all our citizens.

Ruth L. Kirschstein MD  
Acting Director  
National Institutes of Health

Harold C. Slavkin DDS  
Director  
National Institute of Dental and Craniofacial Research
As we begin the twenty-first century, we can be proud of the strides we have made in improving the oral health of the American people. At the turn of the last century, most Americans could expect to lose their teeth by middle age. That situation began to change with the discovery of the properties of fluoride, and the observation that people who lived in communities with naturally fluoridated drinking water had far less dental caries (tooth decay) than people in comparable communities without fluoride in their water supply. Community water fluoridation remains one of the great achievements of public health in the twentieth century—an inexpensive means of improving oral health that benefits all residents of a community, young and old, rich and poor alike. We are fortunate that additional disease prevention and health promotion measures exist for dental caries and for many other oral diseases and disorders—measures that can be used by individuals, health care providers, and communities.

Yet as we take stock of how far we have come in enhancing oral health, this report makes it abundantly clear that there are profound and consequential disparities in the oral health of our citizens. Indeed, what amounts to a "silent epidemic" of dental and oral diseases is affecting some population groups. This burden of disease restricts activities in school, work, and home, and often significantly diminishes the quality of life. Those who suffer the worst oral health are found among the poor of all ages, with poor children and poor older Americans particularly vulnerable. Members of racial and ethnic minority groups also experience a disproportionate level of oral health problems. Individuals who are medically compromised or who have disabilities are at greater risk for oral diseases, and, in turn, oral diseases further jeopardize their health.

The reasons for disparities in oral health are complex. In many instances, socioeconomic factors are the explanation. In other cases, disparities are exacerbated by the lack of community programs such as fluoridated water supplies. People may lack transportation to a clinic and flexibility in getting time off from work to attend to health needs. Physical disability or other illness may also limit access to services. Lack of resources to pay for care, either out-of-pocket or through private or public dental insurance, is clearly another barrier. Fewer people have dental insurance than have medical insurance, and it is often lost when individuals retire. Public dental insurance programs are often inadequate. Another major barrier to seeking and obtaining professional oral health care relates to a lack of public understanding and awareness of the importance of oral health.

We know that the mouth reflects general health and well-being. This report reiterates that general health risk factors common to many diseases, such as tobacco use and poor dietary practices, also affect oral and craniofacial health. The evidence for an association between tobacco use and oral diseases has been clearly delineated in every Surgeon General's report on tobacco since 1964, and the oral effects of nutrition and diet are presented in the Surgeon General's report on nutrition (1988). Recently, research findings have pointed to possible associations between chronic oral infections and diabetes, heart and lung diseases, stroke, and low-birth-weight, premature births. This report assesses these emerging associations and explores factors that may underlie these oral-systemic disease connections.

To improve quality of life and eliminate health disparities demands the understanding, compassion, and will of the American people. There are opportunities for all health professions, individuals, and communities to work together to improve health. But more needs to be done if we are to make further improvements in America's oral health. We hope that this Surgeon General's report
will inform the American people about the opportunities to improve oral health and provide a platform from which the science base for craniofacial research can be expanded. The report should also serve to strengthen the translation of proven health promotion and disease prevention approaches into policy development, health care practice, and personal lifestyle behaviors. A framework for action that integrates oral health into overall health is critical if we are to see further gains.

David Satcher MD, PhD
Surgeon General
Acknowledgments

This report was prepared by the Department of Health and Human Services under the direction of the National Institutes of Health, National Institute of Dental and Craniofacial Research.

Ruth L. Kirschstein MD
Acting Director, National Institutes of Health, DHHS, Bethesda, MD

Harold C. Slavkin DDS
Director, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

David Satcher MD, PhD
Assistant Secretary for Health and Surgeon General, Office of Public Health and Science, Office of the Secretary, Washington, DC

Nicole Lurie MD, MSPH
Principal Deputy Assistant Secretary for Health, Office of Public Health and Science, Office of the Secretary, Washington, DC

Beverly L. Malone PhD, RN, FAAN
Deputy Assistant Secretary for Health, Office of Public Health and Science, Office of the Secretary, Washington, DC

Arthur Lawrence PhD
Assistant Surgeon General, USPHS, Deputy Assistant Secretary for Health (Operations), Office of Public Health and Science, Office of the Secretary, Washington, DC

Kenneth Moritugu MD, MPH
Deputy Surgeon General, USPHS, Office of the Surgeon General, Office of the Secretary, Washington, DC

Allan S. Noonan MD, MPH
Captain, USPHS, Office of the Surgeon General, Office of the Secretary, Washington, DC

*Indicates Coordinating Author

PROJECT TEAM
Caswell A. Evans DDS, MPH
Project Director and Executive Editor
Assistant Director, Los Angeles County Department of Health Services, Los Angeles, CA

Dushanka V. Kleinman DDS, MScD
Co-Executive Editor
Assistant Surgeon General, USPHS
Deputy Director, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

William R. Maas DDS, MPH, MS
Assistant Surgeon General, Chief Dental Officer, USPHS
Director, Division of Oral Health, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

Joan S. Wilentz MA
Science Writer and Editor, Bethesda, MD

Roseanne Price ELS
Editor, Silver Spring, MD

Marla Fogelman
Editor, Silver Spring, MD

CONTRIBUTORS
Margo Adesanya DDS
Staff Scientist, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Alfredo Aguirre DDS, MS
Director and Associate Professor, Advanced Oral and Maxillofacial Pathology, State University of New York at Buffalo School of Dental Medicine, Buffalo, NY

Ronald Andersen PhD, MA
Wasserman Professor of Health Services and Professor of Sociology, University of California Los Angeles School of Public Health, Los Angeles, CA
Acknowledgments

Jay R. Anderson DMD, MHSA
Chief Dental Officer, Division of Community and Migrant Health, Bureau of Primary Health Care, Health Resources and Services Administration, DHHS, Rockville, MD

Kenneth J. Anusavice PhD, DMD
Associate Dean for Research, Chair, Department of Dental Biomaterials, University of Florida College of Dentistry, Gainesville, FL

