

Edwin B. Fisher *Editor*

Linda D. Cameron · Alan J. Christensen

Ulrike Ehlert · Yan Guo

Brian Oldenburg · Frank J. Snoek

Associate Editors

Principles and Concepts of Behavioral Medicine

A Global Handbook

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Editor

Edwin B. Fisher
Department of Health Behavior
Gillings School of Global Public Health
University of North Carolina at Chapel Hill
Chapel Hill, NC, USA

Associate Editors

Linda D. Cameron
Psychological Sciences
University of California, Merced
Merced, CA, USA

The University of Auckland
Auckland, New Zealand

Ulrike Ehlert
Department of Clinical Psychology
and Psychotherapy
University of Zurich
Zürich, Switzerland

Brian Oldenburg
Melbourne School of Population
and Global Health
University of Melbourne
Melbourne, Australia

Alan J. Christensen
Department of Psychological and Brain
Sciences and Department of Internal
Medicine

The University of Iowa
Iowa City, IA, USA

Yan Guo
School of Public Health
Peking University Health Science
Center
Beijing, P.R. China

Frank J. Snoek
Departments of Medical Psychology
Academic Medical Center (AMC)
and VU University Medical
Center (VUMC)
Amsterdam, The Netherlands

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Editor's Dedication

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Contributors

Pilvikki Absetz Institute of Public Health and Clinical Nutrition, University of Eastern Finland Faculty of Social Sciences, University of Tampere, Tampere, Finland

John P. Allegrante Department of Health and Behavior Studies, Teachers College, Columbia University, New York, NY, USA

Department of Sociomedical Sciences, Mailman School of Public Health, Columbia University, New York, NY, USA

Chad E. Barrett Department of Psychology, University of Colorado Denver, Denver, CO, USA

Linda C. Baumann University of Wisconsin-Madison School of Nursing, Madison, WI, USA

Sara J. Becker Center for Alcohol and Addictions Studies, Brown University School of Public Health, Providence, RI, USA

Silja Bellingrath Faculty of Educational Sciences, Department of Work- and Organizational Psychology, Institute of Psychology, University Duisburg-Essen, Essen, Germany

Nivedita L. Bhushan Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Karen A. Blase National Implementation Research Network, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

James A. Blumenthal Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC, USA

Renée I. Boothroyd Frank Porter Graham (FPG) Child Development Institute, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Ron Borland Nigel Gray Fellowship Group, Cancer Council Victoria, Melbourne, VIC, Australia

Kimberly Bowen Department of Psychology and Health Psychology Program, University of Utah, Salt Lake City, UT, USA

Kaitlyn E. Brodar Department of Psychology, University of Miami, Coral Gables, FL, USA

Jos F. Brosschot Department of Psychology, Leiden University, Leiden, The Netherlands

Lora E. Burke Department of Health and Community Systems, School of Nursing, University of Pittsburgh, Pittsburgh, PA, USA

Linda D. Cameron Psychological Sciences, University of California, Merced, Merced, CA, USA

The University of Auckland, Auckland, New Zealand

Bronwyn Carter Department of Public Health, School of Public Health and Psychology, La Trobe University, Melbourne, VIC, Australia

David A. Chambers National Cancer Institute, National Institutes of Health, Bethesda, MD, USA

Carina K. Y. Chan School of Psychology and Public Health, College of Science, Health and Engineering, La Trobe University, Bendigo, Victoria, Australia

Alan J. Christensen Department of Psychological and Brain Sciences and Department of Internal Medicine, The University of Iowa, Iowa City, IA, USA

Persis Commissariat Department of Medicine, Joslin Diabetes Center, One Joslin Place, Boston, MA, USA

Muchieh Maggy Coufal Peers for Progress and Asian Center for Health Education, Plano, TX, USA

Gary Cuddeback School of Social Work, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Jamie A. Cvengros Sleep Disorders Service and Research Center, Rush University Medical Center, Chicago, IL, USA

Timothy P. Daaleman Department of Family Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Meena Daivadanam Department of Food, Nutrition & Dietetics, Uppsala University, Uppsala & Department of Public Health Sciences, Karolinska Institute, Stockholm, Sweden

Gail Davey Brighton and Sussex Medical School, University of Sussex, Brighton, UK

Gerald C. Davison Department of Psychology, University of Southern California, Los Angeles, CA, USA

Joost Dekker Department of Psychiatry and Department of Rehabilitation Medicine, VU University Medical Center, Amsterdam, The Netherlands

Alan M. Delamater Division of Clinical Psychology, Department of Pediatrics, University of Miami Miller School of Medicine, Miami, FL, USA

Ulrike Ehlert Department of Clinical Psychology and Psychotherapy, University of Zurich, Zurich, Switzerland

Jason Fanning Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Champaign, IL, USA

Michelle C. Feng Department of Psychology, University of Southern California, Los Angeles, CA, USA

Maarten J. Fischer Department of Medical Oncology, Leiden University Medical Center, Leiden, The Netherlands

Edwin B. Fisher Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Amanda A. M. Fixsen Invest in Kids, Denver, CO, USA

Dean L. Fixsen National Implementation Research Network, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

John P. Foreyt Department of Medicine, Baylor College of Medicine, Houston, TX, USA

Kenneth E. Freedland Department of Psychiatry, Washington University School of Medicine, St. Louis, MO, USA

David P. French Manchester Centre for Health Psychology, School of Health Sciences, University of Manchester, Manchester, UK

Russell E. Glasgow Department of Family Medicine, University of Colorado School of Medicine, Denver, CO, USA

Carol Golin Department of Medicine, School of Medicine, Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Jullie Tran Graham HelpForce, London, UK

Leonard Green Department of Psychological and Brain Sciences, Washington University in St. Louis, St. Louis, MO, USA

Robert Kent de Grey Department of Psychology and Health Psychology Program, University of Utah, Salt Lake City, UT, USA

Yan Guo School of Public Health, Peking University Health Science Center, Beijing, P.R. China

Cyrille Harpet Department of Environmental and Occupational Health, EHESP School of Public Health, Paris, France

Hendrik D. de Heer Department of Physical Therapy and Athletic Training, Northern Arizona University, Flagstaff, AZ, USA

Zoe Heritage Department of Human and Social Sciences, EHESP School of Public Health, Paris, France

Clyde Hertzman Faculty of Medicine, School of Population and Public Health, University of British Columbia, Vancouver, BC, Canada

Bradford W. Hesse Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Bethesda, MD, USA

Christel Hyden Department of Family and Social Medicine, Albert Einstein College of Medicine, Yeshiva University, New York, NY, USA