*Kathryn A. Atchison DDS, MPH
Professor and Associate Dean for Research, University of California Los Angeles School of Dentistry, Los Angeles, CA

James J. Bader DDS, MPH
Professor, University of North Carolina School of Dentistry, Chapel Hill, NC

Charles Bertolami DDS, D.Med.Sc.
Dean, University of California San Francisco School of Dentistry, San Francisco, CA

Aljernon Bolden DMD, MPH
Director, Community Health Programs and Co-Director, Division of Dental Public Health, Boston University Goldman School of Dental Medicine, Boston, MA

L. Jackson Brown DDS, PhD
Associate Executive Director, American Dental Association, Chicago, IL

Janet A. Brunelle MS
Statistician (retired), National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Brian A. Burt BDS, MPH, PhD
Professor of Dental Public Health, Department of Epidemiology University of Michigan School of Public Health, Ann Arbor, MI

Nita Chainani-Wu DMD, MPH
University of California San Francisco School of Dentistry, San Francisco, CA

David W. Chen MD, MPH
Commander, USPHS, Deputy Director, Division of Associated, Dental, and Public Health Professions, Bureau of Health Professions, Health Resources and Services Administration, DHHS, Rockville, MD

Joseph Ciardi PhD
Consultant, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Betty DeBerry-Summer DDS, MPH
Captain, USPHS, Chief Dental Officer, Bureau of Primary Health Care, Health Resources and Services Administration, DHHS, Bethesda, MD

Teresa A. Dolan DDS, MPH
Professor and Associate Dean, University of Florida College of Dentistry, Gainesville, FL

*Chester W. Douglass DMD, PhD
Professor and Chair, Department of Oral Health Policy and Epidemiology, Harvard School of Dental Medicine, Boston, MA

M. Ann Drum DDS, MPH
Captain, USPHS, Acting Director, Division of Research, Education and Training, Maternal and Child Health Bureau, Health Resources and Services Administration, DHHS, Rockville, MD

Thomas F. Drury PhD
Senior Scientist, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Burton L. Edelstein DDS, MPH
Director, Children's Dental Health Project, American Academy of Pediatrics, Washington, DC

Frederick C. Eichmiller DDS
Director, Paffenbarger Research Center, American Dental Association Health Foundation, National Institute of Standards and Technology, Gaithersburg, MD

Mary P. Faine MS, RD, CD
Associate Professor and Director of Nutrition Education, University of Washington School of Dentistry, Seattle, WA

Denise J. Fedele DMD, MS
Chief Professional Development and Research in Dental Care Clinical Research, Veterans Administration Medical Health Care System, Department of Veterans Affairs, Perry Point, MD

Christopher H. Fox DMD, DMSc
Director of Professional Relations, Europe, Colgate-Palmolive Co., New Jersey

Philip C. Fox DDS
Director, Research and Development Affiliation, Amarillo Biosciences, Inc., Amarillo, TX

Lawrence J. Furman DDS, MPH
Captain, USPHS, Head, Department of Health Services, U.S. Merchant Marine Academy, Kings Point, NY

Isabel Garcia DDS, MPH
Captain, USPHS, Special Assistant for Science Transfer, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

*Robert J. Genco DDS, PhD
Distinguished Professor and Chair, Department of Oral Biology, State University of New York at Buffalo School of Dental Medicine, Buffalo, NY

Gretchen Gibson DDS, MPH
Director, Special Care Dental Clinics, Veterans Administration North Texas Healthcare Systems, Department of Veterans Affairs, Dallas, TX

x

ORAL HEALTH IN AMERICA: A REPORT OF THE SURGEON GENERAL
Acknowledgments

Sharon M. Gordon DDS, MPH  
Director, Office of Education, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Catherine Hayes DMD, DMSc  
Assistant Professor, Department of Oral Health Policy and Epidemiology, Harvard School of Dental Medicine, Boston, MA

Alice M. Horowitz PhD  
Senior Scientist, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Herschel Horowitz DDS, MPH  
Consultant, Dental Research and Public Health, Bethesda, MD

Jeffrey Hyman DDS, PhD  
Epidemiologist, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Amid I. Ismail DDS, MPH, DrPH  
Professor, University of Michigan School of Dentistry, Ann Arbor, MI

Marjorie Jeffcoat DMD  
Rosen Professor and Chair, Department of Periodontics, University of Alabama School of Dentistry, Birmingham, AL

Candace Jones RDH, MPH  
Captain, USPHS, Director, Dental Diseases Prevention Program, Indian Health Service, DHHS, Rockville, MD

David Jones DDS, MPH  
Captain, USPHS (retired), Rockville, MD

Judith A. Jones DDS, MPH  
Senior Research Associate, Veterans Administration Center for Health Quality, Outcomes and Economic Research, Department of Veterans Affairs and, Associate Professor, Boston University Goldman School of Dental Medicine, Bedford, MA

Kaumudi J. Joshipura BDS, DSc  
Assistant Professor, Harvard School of Dental Medicine, Boston, MA

Linda Kaste DDS, PhD  
Associate Professor and Division Director, Division of Dental Public Health and Oral Epidemiology, Medical University of South Carolina College of Dental Medicine, Charleston, SC

William Kohn DDS, MS  
Captain, USPHS, Associate Director for Science, Division of Oral Health, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

Mary Sue Lancaster RN, MA  
Health Education Specialist, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

Linda LeResche ScD  
Research Professor, University of Washington School of Dentistry, Seattle, WA

James Lipton DDS, PhD  
Captain, USPHS, Assistant Director for Training and Career Development, National Institute of Dental and Craniofacial Research, DHHS, Bethesda, MD

Reginald Louie DDS, MPH  
Captain, USPHS, Regional Dental Consultant, Health Resources and Services Administration, DHHS, San Francisco, CA

*Irwin D. Mandel DDS  
Professor Emeritus, Columbia University School of Dental and Oral Surgery, New York, NY