Harlem Health Promotion Center, Mailman School of Public Health, Columbia University, New York, NY, USA

Craig A. Johnston Department of Health and Human Performance, University of Houston, Houston, TX, USA

Betty L. Kaiser University of Wisconsin-Madison School of Nursing, Madison, WI, USA

Robert M. Kaplan Clinical Excellence Research Center (CERC), Stanford University, Stanford, CA, USA

Ad A. Kaptein Section of Medical Psychology, Leiden University Medical Center, Leiden, The Netherlands

Kristin M. Kilbourn Department of Psychology, University of Colorado Denver, Denver, CO, USA

Sarah D. Kowitt Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Stef P. J. Kremers Department of Health Promotion, Maastricht University, Maastricht, The Netherlands

Alfgeir L. Kristjansson Department of Social and Behavioral Sciences, School of Public Health, West Virginia University, Morgantown, WV, USA

Brigitte M. Kudielka Faculty of Psychology, Department of Medical Psychology, Psychological Diagnostics and Research Methodology, University of Regensburg, Regensburg, Germany

Julia R. Van Liew Department of Psychology, The University of Iowa, Iowa City, IA, USA

Vivian Lin Department of Public Health, School of Public Health and Psychology, La Trobe University, Melbourne, VIC, Australia

Sonia Lippke Department of Psychology and Methods, Bremen International Graduate School of Social Sciences, Jacobs University Bremen, Bremen, Germany

Antonia C. Lyons Department of Psychology, Massey University, Wellington, New Zealand

Kevin S. Masters Department of Psychology, University of Colorado Denver, Denver, CO, USA

Elezebeth Mathews Department of Public Health and Community Medicine, Central University of Kerala, Kasaragod, KL, India

Edward McAuley Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Champaign, IL, USA

Colleen M. McBride Behavioral Sciences and Health Education Department, Rollins School of Public Health, Emory University, Atlanta, GA, USA

Allison J. Metz National Implementation Research Network, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Jude Mikel Department of Psychology and Health Psychology Program, University of Utah, Salt Lake City, UT, USA

Anett Mueller-Alcazar Department of Psychology, Faculty of Human Sciences, Medical School Hamburg, Hamburg, Germany

Sean P. Mullen Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Champaign, IL, USA

Hairong Nan Longhua District Maternity & Child Healthcare Hospital, Shenzhen, China

Faculty of Health and Social Sciences, The Hong Kong Polytechnic University, Hong Kong, SAR, China

Justin M. Nash Department of Allied Health Sciences, University of Connecticut, Storrs, CT, USA

Urs M. Nater Department of Psychology, University of Vienna, Vienna, Austria

Brian Oldenburg Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia

Humberto Parada Division of Epidemiology & Biostatistics, Graduate, School of Public Health, San Diego State University, San Diego, CA, USA

Thomas L. Patterson Department of Psychiatry, University of California, San Diego, La Jolla, CA, USA

Corinne Peek-Asa Department of Occupational and Environmental Health, College of Public Health, University of Iowa, Iowa City, IA, USA

Eileen V. Pitpitan Division of Infectious Diseases and Global Public Health, Department of Medicine, University of California, San Diego, La Jolla, CA, USA

Rachael Powell Manchester Centre for Health Psychology, School of Health Sciences, University of Manchester, Manchester, UK

John Preisser Department of Biostatistics, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Howard Rachlin Department of Psychology, Stony Brook University, Stony Brook, NY, USA

Shoba Ramanadhan Department of Social and Behavioral Sciences, Harvard T. H. Chan School of Public Health, Boston, MA, USA
The Center for Community-Based Research, Dana-Farber Cancer Institute, Boston, MA, USA

Jocelyn Raude Department of Human and Social Sciences, EHESP School of Public Health, Paris, France

Margreet Scharloo Section of Medical Psychology, Leiden University Medical Center, Leiden, The Netherlands

Ralf Schwarzer Department of Psychology, Free University of Berlin, Berlin, Germany

Suzanne E. Scott Population and Patient Health Division, Dental Institute, King's College London, London, UK

William Sherlaw Department of Human and Social Sciences, EHESP School of Public Health, Paris, France

Arjumand Siddiqi Division of Epidemiology, Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada

Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Johannes Siegrist Faculty of Medicine, University of Duesseldorf, Duesseldorf, Germany

Brendan T. Smith Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada

Frank J. Snoek Departments of Medical Psychology, Academic Medical Center (AMC) and VU University Medical Center (VUMC), Amsterdam, The Netherlands

Rebecca L. Sokol Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Jane Speight School of Psychology, Deakin University, Geelong, VIC, Australia

The Australian Centre for Behavioural Research in Diabetes, Diabetes Victoria, Melbourne, Australia

AHP Research Ltd., Hornchurch, Essex, UK

Jamila K. Stockman Division of Infectious Diseases and Global Public Health, Department of Medicine, University of California, San Diego, La Jolla, CA, USA

Jana Strahler Clinical Biopsychology, Department of Psychology, University of Marburg, Marburg, Germany

Patrick Yao Tang Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Fasil Tekola Ayele Division of Intramural Population Health Research, National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD, USA

Jitske Tiemensma Department of Psychology, University of California, Merced, CA, USA

Akizumi Tsutsumi Department of Public Health, Kitasato University School of Medicine, Kanagawa, Japan

Bert N. Uchino Department of Psychology and Health Psychology Program, University of Utah, Salt Lake City, UT, USA

Diana M. URLaub Peers for Progress and Department of Maternal and Child Health, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Ariana Vanderveldt Department of Psychological and Brain Sciences, Washington University in St. Louis, St. Louis, MO, USA

K. “Vish” Viswanath Department of Social and Behavioral Sciences, Harvard T. H. Chan School of Public Health, Boston, MA, USA

The Center for Community-Based Research, Dana-Farber Cancer Institute, Boston, MA, USA

Hein de Vries Department of Health Promotion, Maastricht University, Maastricht, The Netherlands

Jing Wang Department of Nursing Systems, School of Nursing, The University of Texas Health Science Center at Houston, Houston, TX, USA

Trisha L. Welter Department of Student Health and Wellness, University of Iowa, Iowa City, IA, USA

Jingzhen Yang Department of Pediatrics, College of Medicine, The Ohio State University, Columbus, OH, USA

Shajahan Yasin Monash University Malaysia, Jalan Lagoon Selatan, Bandar Sunway, Malaysia

Hua-Hie Yong Nigel Gray Fellowship Group, Cancer Council Victoria, Melbourne, VIC, Australia

Yaguang Zheng Connell School of Nursing, Boston College, Chestnut Hill, MA, USA

Part 1

The Ecological Range of Relationships Between Behavior and Health



Introduction

1

Edwin B. Fisher, Linda D. Cameron,
Alan J. Christensen, Ulrike Ehler, Yan Guo,
Brian Oldenburg, and Frank J. Snoek

As defined by the International Society of Behavioral Medicine (<http://www.isbm.info/about-isbm/charter/>), behavioral medicine is:

... the interdisciplinary field concerned with the development and integration of psychosocial, behavioral and biomedical knowledge relevant to health and illness and the application of this knowledge to prevention, etiology, diagnosis, treatment and rehabilitation. The scope of “behavioral medicine” extends from research efforts to understand fundamental biobehavioral mechanisms; to clinical diagnosis and intervention; to disease prevention and health promotion.

This volume embraces the breadth of that definition and emphasizes a very wide range

of subjects including fundamental aspects of learning, emotion, cognition, genetics and epigenetics, and brain-behavior relationships as well as our still emerging understanding of how natural and built environments, sociocultural factors, and public policies influence behavior and behavior change. The interventions behavioral medicine includes are correspondingly broad, from individual interventions to improved stress management to policy approaches to designing communities that promote physical activity and implementing national health plans that encourage healthy behaviors. In short, behavioral medicine encompasses the entirety of the range of relationships between behavior and health. It is this breadth of both conceptual perspectives and application that this volume seeks to convey.

The contributions of behavior to health and health care have often been limited by failure to

E. B. Fisher (✉)

Department of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
e-mail: edfisher@unc.edu

L. D. Cameron

Psychological Sciences, University of California, Merced, Merced, CA, USA

The University of Auckland, Auckland, New Zealand
e-mail: lcameron@ucmerced.edu

A. J. Christensen

Department of Psychological and Brain Sciences and Department of Internal Medicine, The University of Iowa, Iowa City, IA, USA
e-mail: alan-christensen@uiowa.edu

U. Ehler

Department of Clinical Psychology and Psychotherapy, University of Zurich, Zurich, Switzerland
e-mail: u.ehler@psychologie.uzh.ch

Y. Guo

School of Public Health, Peking University Health Science Center, Beijing, P.R. China
e-mail: guoyan@bjmu.edu.cn

B. Oldenburg

Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Australia
e-mail: brian.oldenburg@unimelb.edu.au

F. J. Snoek

Departments of Medical Psychology, Academic Medical Center (AMC) and VU University Medical Center (VUMC), Amsterdam, The Netherlands
e-mail: Fj.snoek@vumc.nl

identify and assert the roles of behavior and to articulate fully a view of *health as behavior*, how we live our lives. This is in sharp contrast to construing health status as some aggregate of clinical risks and clinical problems. For example, we may think about health as years of quality of life and the behaviors that comprise a life of quality, rather than as years of survival. Similarly, from a behavioral perspective, we can approach health not as managing this, that, or another clinical problem, but rather as promoting and guiding the core behaviors that comprise health across most all diseases and their risks:

- Eating a healthy diet, engaging in regular physical activity, sufficient and restful sleep
- Avoiding dangerous behaviors like smoking and excessive alcohol use
- Cultivating healthy relationships to give and receive social support
- Avoiding/minimizing perceived stress and subjective burden
- Getting screening appropriate to age, sex, family history, and genotype
- Taking appropriate medications

In emphasizing the range of influences on behaviors related to health, this book takes what has come to be termed a *socio-ecological perspective*. This is explained in more detail later in this chapter, but central to this perspective is attention to influences at multiple levels – biological, psychological, family, social, community, cultural, organizational, system, policy – and the relations among these levels, e.g., influences of community and cultural forces on family and individual behavior.

Scope of Behavior and Health

Behavior is central to the development, prevention, treatment, and management of a number of primary diseases and health conditions, including heart disease, cancer, stroke, pulmonary diseases, unintentional injuries, communicable diseases, diabetes, suicide, kidney diseases, liver diseases, and HIV/AIDS. According to

the World Health Organization (World Health Organization, 2015a):

- Tobacco accounts for around six million deaths every year (including from the effects of exposure to second-hand smoke) and is projected to increase to eight million by 2030.
- About 3.2 million deaths annually can be attributed to insufficient physical activity.
- More than half of the 3.3 million annual deaths from harmful drinking are from non-communicable or chronic diseases.
- In 2010, 1.7 million annual deaths from cardiovascular causes have been attributed to excess salt/sodium intake.

The United States Centers for Disease Control and Prevention has estimated that 14 of the top 15 causes of death in the United States are attributable to modifiable behaviors, including physical inactivity, poor diet, smoking, alcohol and other drug use, poor injury control, inadequate sun protective behaviors, inappropriate use of medicines, insufficient immunization, unsafe sexual and reproductive practices, poor oral hygiene, and mental health problems (Heron, Hoyert, et al., 2009). Other countries report similar impacts. In Switzerland, for example, costs of stress management are estimated at 4.2 billion Swiss francs per year (Grebner, Berlowitz, et al., 2010).

The breadth of connections between behavior and health is formidable. In addition to the commonly recognized role of behaviors such as smoking, diet, and physical activity, other behaviors are also fundamental to the development of a number of diseases. For example, stress and stress management play important roles in the development and management of cardiovascular and other diseases, and unsafe sex practices increase the likelihood of contracting infectious diseases such as HIV/AIDS. Chronic conditions like diabetes require self-management of inter-linked behaviors through careful monitoring of diet, physical activity, stress management, and complex disease-specific tasks such as blood glucose monitoring linked with adjustment of medication, diet, and activity. Behavioral and psychological interventions have been shown to

enhance not only quality of life, but also survival through improved psychological adjustment as well as changes in risk behavior (Andersen, Yang, et al., 2008). Cutting across a number of these effects of behavior on health are interactions between behavioral and biological factors such as in cigarette smoking (True, Xian, et al., 1999) and behavioral and environmental influences on expression of genetic propensities for diabetes (Pratley, 1998) or excessive alcohol use (Ducci, Enoch, et al., 2008).

*Behavior Matters*¹ The broad roles of behavior in health and disease (Nater, Gaab, et al., 2006) were documented in a 2011 review (Fisher, Fitzgibbon, et al., 2011) that examined three major diseases (cardiovascular disease, cancer, and HIV/AIDS) and four major risk factors (tobacco use, poor diet, physical inactivity, and excessive alcohol consumption). Together, these account for great health impacts around the world. For example, the four risk factors account for an estimated 36.8% of all deaths in the USA (Mokdad, Marks, et al., 2004, 2005).