Stephen E. Marcus PhD  
Epidemiologist, National Cancer Institute, National Institutes of Health, DHHS, Bethesda, MD

Frank Martin DDS, MPH  
Captain, USPHS, Assistant Chief, Dental Services Branch (retired), Indian Health Service, DHHS, Rockville, MD

Wendy E. Mouradian MD  
Director, Children's Hospital and Regional Medical Center, Departments of Pediatrics, Pediatric Dentistry, Medical History and Ethics, University of Washington, Seattle, WA

*Linda Niessen DMD, MPH, MPP  
Professor, Baylor University College of Dentistry and Vice President, DENTSPLY International, York, PA

Ruth E. Nowjack-Raymer RDH, MPH  
Public Health Researcher, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Steven Offenbacher DDS, PhD, MMSc  
Professor and Director, Center for Oral and Systemic Diseases, University of North Carolina, Chapel Hill, NC

H. Whitney Payne, Jr. DDS, MPH  
Captain, USPHS, Chief of Dental Services, Federal Correctional Institution, Federal Bureau of Prisons, Department of Justice, Seagoville, TX

Edward Peters DMD  
Instructor in Oral Health and Epidemiology, Department of Oral Health Policy and Epidemiology, Harvard School of Dental Medicine, Boston, MA

Douglas E. Peterson DMD, PhD  
Professor and Head, Department of Oral Diagnosis, University of Connecticut School of Dental Medicine, Farmington, CT

Maryann Redford DDS, MPH  
Health Scientist Administrator, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD
*Susan Reisine PhD  
  Professor, University of Connecticut School of Dental Medicine, Hartford, CT

John Rossetti DDS, MPH  
  Captain, USPHS, Chief Dental Officer, Health Resources and Services Administration, DHHS. Rockville, MD

*R. Gary Rozier DDS, MPH  
  Professor, Department of Health Policy Administration, University of North Carolina School of Public Health, Chapel Hill, NC

Susan Runner DDS, MA  
  Captain, USPHS, Branch Chief Dental Devices, Center for Devices and Radiological Health, Food and Drug Administration, Rockville, MD

John S. Rutkauskas DDS, MS  
  Executive Director, American Association of Pediatric Dentistry, Chicago, IL

Margaret Scarlett DMD  
  Captain, USPHS, Office of the Secretary, Office of Public Health and Science, DHHS, Washington, DC

Don Schneider DDS, MPH  
  Captain, USPHS, Chief Dental Officer, Health Care Financing Administration, Center for Medicaid and State Operations, DHHS, Baltimore, MD

Stephen T. Schulz DDS, MS, MPH  
  Lieutenant Commander, U. S. Navy, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Robert H. Selwitz DDS, MPH  
  Captain, USPHS, Senior Dental Epidemiologist, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Gerald Shklar DDS, MS  
  Charles A. Brackett Professor of Oral Pathology, Harvard School of Dental Medicine, Boston, MA

Charles Shuler DMD, PhD  
  Director, Center for Craniofacial Molecular Biology, George and Mary Lou Boone Professor of Craniofacial Molecular Biology, University of Southern California School of Dentistry, Los Angeles, CA

Gary Slade BDSc, DDPH, PhD  
  Assistant Professor, University of North Carolina School of Dentistry, Chapel Hill, NC

Ronald P. Strauss DMD, PhD  
  Professor, School of Dentistry and School of Medicine, University of North Carolina, Chapel Hill, NC

Lawrence Tabak DDS, PhD  
  Senior Associate Dean for Research, University of Rochester School of Medicine and Dentistry, Rochester, NY

George W. Taylor DMD, DrPH  
  Assistant Professor of Dentistry, University of Michigan School of Dentistry, Ann Arbor, MI

Amardeep Singh Thind MD, PhD  
  Assistant Professor, University of California Los Angeles School of Public Health, Los Angeles, CA

Scott L. Tomar DMD, DrPH  
  Epidemiologist/Dental Officer, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

Benedict I. Truman MD, MPH  
  Senior Scientist and Epidemiology Program Officer, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

William Warthen DMD  
  Associate Dean, Center for Professional Development, Baylor College of Dentistry, Dallas, TX

*R. Jane Weintraub DDS, MPH  
  Lee Hysan Professor and Chair, Division of Oral Epidemiology and Dental Public Health, University of California San Francisco School of Dentistry, San Francisco, CA

*B. Alex White DDS, DrPH  
  Assistant Program Director, Economic, Social, and Health Services Research, Kaiser Permanente Center for Health Research, Portland, OR

Deborah Winn Ph.D  
  Senior Investigator, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Athanasios I. Zavras DMD, MS, DMSc  
  Assistant Professor, Department of Health Policy and Epidemiology, Harvard School of Dental Medicine, Boston, MA

SENIOR REVIEWERS

Clifton Dummett Sr. DDS  
  Distinguished Professor Emeritus, University of Southern California School of Dentistry, Los Angeles, CA

Helen C. Rodriguez-Trias MD, FAAP  
  Past-President, American Public Health Association, Brookdale, CA

John Stamm DDS, DDPH, MScD  
  Dean, University of North Carolina School of Dentistry, Chapel Hill, NC

REVIEWERS

Michael C. Alfano DMD, PhD  
  Dean, New York University College of Dentistry, New York, NY

Myron Allukian Jr. DDS, MPH  
  Director, Oral Health, Boston Public Health Commission, Boston, MA
Acknowledgments

Alexia Antczak-Bouckoms DMD, ScD, MPH, MS
Assistant Professor of Medicine, Tufts University
School of Medicine, Medford, MA

Howard L. Bailit DMD, PhD
Health Policy and Primary Care Research Center,
University of Connecticut Health Center,
Farmington, CT

David Barmes BDSc, DDSc, MPH
Specialist Expert for International Health, National
Institute of Dental and Craniofacial Research, National
Institutes of Health, DHHS, Bethesda, MD

Bruce J. Baum DMD, PhD
Chief Gene Therapy and Therapeutic Branch,
National Institute of Dental and Craniofacial Research,
National Institutes of Health, DHHS, Bethesda, MD