For each of these three major diseases and four major risk factors, the 2011 review examined six types of behavioral influence. The first was how behavioral, environmental, and genetic influences moderate one another. Five additional types of influence focused on the roles of behavior in the development of health problems, prevention, disease management, quality of life, and population approaches to health promotion.

Table 1.1 has been adapted from the 2011 review. It provides examples from published research of each of the six types of behavioral influence for each of the three major diseases as

well as the four risk factors. As an example of the many ways in which behavior matters, alcohol use has impacts on health ranging from birth defects to accidents and injuries to alcohol-related liver disease and pancreatitis (Healthy People 2010, 2000). Genetic predispositions may incline the individual to excessive use but these are also moderated by psychosocial factors such as childhood maltreatment (Ducci, Enoch, et al., 2008). Although often difficult to treat, brief interventions can reduce drinking (U.S. Preventive Services Task Force (USPSTF), 2004; Whitlock, Polen, et al., 2004) and problems associated with alcohol (O'Connor & Whaley, 2007), while more intensive psychological treatments can improve quality of life among those recovering from excessive use (Arnedt, Conroy, et al., 2007). Along with tobacco use and physical activity, alcohol use stands as an area in which environmental modifications, such as reducing density of retail outlets, can be effective ([The Guide to Community Preventive Services](#)).

Another set of examples of how behavior matters surround cardiovascular disease, with which the roles of behavior range from the effects of stress on expression of the serotonin transporter gene (Williams, 2007) through the roles of diet, physical activity, smoking, and stress in the development (Eckel & Krauss for the AHA Nutrition Committee, 1998), prevention (Goldberg, Temprosa, et al., 2009), and management of disease (Fonarow, Gawlinski, et al., 2001; Ornish, Scherwitz, et al., 1998). Comprehensive, multi-sector community and population approaches to cardiovascular risk reduction have also documented reduced risk (Vartiainen, Puska, et al., 1994) and mortality (Puska, Vartiainen, et al., 1998).

Table 1.1 provides many additional examples across cancer, HIV/AIDS, tobacco use, poor diet, and physical inactivity. Chapters 2 and 3, *infra* on “Types of Diseases and their Causes” and “Risky Behaviors,” provide far greater details of the roles of behavior in major diseases and health challenges around the world.

¹This section is drawn from a paper co-authored by Fisher and his colleagues, Marian Fitzgibbon, Russell Glasgow, Debra Haire-Joshu, Laura Hayman, Robert Kaplan, Marilyn Nanney, and Judith Ockene. We are indebted to them for providing permission to draw at length from their paper, the full citation of which is, Fisher, E. B., Fitzgibbon, M. L., Glasgow, R. E., Haire-Joshu, D., Hayman, L. L., Kaplan, R. M., Nanney, M.S., & Ockene, J. K. (2011). Behavior matters. *American Journal of Preventive Medicine*, 40(5), e15–30.

Table 1.1 Behavior – health linkages among major “actual causes” of death and major diseases**Linkage 1 – behavioral, environmental, and genetic influences moderate one another****Tobacco use:**

Both environmental and genetic factors influence onset and persistence of smoking (Agrawal, Madden, et al., 2005; Heath, Kirk, et al., 1999; Madden, Heath, et al., 1999; Maes, Neale, et al., 2006)

Poor diet:

Studies of food preferences indicate genetic influences are smaller than environmental influences (Perusse, Tremblay, et al., 1988; Reed, Bachmanov, et al., 1997)

Physical activity:

In twin studies, greater physical activity levels are associated with lower rates of obesity in genetically high-risk individuals (Samaras, Kelly, et al., 1999)

Alcohol use:

Childhood maltreatment exacerbates genetic influences on adult alcohol use and anti-social personality among women and men (Ducci, Enoch, et al., 2008)

Cardiovascular disease and diabetes

Influence of serotonin transporter gene on cardiovascular risk is moderated by stress and environmental factors (Williams, 2007)

Cancer:

Nutrition and lifestyle intervention reduces prostate gene expression and tumorigenesis in men (Ornish, Magbanua, et al., 2008)

HIV/AIDS:

In monkey models of HIV, individual characteristics (sociability), stable versus unstable social conditions, and genotype for the serotonin transporter gene interact in their effects on disease progression (Capitano, Abel, et al., 2008)

Linkage 2 – behavior influences health**Tobacco use:**

Numerous Surgeon General’s reports have concluded that smoking is a leading cause of cancer, cardiovascular, and pulmonary disease and premature death (Centers for Disease Control and Prevention, 2004)

Poor diet:

Systematic reviews conclude that obesity contributes to hypertension, hyperlipidemia, diabetes, CVD, and some cancers (Calle & Thun, 2004; Goldberg & King, 2007; Must, Spadano, et al., 1999; National Heart Lung and Blood Institute and National Institute of Diabetes and Digestive and Kidney Disease, 1998; Schulze & Hu, 2005; Sharma, 2007; United States Department of Health and Human Services, 2001)

Physical activity:

Randomized trials and systematic reviews conclude that physical activity is associated with decreased all-cause mortality, (Blair, Kohl, et al., 1989) reduced risk for chronic diseases, reduced risk of breast cancer (Berlin & Colditz, 1990; Haskell, Lee, et al., 2007; Powell, Thompson, et al., 1987)

Alcohol use:

“Alcohol abuse alone is associated with motor vehicle crashes, homicides, suicides, and drowning.... Long-term heavy drinking can lead to heart disease, cancer, alcohol-related liver disease, and pancreatitis. Alcohol use during pregnancy is known to cause fetal alcohol syndrome, a leading cause of preventable mental retardation” (Healthy People 2010, 2000)

Cardiovascular disease and diabetes

Diet and obesity are risk factors for diabetes and cardiovascular disease (Eckel, Krauss, & for the AHA Nutrition Committee, 1998)

Cancer:

Findings from systematic reviews, meta-analyses, large prospective studies, and randomized trials link risk for cancer with poor diet, physical inactivity, smoking, stress, and social involvement (Office of Behavioral and Social Sciences Research, 2007; Greenwald, Clifford, & Milner, 2001; Kuller, 1997; Matthews, Shu, et al., 2001; Rockhill, Willett, et al., 1999; Thune, Brenn, et al., 1997)

HIV/AIDS:

There is “substantial and consistent evidence that chronic depression, stressful events, and trauma may negatively affect HIV disease progression” (Reiche, Nunes, & Morimoto, 2004; Leserman, 2008)

(continued)

Table 1.1 (continued)**Linkage 3 – behavior change interventions prevent disease****Tobacco use:**