Stephen C. Bayne MS, PhD
Professor, University of North Carolina School of
Dentistry, Chapel Hill, NC

James D. Beck PhD
Kenan Professor, University of North Carolina School
of Dentistry, Chapel Hill, NC

Eugenio Beltran UMD, MPH, MS, DrPH
Senior Research Fellow, Division of Oral Health,
Centers for Disease Control and Prevention, DHHS,
Atlanta, GA

Henning Birkedal-Hansen DDS, PhD
Scientific Director, National Institute of Dental and
Craniofacial Research, National Institutes of Health,
DHHS, Bethesda, MD

Karina Boeing MPH
Chief, Health Promotion Branch, National Institute of
Dental and Craniofacial Research, National Institutes of
Health, DHHS, Bethesda, MD

William H. Bowen BDS, PhD
Welscher Professor of Dentistry, School of Dentistry,
University of Rochester Medical Center, Rochester, NY

Norman S. Braverman PhD
Associate Director for Clinical, Behavioral and Health
Promotion Research, National Institute of Dental and
Craniofacial Research, National Institutes of Health,
DHHS, Bethesda, MD

Bruce B. Brehm DMD, MPH
Lieutenant Colonel, U.S. Army, Tri-Service Center
for Oral Health Studies, Uniformed Services University
of the Health Sciences, Department of Defense,
Bethesda, MD

Patricia S. Bryant PhD
Director, Behavioral and Health Promotion Research,
National Institute of Dental and Craniofacial Research,
National Institutes of Health, DHHS, Bethesda, MD

Maria Teresa Canto MS, DDS, MPH
Public Health Research Specialist, National Institute of
Dental and Craniofacial Research, National Institutes of
Health, DHHS, Bethesda, MD

Eli Capilouto DMD, MPH, ScD
Dean, School of Public Health, University of Alabama
at Birmingham, Birmingham, AL

Victoria A. Cargill MD, MSCE
Medical Officer, Office of AIDS Research, National
Institutes of Health, DHHS, Bethesda, MD

D. Walter Cohen DDS
Chancellor Emeritus, Medical College of Pennsylvania,
Hahneman University, Philadelphia, PA

Lois K. Cohen PhD
Director, Office of International Health, National
Institute of Dental and Craniofacial Research, National
Institutes of Health, DHHS, Bethesda, MD

Robert J. Collins UMD, MPH
Deputy Executive Director, International and
American Associations for Dental Research,
Alexandria, VA

Stephen B. Corbin DDS, MPH
Director of Health and Research Initiatives, Special
Olympics, Inc., Washington, DC

James G. Corrigan PhD
Evaluation Officer, National Institute of Dental and
Craniofacial Research, National Institutes of Health,
DHHS, Bethesda, MD

James J. Crall DDS, ScD
Chairman, Department of Pediatric Dentistry,
University of Connecticut School of Dental Medicine,
Farmington, CT

Ananda E Dasanayake BDS, MPH, PhD
Associate Professor, Department of Oral Biology
University of Alabama School of Dentistry,
Birmingham, AL

Dominick P. DePaola DDS, PhD
President and CEO, The Forsyth Institute, Boston, MA

Richard D'Eustachio DDS
Private Practice, Clery Hill, NJ

Ray Dionne DDS, PhD
Captain, USPHS, Clinical Director, National Institute
of Dental and Craniofacial Research, National
Institutes of Health, DHHS, Bethesda, MD

Marylin Dodd RN, PhD
Professor, University of California San Francisco
School of Nursing, San Francisco, CA

Scott Dubowsky DDS, FAGD
Private Practice, Bayonne, NJ

Robert Dumbaugh DDS, MPH
Dental Executive Director, Palm Beach County Health
Department, Palm Beach, FL

Joel Epstein DMD, MSD
Research Associate Professor, Department of Oral
Medicine, University of Washington School of
Dentistry, Seattle, WA
Acknowledgments

Ronald Ettinger BDS, MDS, DDSc
Professor, Department of Prosthodontics and Dows Institute for Dental Research, University of Iowa, Iowa City, IA

Raymond Fonseca DMD
Dean, University of Pennsylvania School of Dental Medicine, Philadelphia, PA

Allan J. Formicola DDS
Dean, School of Dental and Oral Surgery, Columbia University, New York, NY

Jane L. Forrest Ed.D., RDH
Assistant Dean, Dental Hygiene Research and Instructional Technology, Director, National Center for Dental Hygiene Research, University of Southern California School of Dentistry, Los Angeles, CA

Robert T. Frame DMD, MS, CHE
Assistant Under Secretary for Health for Dentistry, Department of Veterans Affairs, Washington, DC

Raul I. Garcia DMD
Professor and Chair, Department of Health Policy, Boston University Goldman School of Dental Medicine, Boston, MA

Jay Alan Gershen DDS, PhD
Executive Vice Chancellor, University of Colorado Health Sciences Center, Denver, CO

Michael Glick DMD
Professor of Oral Medicine, Director, Programs for Medically Complex Patients, University of Pennsylvania School of Dental Medicine, Philadelphia, PA

Barbara F. Gooch DMD, MPH
Dental Officer, Division of Oral Health, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

John Greene DMD, MPH
Dean Emeritus, University of California San Francisco School of Dentistry, San Francisco, CA

Deborah Greenspan BDS, DSc, ScD (hc), FDSRCS Ed (hon)
Professor of Clinical Oral Medicine, University of California San Francisco School of Dentistry, San Francisco, CA

John S. Greenspan BSc, BDS, PhD, FRCPath
Professor and Chair, Department of Stomatology, University of California San Francisco School of Dentistry, San Francisco, CA

Robert O. Greer DDS, ScD
Professor of Pathology and Medicine, University of Colorado Health Sciences Center, Schools of Medicine and Dentistry, Denver, CO

David Grebowski PhD
Professor of Health Services and Dental Public Health Sciences, University of Washington, Seattle, WA