A major multi-site trial demonstrated that smoking cessation programs substantially reduce mortality even when only a minority of patients stop smoking (Anthonisen, Skeans, et al., 2005)

Poor diet:

Systematic reviews and randomized trials of interventions for childhood obesity show positive impacts on diet, weight gain trajectory, and weight loss maintenance, (Campbell & Hesketh, 2007; Connelly, Duaso, & Butler, 2007; DeMattia, Lemont, & Meurer, 2007; Epstein, Valoski, et al., 1994; Fitzgibbon, Stolley, et al., 2005; Summerbell, Waters, et al., 2005) and on insulin resistance (Savoie, Shaw, et al., 2007)

Physical activity:

Among overweight, previously inactive women at risk for type 2 diabetes, accumulating 10,000 steps/day for 8 weeks improved glucose tolerance and reduced both systolic and diastolic blood pressure (Swartz, Strath, et al., 2003)

Alcohol use:

A 15-min counseling for pregnant women increased abstinence from drinking 5X relative to controls and resulted in higher birth weights, birth lengths, and 3X reduction in fetal mortality (0.9% vs 2.9%.) (O'Connor & Whaley, 2007)

Cardiovascular disease and diabetes

Lifestyle interventions focusing on diet, weight loss, and exercise can reduce the incidence of diabetes in persons at risk for the disease (Diabetes Prevention Program Research Group, 2002; Tuomilehto, Lindstrom, et al., 2001; Lindstrom, Ilanne-Parikka, et al., 2006)

Cancer:

In a number of large prospective longitudinal studies and meta-analyses, physical activity has been linked to reduced risk of colon cancer (Albanes, Blair, & Taylor, 1989; Ballard-Barbash, Schatzkin, et al., 1990; Lee, Paffenbarger, & Hsieh, 1991; Martinez, Giovannucci, et al., 1997; Meyerhardt, Heseltine, et al., 2006; Samad, Taylor, et al., 2005; Thun, Calle, et al., 1992)

HIV/AIDS:

The US Preventive Services Task Force recommends high-intensity behavioral counseling to prevent sexually transmitted infections for all sexually active adolescents and for adults at heightened risk (U.S. Preventive Services Task Force (USPSTF), 2008)

Linkage 4 – behavior change interventions improve disease management**Tobacco use:**

Self-management skills (e.g., setting quit date, planning for coping with temptations to relapse) help individuals quit smoking (Fiore, Bailey, et al., 2000)

Poor diet:

Randomized behavioral interventions show that peer nutrition education positively influences diabetes self-management in Latinos (Perez-Escamilla, Hromi-Fiedler, et al., 2008)

Physical activity:

Randomized clinical trials show that exercise training reduces HbA1c among those with diabetes (Boule, Haddad, et al., 2001)

Alcohol use:

Brief behavioral counseling interventions with follow-up produce small to moderate reductions in alcohol consumption that are sustained over 6- to 12-month periods or longer.(US Preventive Services Task Force (USPSTF), 2004; Whitlock, Polen, et al., 2004)

Cardiovascular disease and diabetes

Diabetes self-management programs improve disease management (Norris, Engelgau, & Narayan, 2001) and metabolic control (Anderson, Funnell, et al., 1991, 1995; Aubert, Herman, et al., 1998; Clement, 1995; Greenfield, Kaplan, et al., 1988; Muhlhauser & Berger, 1993; Norris, Lau, et al., 2002; Pieber, Brunner, et al., 1995; Rubin, Peyrot, & Saudek, 1989, 1993) including among older adults and ethnic minorities, (Anderson, Herman, et al., 1991; Glasgow, Toobert, & Hampson, 1991; Glasgow, Toobert, et al., 1992) and reduce complications (The Diabetes Control and Complications Trial Research Group, 1993, 1995) as well as myocardial infarction, stroke, or death from cardiovascular disease (The Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study Research Group, 2005)

(continued)

Table 1.1 (continued)

Interventions promoting comprehensive lifestyle changes for patients with coronary artery disease can reduce progression of coronary atherosclerosis and cardiac events (Ornish, Scherwitz, et al., 1998) and increase smoking cessation, improve functional capacity, lower LDL cholesterol, and reduce all-cause mortality (Fonarow, Gawlinski, et al., 2001)

Cancer:

Randomized trials of patients with cancer indicate that physical activity increases functional capacity during chemotherapy, (MacVicar, Winningham, & Nickel, 1989) improves marrow recovery and decreases complications during peripheral blood stem transplantation, (Dimeo, Fetscher, et al., 1997) and decreases fatigue and other symptoms associated with radiation therapy and chemotherapy (Mock, Dow, et al., 1997)

HIV/AIDS:

Behavioral medicine interventions have improved adherence and helped individuals cope with the disease and its impacts, in turn improving their general disease management and quality of life (Office of Behavioral and Social Sciences Research, 2007)

Linkage 5 – psychosocial and behavioral interventions improve quality of life (QOL)**Tobacco use:**

Improved health-related QOL is a significant health outcome for ex-smokers compared to current smokers (Crothers, Griffith, et al., 2005; Garcés, Yang, et al., 2004; Ostbye & Taylor, 2004; Wilson, Parsons, & Wakefield, 1999)

Poor diet:

In randomized trials, lifestyle interventions show improved nutritional status and quality of life and less depressive symptoms and improved physical functioning (Drewnowski & Evans, 2001; Scheier, Helgeson, et al., 2005; Fontaine & Barofsky, 2001)

Physical activity:

Randomized trials show physical activity improves quality of life in older adults (Drewnowski & Evans, 2001; Rejeski, Brawley, & Shumaker, 1996) and improves quality of life and fatigue in breast cancer survivors (Courneya, 2003)

Alcohol use:

Cognitive-behavioral treatment of insomnia among those recovering from excessive alcohol use improved measures of sleep as well as depression, anxiety, and quality of life (Arnedt, Conroy, et al., 2007)

Cardiovascular disease and diabetes

Comprehensive behavioral disease management interventions among patients with cardiovascular disease or diabetes show benefits for a variety of clinical indicators as well as reduced general distress and depressive symptoms, (Blumenthal, Sherwood, et al., 2005) emotional and social functioning, (Castaldo & Reed, 2008) reduced anxiety and depressed mood, (Vale, Jelinek, et al., 2003) general quality of life (Ades, Pashkow, et al., 2000; Cochran & Conn, 2008; Lalonde, Gray-Donald, et al., 2002; Yu, Sheung-Wai Li, et al., 2003)

Cancer:

Randomized psychosocial interventions show decreased psychological distress, pain and nausea secondary to treatment, and improve quality of life and immune system modulation (Antoni, Lehman, et al., 2001; Lepore, Helgeson, et al., 2003; Lieberman, Golant, et al., 2003; Penedo, Dahn, et al., 2004)

HIV/AIDS:

Stress-management interventions enhance emotional status and quality of life (Antoni, Caricco, et al., 2006; Scott-Sheldon, Kalichman, et al., 2008)

Linkage 6 – health promotion programs improve health of populations**Tobacco use:**

Antismoking campaign in California that includes counter-media, youth prevention programs, cessation services, and tax increases reduced smoking and accompanying rates of cardiovascular disease (Fichtenberg & Glantz, 2000) and death rates from lung cancer (Jemal, Thun, et al., 2008)

Poor diet:

Mass-media health education campaigns (Stern, Farquhar, et al., 1976) and policy and environmental supports (McAlister, Puska, et al., 1982; Puska, Nissinen, et al., 1985) can lead to significant improvements in fruit, vegetable, and fat consumption in general populations.

Physical activity:

Community-wide walk to school programs increase walking and biking to school (Staunton, Hubsmith, & Kallins, 2003), and walking and fitness trails increased physical activity in a rural African-American population (Brownson, Housemann, et al., 2000)

(continued)

Table 1.1 (continued)**Alcohol use:**

Guide to Community Preventive Services reports that regulating density of outlets for alcohol reduces consumption and that enforcing laws prohibiting the sale of alcohol to minors reduces underage consumption (The Guide to Community Preventive Services)

Cardiovascular disease and diabetes

Working with mass media, food producers, community-level campaigns, diverse professionals, informal opinion leaders, and the health system, a regional program in North Karelia, Finland, reduced cardiovascular risk factors (Vartiainen, Puska, et al., 1994) and mortality (Puska, Vartiainen, et al., 1998) as well as cancer risk factors (Luostarinen, Hakulinen, & Pukkala, 1995)

Cancer:

In 2006, overall cancer death rates declined because of 50% reduction in male smoking from 47% in the 1960s to less than 23% (Thun & Jemal, 2006)

HIV/AIDS:

Behavioral medicine programs have made major contributions to slowing the spread of HIV/AIDS; from 150,000 cases per year in the early 1980s to approximately 40,000 today (Centers for Disease Control and Prevention, 2005)

Global Trends in Health and Behavior²

Life expectancy has increased markedly over the past 50 years, with an ever increasing proportion of the world's population expected to live until late adulthood. Between 1950 and 1990, life expectancy at birth increased from 40 years to 63 years in developing countries (World Bank, 1993). More recently still, average life expectancy increased to 68 years globally in 2007, with a disproportionately large portion of that increase occurring in countries in Asia, including China (WHO, 2009).

Despite the global increases in average life expectancy, recent decades have witnessed a marked increase in non-communicable diseases (NCDs). The global prevalence of non-communicable diseases is expected to rise from 43% in 1998 to 66% in 2030 (WHO, 2008). Key growth will include cardiovascular and respiratory diseases with their behavioral risk factors of unhealthy diet and alcohol consumption, physical inactivity, and tobacco use (WHO, 2005).

Among risk factors, tobacco use itself is projected to cause more premature death and disability than any other single disease, with mortality attributed to tobacco use projected to increase from 5.4 million deaths in 2004 to 8.3 million deaths in 2030 (WHO, 2008). A major contributor to this is the increased uptake of tobacco use in very populous countries such as China.

Amidst significant improvements in health, both social and economic disparities remain a major cause of poor health and disease. Attention to disparities and to the social determinants of health has grown dramatically, spurred in large measure by the leadership of the United Nations. It has placed health in the context of human equity and human rights dating back to the UN Universal Declaration of Human Rights (1948) and the Alma Ata Declaration, which advocated achievement of 'Health for All' (1978). A major initiative included the Commission on Social Determinants of Health, chaired by Sir Michael Marmot. The Commission reviewed the evidence surrounding global health inequalities and the "causes of the causes," culminating in the final report, *Closing the Gap in a Generation* (Commission on the Social Determinants of Health, 2008). The three main recommendations in the report proposed to reduce ill health and disadvantage are (1) improving daily living conditions; (2) redressing the inequitable distribution of power, money, and resources; and (3) improving measurement and

²This section is adapted and updated from Oldenburg B, De Courten M, Freaan E. The contribution of health psychology to the advancement of global health. In Suls, J., Davidson, K. W., Kaplan, R. K. (eds) *Handbook of Health Psychology* Guilford Press, 2010.

understanding of the problem and assessing the impact of action. The pertinence of behavior to the first two is clear and great. These issues of social determinants of health, non-health policy and health, and equity/inequity are discussed at length in numerous chapters, especially those by Sherlaw et al. and by Siddiqi et al., *infra*.

Characterizing Overall Burden of Disease The Global Burden of Disease (GBD) framework, developed in 1992 with the support of the World Bank and World Health Organization, summarizes the wide-ranging and sometimes seemingly contradictory information available on morbidity, mortality, and other health outcomes. Prior to the GBD framework, evidence for policy-making was limited primarily to disease-specific mortality statistics. The initial and subsequent GBD studies provide a more comprehensive measure that aggregates and standardizes measures of mortality, disability, impairment, and illness that arise from disease, injury, and risk factors. GBD studies combine the years of life lost due to premature mortality and healthy years of life lost due to disability in a “Disability-Adjusted-Life-Year” (DALY) (Lopez, Mathers, et al., 2006). One DALY, therefore, is equal to 1 year of full health lost, whether by death or by disability. This allows direct comparison of impacts of diseases that cause early death with impacts of those that cause prolonged suffering or disability.

An analysis of global DALYs and life expectancy between 1990 and 2013 (DALYs Collaborators, Murray, et al., 2015) noted interesting differences in changes in life expectancy and DALYs. Worldwide life expectancy at birth rose by 6.2 years from 1990 to 2013, from an average of 65.3 years to 71.5 years. A more complex picture emerges in considering DALYs, and, a key component of DALYs, years of life lived with disability, YLDs. With increased numbers living longer, the worldwide total YLDs have increased and the total DALYs have increased for non-communicable diseases. The authors conclude that an epidemiological transition is occurring in which global health is improving but population growth, aging, and increased non-communicable diseases have increased the numbers of DALYs and YLDs.