Ellen R. Gritz PhD
Professor and Chair, Department of Behavioral Science, M.D. Anderson Cancer Center, University of Texas, Houston, TX

Kenneth A. Gruber PhD
Chief, Chronic Diseases Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Kevin Hardwick DDS, MPH
Captain, USPHS, International Health Officer, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Hazel J. Harper DDS, MPH
Private Practice, Washington, DC

John Hauth MD
Professor, Interim Chairman and Director, Center for Research in Women's Health, University of Alabama at Birmingham, Birmingham, AL

Maxine Hayes MD, MPH
Assistant Secretary, Community and Family Health, Washington State Department of Health, Olympia, WA

Marc W. Helt DMD, PhD
Professor and Director of the Claude Pepper Center, University of Florida College of Dentistry, Gainesville, FL

Joseph Henry DDS, PhD, ScD
Dean Emeritus, Howard University College of Dentistry and Professor, Harvard School of Dental Medicine, Boston, MA

Mark C. Herzberg DDS, PhD
Professor, University of Minnesota School of Dentistry, Minneapolis, MN

Alan R. Hinman MD, MPH
Senior Consultant for Public Health Programs, Taskforce for Child Survival and Development, Decatur, GA

Cynthia Hodge DMD, MPH
Private Practice, Nashville, TN

Dorthe Holst DDS, MPH
Professor, Department of Community Dentistry, University of Oslo, Oslo, Norway

John F. Howe III MD
President, University of Texas Health Science Center at San Antonio, San Antonio, TX

David Johnsen DDS, MS
Dean and Professor of Pediatric Dentistry, University of Iowa College of Dentistry, Iowa City, IA

Ralph Katz DMD, PhD
Professor, Department of Behavioral Science and Community Health, University of Connecticut School of Dental Medicine, Farmington, CT

H. Asman Kiyak MA, PhD
Director, Institute on Aging and Professor, University of Washington School of Dentistry, Seattle, WA
Acknowledgments

Kathleen Mangskau RDH, MPA
Director, North Dakota Oral Health Program, North Dakota Department of Health, Bismarck, ND

Georgetta Manning-Cox DDS, MPH
Chairman, Community Dentistry and Associate Professor, Howard University College of Dentistry, Washington, DC

Don Marianos DDS, MPH
Consultant in Public Health, Pinetop, AZ

Gary C. Martin DDS, MPH
Lieutenant Colonel, U.S. Air Force, Tri-Service Center for Oral Health Studies, Uniformed Services University of the Health Sciences, Department of Defense, Bethesda, MD

Richard Mascola DDS
Private Practice, Jericho, NY

Carolyn Beth Mazzella RN
Assistant Surgeon General, USPHS, Office of the PHS Chief Nurse, Health Resources and Services Administration, DHHS, Rockville, MD

Kim McFarland DDS, MS
Dental Health Director, State of Nebraska, Nebraska Department of Health, Lincoln, NE

J. Michael McGinnis MD
Senior Vice President and Director, Health Group, The Robert Wood Johnson Foundation, Princeton, NJ

Robert Mecklenburg DDS, MPH
Coordinator, Tobacco and Oral Health Initiatives for the Tobacco Control Research Branch, National Cancer Institute, DHHS, Bethesda, MD

Roseann Mulligan DDS, MS
Professor and Chairman, Department of Dental Medicine and Public Health, University of Southern California School of Dentistry, Los Angeles, CA

Juan M. Navia PhD
Professor Emeritus, University of Alabama at Birmingham, Birmingham, AL

Edward O'Neil PhD, MPA
Professor, Dental Public Health and Hygiene, Director, Center for Health Professions, University of California, San Francisco, San Francisco, CA

Roy C. Page DDS, PhD
Professor, Departments of Periodontics and Pathology, Schools of Dentistry and Medicine, University of Washington, Seattle, WA

No-Hee Park DMD, PhD
Dean, School of Dentistry, University of California Los Angeles, Los Angeles, CA
Acknowledgments

Steven Perlman DDS, MScD
Associate Professor of Pediatric Dentistry, Boston University Goldman School of Dental Medicine, Boston, MA

Poul Erik Petersen DDS, Dr Odont Sci, BA, MSc
Professor, University of Copenhagen, School of Dentistry, Copenhagen N, Denmark

Kathy Phipps RDH, DrPH
Associate Professor, Oregon Health Sciences University, Newport, OR

Scott Presson DDS, MPH
Captain, USPHS, Chief, Program Services Branch, Division of Oral Health, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

Francisco Ramos-Gomez DDS, MS, MPH
Associate Professor, Department of Growth and Development, University of California San Francisco, San Francisco, CA

E. Diane Relow DDS, PhD
Professor and Chair, Department of Orthodontics, University of Medicine and Dentistry of New Jersey, Newark, NJ

Michael Rethman DDS, MS
Colonel, U.S. Army, Chief of Periodontics, Tripler Dental Clinic, Honolulu, HI

S. Timothy Rose DDS, MS
Private Practice, Appleton, WI

Bruce Rothwell DMD, MSD
Associate Professor and Chairman, University of Washington, Restorative/Hospital Dentistry, Seattle, WA

Shirley B. Russell PhD
Professor and Chairperson, Department of Microbiology, Associate Dean for Research, Meharry Medical College, Nashville, TN

Ann L. Sandberg PhD
Chief, Neoplastic Diseases Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Charles Sanders DDS
Dean, Howard University College of Dentistry, Washington, DC

Michele Saunders DMD, MS, MPH
Endowed Professor of Clinical Dentistry, University of Texas Health Science Center, San Antonio, TX

Crispian Scully MD, PhD, MDS
Dean, Director of Studies and Research, International Centers for Excellence in Dentistry and Eastman Dental Institute for Oral Health Care Sciences, University College of London, London, England

Leslie W. Seldin DDS, PC
Private Practice, New York, NY

Aubrey Sheiham BDS, PhD, DHC
Professor, Department of Epidemiology and Public Health, University College London Medical School, London, England