Global Goals and Health In 2000, the United Nations set a group of eight Millennium Development Goals (MDGs) for achievement by 2015. Four were directly related to health: reduce child mortality, improve maternal health, combat HIV/AIDS, malaria and tuberculosis, and increase access to safe drinking water and sanitation (UN, 2008). In May of 2015, the WHO reported on progress toward the health-related goals in each of the 194 countries for which data were available (World Health Organization, 2015b). Drawn from the WHO’s description, this section summarizes the “mixed” results to date:

- **Child deaths halved** – Since 1990, child deaths have been reduced almost by half – falling from an estimated 90 deaths per 1000 live births to 46 deaths per 1000 live births in 2013. This progress, however, has not achieved the goal of reducing the death rate by two-thirds. Less than one-third of all countries achieved or were on track to meet this target by the end of 2015. The top killers of children aged less than 5 years are now: preterm birth complications, pneumonia, birth asphyxia, and diarrhoea.
- **Saving more mothers** – The number of women who died due to complications during pregnancy and childbirth has almost halved between 1990 and 2013. This however is also insufficient to reach the goal of 75% reduction by the end of 2015. The maternal mortality ratio has fallen in every region. However, 13 countries with some of the world’s highest rates have made little progress in reducing these largely preventable deaths. In the WHO African Region, 1 in 4 women wanting to prevent or delay childbearing does not have access to contraceptives, and only 1 in 2 women gives birth with the support of a skilled birth attendant. Less than two-thirds (64%) of women worldwide receive the recommended minimum of 4 antenatal care visits during pregnancy.
- **Reversing the spread of HIV** – In 2013, 2.1 million people were diagnosed with new infections, down 38% from 3.4 million in 2001. At the same time, expansion of WHO recommendations regarding who is eligible for treatment have increased the numbers who

will need to be reached in order to achieve the goal of universal access to treatment for HIV. The world was projected to have exceeded the target of placing 15 million people in low- and middle-income countries on antiretroviral therapy (ARTs) by the end of 2015. By the end of 2013, almost 13 million people received ARTs globally. Of these, 11.7 million lived in low- and middle-income countries, representing 37% of people living with HIV in those countries.

- **Increasing access to safe drinking water and sanitation** – Although the global target for increasing access to safe drinking water was met in 2010, the WHO African and Eastern Mediterranean Regions fall far short, particularly for people living in rural areas or with income poverty. Almost one billion people still have minimal access to basic sanitation and are forced to defecate in open spaces such as fields and near water sources. Lack of sanitation facilities puts these people at high risk of diarrheal diseases (including cholera), trachoma and hepatitis.

Other key indicators of health noted in the appraisal of progress toward Millennium Development Goals make clear the broad role of behavior in health worldwide:

- Life expectancy at birth has increased 6 years for both men and women since 1990.
 - Two-thirds of deaths worldwide are due to non-communicable diseases.
 - In some countries, more than one-third of births are delivered by cesarean section.
 - In low- and middle-income countries, only two-thirds of pregnant women with HIV receive antiretroviral therapy to prevent transmission to their baby.
 - Over one-third of adult men smoke tobacco.
 - Only 1 in 3 African children with suspected pneumonia receives antibiotics.
 - 15% of women worldwide are obese.
 - The median age of people living in low-income countries is 20 years, while it is 40 years in high-income countries.
 - One quarter of men have elevated blood pressure.
- Following the 2015 appraisal of progress toward the *Millennium Development Goals*, members of the United Nations adopted the *Sustainable Development Goals: 17 Goals to Transform our World*. Their broad objectives, to be achieved over the next 15 years, are “to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda” (United Nations, 2015). The 17 goals range widely including, for example, “climate action” and “responsible production and consumption.” Under the overarching health goal to “Ensure healthy lives and promote well-being for all at all ages,” specific targets are:
- By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births
 - By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births
 - By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases
 - By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being
 - Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol
 - By 2020, halve the number of global deaths and injuries from road traffic accidents
 - By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs
 - Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all
 - By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

- Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate
- Support the research and development of vaccines and medicines for the communicable and noncommunicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all
- Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States
- Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

As with the previous Millennium Development Goals, these Sustainable Development Goals make clear the critically important contribution of behavior to health around the globe.

Historical and Conceptual Roots of Behavioral Medicine

Behaviorism

An important foundation for the development of behavioral medicine has been the intellectual tradition and empirical approaches of behaviorism in western psychology of the twentieth century. Neil Miller, a major figure in twentieth-century behaviorism and in the application of behaviorism to complex behavior and psychotherapy (Dollard & Miller, 1950), contributed greatly in the development of behavioral medicine. Many important areas of behavioral medicine have their roots in behavior therapy and its application to mental

health and psychotherapy of behaviorism and the “laws of learning” (Wolpe, 1969). For example, biofeedback (Cox, Sutphen, et al., 1998), stress-management interventions featuring relaxation and active coping with stressors (Bishop, Kaur, et al., 2005; Levenkron, Cohen, et al., 1983; Nater, Gaab, et al., 2006; Penedo, Dahn, et al., 2004; Surwit, van Tilburg, et al., 2002), group and individual interventions for weight management or smoking cessation (Lichtenstein, Harris, et al., 1973; Stuart, 1967), all are based in behavior therapy and were integral to the early development of self-control and self-management interventions in the 1960s (Bandura, 1969; Goldfried & Merbaum, 1973; Kanfer, 1970).

The connections between behavioral medicine and behaviorism were also social and organizational. The first meeting of the US Society of Behavioral Medicine (SBM) in 1979 was held in conjunction with a meeting of the Association for the Advancement of Behavior Therapy (AABT, now called the Association for Behavioral and Cognitive Therapies). W. Stewart Agras, the founding president of SBM (1979–80) was also president of AABT (1985), and a number of major contributors to behavioral medicine and obesity research have been presidents of AABT (Richard Stuart, 1974–75, G. Terrence Wilson, 1980–81, and Kelly Brownell, president of both AABT and SBM in 1988–89) as was Gerald C. Davison (1973–74), the senior author of this volume’s chapter on Values in Behavioral Medicine.

Behaviorism has evolved considerably over recent decades to encompass and explain complex patterns of behavior, including “self control,” addictions, and even community approaches to substance use disorders. This evolution has included articulation of the linkages among complex behaviors, including through the growing field of behavioral economics. It has also expanded in scope to include a broad range of social, organizational, and economic determinants of behavior, sharing much with socio-ecological models in community and public health. Approaches to alcohol abuse, for example, may emphasize economic substitutability of alcohol and positive addictions and promote alternatives to drinking rather than focusing on reducing alcohol consumption itself (Vuchinich & Tucker, 1996).

Behaviorism, behavioral economics, and their evolution as a foundation of behavioral medicine are more fully explored in the present chapter by Rachlin and colleagues, *infra*.