Cynthia Sherwood DDS
Private Practice, Independence, KS

Mark D. Siegel DDS, MPH
Chief, Bureau of Oral Health Services, Ohio Department of Health, Columbus, OH

Sol Silverman Jr. MA, DDS
Professor of Oral Medicine, University of California San Francisco School of Dentistry, San Francisco, CA

Susan F. Silvertone MD, PhD
Assistant Professor and Endic Neddle Scholar, University of Pennsylvania School of Dental Medicine, Philadelphia, PA

Jeanne Sinkford DDS, MS, PhD
Associate Executive Director, American Dental Education Association, Washington, DC

Judy A. Small PhD
Chief, Craniofacial Anomalies and Injuries Branch, National Institute of Dental and Craniofacial Research, National Institutes of Health, DHHS, Bethesda, MD

Christian Stohler DMD, Dr.Med.Dent
William R. Mann Professor and Chair, Department of Biologic and Materials Sciences, University of Michigan School of Dentistry, Ann Arbor, MI

George Stookey PhD
Executive Associate Dean, Indiana University School of Dentistry, Indianapolis, IN

Michael Till DDS, PhD
Dean, University of Minnesota School of Dentistry, Minneapolis, MN

Richard Valachovic DMD, MPH
Executive Director, American Dental Education Association, Washington, DC

Clemencia M. Vargas DDS, MPH, PhD
Assistant Professor, University of Maryland School of Dentistry, Baltimore, MD

Rueben Warren DDS, MPH, DrPH
Associate Administrator for Urban Affairs, The Agency for Toxic Substances and Disease Registry, DHHS, Atlanta, GA

Reginald Wells PhD
Deputy Commissioner, Administration for Children and Families, Administration on Developmental Disabilities, DHHS, Washington, DC

Terrie Wetle PhD
Deputy Director, National Institute on Aging, National Institutes of Health, DHHS, Bethesda, MD

David A. Whiston DDS
Private Practice, Falls Church, VA
Acknowledgments

Claude Earl Fox MD, MPH
Administrator, Health Resources and Services Administration, DHHS, Rockville, MD

Patricia A. Grady PhD, RN, FAAN
Director, National Institute of Nursing Research, National Institutes of Health, DHHS, Bethesda, MD

Elizabeth Jacobson PhD
Deputy Director for Science, Center for Devices and Radiological Health, Food and Drug Administration, DHHS, Rockville, MD

Wanda K. Jones Dr. Ph.
Deputy Assistant Secretary for Health, Office of Women’s Health, DHHS, Washington, DC

Lireka P. Joseph Dr. Ph.
Captain, USPHS, Director, Office of Health and Industry Programs, Center for Devices and Radiological Health, Food and Drug Administration, DHHS, Rockville, MD

Douglas B. Kamerow MD, MPH
Assistant Surgeon General, USPHS, Director, Center for Practice and Technology Assessment, Agency for Healthcare Research and Quality, DHHS, Rockville, MD

Mireille B. Kanda MD, MPH
Director of Health and Disability Services, Head Start Bureau, Agency for Children, Youth, and Families, DHHS, Washington, DC

Rod F. Kirk DDS
Captain, USPHS, Chief, Dental Program, Federal Bureau of Prisons, Department of Justice, Washington, DC

Kenneth W. Kizer MD, MPH
Under Secretary for Health (retired), Department of Veterans Affairs, Washington, DC

William Kohn DDS
Captain, USPHS, Associate Director for Science, Division of Oral Health, Centers for Disease Control and Prevention, DHHS, Atlanta, GA

Edward Sondik PhD
Director, National Center for Health Statistics, Centers for Disease Control and Prevention, DHHS, Hyattsville, MD
Acknowledgments

Sue Swenson
Commissioner, Administration on Developmental Disabilities, Administration for Children and Families, DHHS, Washington, DC

Jeanette Takamura
Assistant Secretary for Aging, Administration on Aging, DHHS, Washington, DC

Ron J. Vogel
Acting Deputy Administrator of the Food and Nutrition Programs, Food and Nutrition Service, Department of Agriculture, Alexandria, VA
# Contents

| Executive Summary | 1 |
| THE CHALLENGE, 4 |
| THE CHARGE, 4 |
| THE SCIENCE BASE FOR THE REPORT, 5 |
| ORGANIZATION OF THE REPORT, 5 |
| Part Five: What Are the Needs and Opportunities to Enhance Oral Health? 9 |
| MAJOR FINDINGS, 10 |
| A FRAMEWORK FOR ACTION, 11 |
| CONCLUSION, 13 |
| REFERENCES, 13 |
| PROJECT TEAM, 13 |

**PART ONE**

## WHAT IS ORAL HEALTH?

The Meaning of Oral Health

**THE CHALLENGE, 19**

**THE CHARGE, 19**

**THE SCIENCE BASE FOR THE REPORT, 19**

**ORGANIZATION OF THE REPORT, 20**

- What Is Oral Health? 20
- What Is the Status of Oral Health in America? 20
- What Are the Needs and Opportunities to Enhance Oral Health? 21

**A Call to Action, 21**

### Chapter 2

**The Craniofacial Complex**

**CONTACT AND COMMUNICATION, 23**

- Taste and Smell, 23
- Touch, Temperature, and Pain, 24
- Speech, 25

**THE ORAL CAVITY, 25**

- The Oral Mucosa, 25
- The Teeth, 26
- The Salivary Glands, 26
- The Immune System, 27
CRANIOFACIAL ORIGINS, 28
   Early Development, 29
   Genetic Controls, 30
THE AGING OF CRANIOFACIAL TISSUES, 31
   The Teeth, 31
   The Jaws, 31
   The Oral Mucosa, 32
   Sensory and Motor Functioning, 32
   The Salivary Glands, 32
FINDINGS, 32
REFERENCES, 33

PART TWO
Chapter 3
WHAT IS THE STATUS OF ORAL HEALTH IN AMERICA?  35
   Diseases and Disorders
DENTAL AND PERIODONTAL INFECTIONS, 37
   Dental Caries, 37
   Periodontal Diseases, 39
SELECTED MUCOSAL INFECTIONS AND CONDITIONS, 42
   Oral Candidiasis, 42
   Herpes Simplex Virus Infections, 43
   Oral Human Papillomavirus Infections, 43
   Recurrent Aphthous Ulcers, 43
ORAL AND PHARYNGEAL CANCERS AND
   PRECANCEROUS LESIONS, 44
   Heightening the Risk, 44
   Prevention and Management, 47
DEVELOPMENTAL DISORDERS, 47
   Craniofacial Anomalies Caused by Altered
      Branchial Arch Morphogenesis, 47
   Cranial Bone and Dental Anomalies, 48
   Craniofacial Defects Secondary to Other
      Developmental Disorders, 49
   Craniofacial Manifestations of Single-Gene Defects, 49
INJURY, 50
   Sports, 50
   Falls, 50
   Motor Vehicle Collisions, 50
   Violence, 51
SELECTED CHRONIC AND DISABLING CONDITIONS, 51
   Sjögren's Syndrome, 51
   Acute and Chronic Oral-Facial Pain, 52
   Temporomandibular Disorders, 52
A MIRROR, A MODEL, AND A BETTER UNDERSTANDING
   OF DISEASES AND DISORDERS, 53
FINDINGS, 53
REFERENCES, 53
### Chapter 4  The Magnitude of the Problem

**WHO HAS WHAT DISEASES AND CONDITIONS?** 63  
- Dental Caries, Periodontal Diseases, and Tooth Loss, 63  
- Oral and Pharyngeal Cancers and Precancerous Lesions, 67  
- Selected Mucosal Infections and Diseases, 70  
- Developmental Disorders, 71  
- Injury, 72  
- Chronic and Disabling Conditions, 73

**WHAT IS THE BURDEN OF DISEASE IN SELECTED POPULATIONS? CHALLENGES AND OPPORTUNITIES, 74**  
- Racial and Ethnic Minorities, 74  
- Women's Health, 77  
- Individuals with Disabilities, 78

**UTILIZATION OF PROFESSIONAL CARE: WHAT DO WE KNOW ABOUT THE RELATIONSHIP OF ORAL HEALTH AND USE OF DENTAL SERVICES?** 79  
- Dental Care Utilization, 80  
- Variation by Sex, Race/Ethnicity, Income, and Insurance, 81  
- Variation by Oral Health Status, 82  
- Reasons for Nonutilization, 83  
- Unmet Needs, 83  
- Outcomes of Appropriate Levels of Access and Utilization: An Example, 83

**ORAL HEALTH STATUS IN CHANGING TIMES, 87**  
**FINDINGS, 89**  
**REFERENCES, 89**

### Part Three  WHAT IS THE RELATIONSHIP BETWEEN ORAL HEALTH AND GENERAL HEALTH AND WELL-BEING? 95

**Chapter 5  Linkages with General Health** 97

**THE MOUTH AND FACE AS A MIRROR OF HEALTH AND DISEASE, 97**  
- Physical Signs and Symptoms of Disease and Risk Factors, 97  
- Oral Manifestations of HIV Infection and of Osteoporosis, 101  
- Oral-fluid-based Diagnostics: The Example of Saliva, 103  
- Conclusion, 104

**THE MOUTH AS A PORTAL OF ENTRY FOR INFECTION, 104**  
- Oral Infections and Bacteremia, 104  
- Oral Infections as a Result of Therapy, 105  
- Infective Endocarditis, 107  
- Oral Infections and Respiratory Disease, 108  
- Oral Transmission of Infections, 108  
- Conclusion, 109
CRANIOFACIAL ORIGINS, 28
   Early Development, 29
   Genetic Controls, 30

THE AGING OF CRANIOFACIAL TISSUES, 31
   The Teeth, 31
   The Jaws, 31
   The Oral Mucosa, 32
   Sensory and Motor Functioning, 32
   The Salivary Glands, 32

FINDINGS, 32
REFERENCES, 33

PART TWO
Chapter 3
WHAT IS THE STATUS OF ORAL HEALTH IN AMERICA? 35

DISEASES AND DISORDERS 37
   DENTAL AND PERIODONTAL INFECTIONS, 37
      Dental Caries, 37
      Periodontal Diseases, 39
   SELECTED MUCOSAL INFECTIONS AND CONDITIONS, 42
      Oral Candidiasis, 42
      Herpes Simplex Virus Infections, 43
      Oral Human Papillomavirus Infections, 43
      Recurrent Aphthous Ulcers, 43
   ORAL AND PHARYNGEAL CANCERS AND PRECANCEROUS LESIONS, 44
      Heightening the Risk, 44
      Prevention and Management, 47
   DEVELOPMENTAL DISORDERS, 47
      Craniofacial Anomalies Caused by Altered Branchial Arch Morphogenesis, 47
      Cranial Bone and Dental Anomalies, 48
      Craniofacial Defects Secondary to Other Developmental Disorders, 49
      Craniofacial Manifestations of Single-Gene Defects, 49

INJURY, 50
   Sports, 50
   Falls, 50
   Motor Vehicle Collisions, 50
   Violence, 51
   SELECTED CHRONIC AND DISABLING CONDITIONS, 51
      Sjögren's Syndrome, 51
      Acute and Chronic Oral-Facial Pain, 52
      Temporomandibular Disorders, 52

A MIRROR, A MODEL, AND A BETTER UNDERSTANDING OF DISEASES AND DISORDERS, 53

FINDINGS, 53
REFERENCES, 53
Chapter 4

The Magnitude of the Problem

WHO HAS WHAT DISEASES AND CONDITIONS? 63
Dental Caries, Periodontal Diseases, and Tooth Loss, 63
Oral and Pharyngeal Cancers and Precancerous Lesions, 67
Selected Mucosal Infections and Diseases, 70
Developmental Disorders, 71
Injury, 72
Chronic and Disabling Conditions, 73