Cognitive Psychology and Decision Making

As behaviorism has grown to address complex patterns of behavior, so too the “cognitive revolution” led much of psychology toward explorations of attention, perception, problem-solving, and memory processes shaping behavior (Mandler, 2002). With this, many behavioral medicine researchers increasingly turned their attention to cognitive and decision-making processes directing health behavior. Applications of cognitive psychology to behavioral medicine have included research on illness schemata and their roles in shaping health information processing, health behaviors, adjustment to illnesses, health outcomes, and even survival (Cameron, Durazo, & Rus, 2015; Crawshaw, Rimington, et al., 2015). Public health emphases on disease prevention fueled research on risk perception and its influence on decisions to engage in protective behaviors such as vaccinations (Weinstein, Kwitel, et al., 2007) and risky behaviors such as cigarette smoking (Slovic, 2001). Economic models of rational decision making gave rise to models of health decision making such as the Health Belief Model (Janz & Becker, 1984), with decisions being viewed as calculations made by weighing the health risks with the benefits versus costs of the health behavior. Advances in social cognition and affective science fostered the development of increasingly sophisticated theories of health cognition that incorporated social influences (e.g., norms and social learning), emotions (e.g., fear), and dual-coding (deliberative and automatic thought) processes (Ajzen, 1985; Bandura, 1977; Leventhal, 1970). Self-regulation theories of health behavior evolved to incorporate these processes into models of the dynamic processes through which individuals set health goals, engage in actions to attain them, and evaluate their progress in goal attainment (Carver & Scheier, 1998; Leventhal, Bodnar-Deren, et al., 2012).

Cognitive theory and research inform an array of behavioral medicine interventions. For example, health communications commonly reflect the application of social learning theory with model characters displaying healthy behaviors. Cognitive behavior therapy is used to treat numerous health conditions, including depression and anxiety disorders (Hollon, Stewart, & Strunk, 2006), as well as substance abuse (McHugh, Hearon, & Otto, 2010) and binge eating (Painot, Jotterand, et al., 2001). Mindfulness interventions have proliferated, with mounting evidence of their benefits for individuals with chronic pain, cancer, epilepsy, and numerous other conditions (Carlson, 2012). Decision aids designed to assist individuals facing complex medical decisions (e.g., choices of cancer treatment) are increasingly commonplace, and they have been shown to improve knowledge, increase participation in “shared decision making,” and reduce decisional conflict (Stacey, Légaré, et al., 2014). Research revealing the automaticity of many health behaviors is guiding the development of “nudge” and other strategies to encourage healthy choices through priming, such as by using small plates to reduce food consumption or narrow glasses to reduce alcohol intake (Marteau, Hollands, & Fletcher, 2012).

Psychosomatic Medicine

Psychosomatic medicine and behavioral medicine have much in common. According to the journal *Psychosomatic Medicine*, the field includes “experimental and clinical studies dealing with various aspects of the relationships among social, psychological, and behavioral factors and bodily processes in humans and animals” (<http://journals.lww.com/psychosomaticmedicine/pages/aboutthejournal.aspx>). Nevertheless, there are differences in emphasis and tradition between the two, including:

1. The significantly longer tradition of psychosomatic medicine and its clear dedication to and establishment in medicine
2. The relative lack of research concerning prevention in psychosomatics

3. The strong orientation of behavioral medicine toward neuroscience and experimentally based methodologies
4. The clear dedication of behavioral medicine toward inclusion of a very broad range of disciplines relative to the greater emphasis in psychosomatics on medicine, psychiatry, and psychology
5. The fact that psychosomatics has its origins in psychoanalysis such as in the work of Franz Alexander (Alexander & Benedek, 1950). In 1950, Mitscherlich implemented the first department for psychosomatic medicine at the University Hospital Heidelberg, Germany (Mitscherlich, 1995). He was strongly engaged in implementing a psychoanalytically driven holistic bio-psycho-social view for diagnosis and treatment of medically ill patients. In German-speaking countries this psychoanalytic tradition is still very much alive and present at university institutions. In contrast, the roots of behavioral medicine come from learning theories, behavior therapy, and psychophysiology. Therefore research and teaching is present in psychology, neuroscience, and medicine such as internal medicine and psychiatry.

Decades ago, these fields showed large differences in their research methods with an emphasis on case studies in psychosomatics and experimental studies in behavior medicine. Recent research methodologies in psychosomatics and behavior medicine are more similar, especially in the USA where the differences and the separation between both research fields are much less than was the case in the past. Both psychosomatic and behavioral medicine engage in research on mind-body-interactions. Therefore in both disciplines psychological and somatic aspects and their interaction are studied. Both disciplines have also come to draw on a broad set of variables to explain a variety of diseases and disorders. These substantive similarities are reflected in the American Psychosomatic Society being member of the International Society of Behavioral Medicine since the 1990s. Indeed, many behavioral medicine research groups publish their findings in journals such as *Psychosomatic Medicine* or the *Journal of Psychosomatic Research*.

Public Health and the Ecological Perspective

Within public health and much literature seeking to address population approaches to health, an “ecological model” of health has gained substantial popularity (McLeroy, Bibeau, & Steckler, 1988; Sallis & Owen, 2015). In ecological or socio-ecological approaches, the behavior of the individual is viewed as guided by layers of influences including the family, proximal social influences such as social networks or neighborhoods, organizational influences such as worksite or community systems or health-care systems, and larger social influences such as government, policy, and large economic structures. Different models may identify different numbers of layers of influence and different components of each, but they share two important emphases: (1) that the behavior of the individual reflects the influence of all the layers; and (2) that the layers interact in their influence so that, e.g., communities may influence families but families may also influence communities.

Many applications and research initiatives in behavioral medicine embrace the multi-layered influences of the socio-ecological model. For example, research in India extending the findings of the Diabetes Prevention Program (described in the chapter on obesity by Johnston et al., *infra*) examines cultural and community factors surrounding healthy diet, physical activity, and diabetes; recruits the influence of the family; and promotes key behaviors of the individual. Similarly, cognitive behavior therapy for postpartum depression in Pakistan is delivered through the primary care system by peer “Lady Health Workers” and is presented and described in ways that take into consideration cultural views and stigma surrounding mental health in rural Pakistan (Rahman, 2007).

In addition to breadth of influence, the socio-ecological model moves attention “upstream” to focus on how policy, organizational, cultural, social, and community characteristics influence family and individual practices that in turn can significantly impact on prevention and care. This then leads to greater attention to upstream determinants in prevention and their influence on populations