WHAT IS THE BURDEN OF DISEASE IN SELECTED POPULATIONS? CHALLENGES AND OPPORTUNITIES, 74
Racial and Ethnic Minorities, 74
Women's Health, 77
Individuals with Disabilities, 78

UTILIZATION OF PROFESSIONAL CARE: WHAT DO WE KNOW ABOUT THE RELATIONSHIP OF ORAL HEALTH AND USE OF DENTAL SERVICES? 79
Dental Care Utilization, 80
Variation by Sex, Race/Ethnicity, Income, and Insurance, 81
Variation by Oral Health Status, 82
Reasons for Nonutilization, 83
Unmet Needs, 83
Outcomes of Appropriate Levels of Access and Utilization: An Example, 83

ORAL HEALTH STATUS IN CHANGING TIMES, 87
FINDINGS, 89
REFERENCES, 89

PART THREE

WHAT IS THE RELATIONSHIP BETWEEN ORAL HEALTH AND GENERAL HEALTH AND WELL-BEING? 95

Chapter 5

Linkages with General Health

THE MOUTH AND FACE AS A MIRROR OF HEALTH AND DISEASE, 97
Physical Signs and Symptoms of Disease and Risk Factors, 97
Oral Manifestations of HIV Infection and of Osteoporosis, 101
Oral-fluid-based Diagnostics: The Example of Saliva, 103
Conclusion, 104

THE MOUTH AS A PORTAL OF ENTRY FOR INFECTION, 104
Oral Infections and Bacteremia, 104
Oral Infections as a Result of Therapy, 105
Infective Endocarditis, 107
Oral Infections and Respiratory Disease, 108
Oral Transmission of Infections, 108
Conclusion, 109
## Preventions and Control of Craniofacial Birth Defects

Summary, 173

## Prevention and Control of Intentional and Unintentional Injury

Craniofacial Injuries, 173
Summary: Prevention of Craniofacial Injuries, 176

## Oral Health Promotion and Disease Prevention Knowledge and Practices

Dental Caries Prevention, 177
Periodontal Disease Prevention, 178
Oral Cancer Prevention and Early Detection, 178
Summary, 179

## Building upon Success

Summary, 176

## Chapter 8

**Personal and Provider Approaches to Oral Health**

### Individual Responsibility: Personal Approaches to Oral Health

Daily Hygiene and Dental Caries Prevention, 189
Daily Hygiene and the Prevention of Periodontal Diseases, 190
Healthy Lifestyles, 190
Care Seeking, 190

### Provider-Based Care, 191

Risk Assessment, 192
Diagnostic Tests, 193
Oral Health Assessment, 193
Changing Approaches to Selected Diseases and Conditions, 196
Chronic Craniofacial Pain and Sensorimotor Conditions, 211
Temporomandibular Disorders, 211
Mucosal and Autoimmune Diseases, 212

### Factors Affecting Future Health Care Practices, 212

Evidence-based Practice, 213
Clinical Practice Guidelines, 213
Science and Technology Contributions, 214
Broadening the Base for the Provision of Oral Health Care, 216

## Chapter 9

**Provision of Oral Health Care**

### Components of Professional Care, 223

The Dental Component, 223
The Medical Component, 225
The Public Health Component, 225
Areas of Overlap, 227

### Expenditures for Oral Health Care, 227

Financing and Reimbursement, 229

Insurance, 229
The Changing Market, 231
Federal and State Programs, 233

---

*ORAL HEALTH IN AMERICA: A REPORT OF THE SURGEON GENERAL*
### Contents

FACTORS AFFECTING THE CAPACITY TO MEET ORAL HEALTH NEEDS, 234
- Numbers of Dental Personnel, 235
- Sex and Racial/Ethnic Composition of Dental Personnel, 236
- Student Indebtedness and Its Effects, 237
- Personnel Needs for Faculty and Clinical Research, 238
- Curriculum Needs, 238
- Taking Care of Those Most in Need, 239

TWENTY-FIRST CENTURY CHALLENGES: WHAT LIES AHEAD? 239

FINDINGS, 240
REFERENCES, 241

<table>
<thead>
<tr>
<th>PART FIVE</th>
<th>WHAT ARE THE NEEDS AND OPPORTUNITIES TO ENHANCE ORAL HEALTH?</th>
<th>243</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 10</td>
<td>Factors Affecting Oral Health over the Life Span</td>
<td>245</td>
</tr>
<tr>
<td></td>
<td>HEALTH IN THE CONTEXT OF SOCIETY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Historical Models, 245</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Contemporary Models, 246</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHANGING VULNERABILITIES THROUGHOUT LIFE</td>
<td>249</td>
</tr>
<tr>
<td></td>
<td>- Children, 249</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Adolescents and Young Adults, 257</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Midlife Adults, 258</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Older Americans, 262</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACHIEVING ORAL HEALTH THROUGHOUT LIFE</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>FINDINGS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REFERENCES</td>
<td>269</td>
</tr>
</tbody>
</table>

| Chapter 11 | Facing the Future                                          | 275 |
|            | THE PAST AND PRESENT AS PROLOGUE                           |     |
|            | - The Pioneers, 275                                        |     |
|            | - Vital Statistics, 275                                    |     |
|            | - Health Improvement, 276                                  |     |
|            | DIVERSITY OF DISEASES AND PATIENTS, 276                    |     |
|            | TRANSFORMING TREATMENTS, 276                               |     |
|            | TRANSFORMING HEALTH PROFESSIONAL EDUCATION, 276            |     |
|            | TRANSFORMING HEALTH CARE, 277                              |     |
|            | ORAL HEALTH—NOT YET FOR ALL, 277                           |     |
|            | HOPE FROM SCIENCE AND TECHNOLOGY, 278                      |     |
|            | A FRAMEWORK FOR ORAL HEALTH, 280                           |     |
|            | REFERENCES                                                 | 281 |

| Chapter 12 | A Call to Action                                           | 283 |
|            | MAJOR FINDINGS, 283                                       |     |
|            | A FRAMEWORK FOR ACTION, 284                               |     |
|            | CONCLUSION, 287                                            |     |

Index 289