Handbook of Behavioral Medicine
Preface

Behavioral medicine emerged in the 1970s as the interdisciplinary field concerned with the integration of behavioral, psychosocial, and biomedical science knowledge relevant to the understanding of health and illness, and the application of this knowledge to prevention, diagnosis, treatment, and rehabilitation. The Academy of Behavioral Medicine Research was founded in 1978 as a forum for established behavioral medicine researchers to exchange ideas in an informal atmosphere. The discipline has subsequently grown and evolved substantially. Recent years have witnessed an enormous diversification of behavioral medicine, with new sciences (e.g., genetics, life course epidemiology) and new technologies (e.g., neuroimaging) coming into play. New health problems have emerged, notably obesity and metabolic disorders, that present fresh challenges to the integration of behavioral sciences with public health. Traditional areas of behavioral medicine research such as the influence of psychological factors on physiological responses have been transformed with measures of intracellular processes, cell signaling molecules, cardiac morphology, and gene expression. Cardiovascular behavioral medicine and psychoneuroimmunology, the disciplines which underpin much of the pathophysiological research in behavioral medicine, have converged in the shared exploration of biobehavioral processes across a range of medical conditions. The field of psychological assessment has benefited from new techniques such as ecological momentary assessment and item response theory, while objective methods are being increasingly used in behavioral assessment. Interventional behavioral medicine has had a new lease on life with large clinical trials, the use of the Internet and other information technologies, and the introduction of the public health perspective into the individual-level behavioral change tradition. These developments have obliged practitioners to embrace new statistical and analytic approaches. Theoretical understanding has developed considerably, with concepts such as allostatic load, illness representations, and epigenetics enriching the diverse domains of behavioral medicine. The discipline has also become international, with learned societies in more than 20 countries, and high-quality research laboratories spread throughout the world.

There is a need to bring together these new developments in a compendium of methods and applications. This handbook aims to fill this need by providing an up to date survey of methods and applications drawn from the
broad range of behavioral medicine research and practice. The handbook is divided into 10 sections that address key fields in behavioral medicine, ranging from basic biobehavioral processes, through individual developmental and socioemotio nal factors, to public health and clinical trials. Each section begins with one or two methodological or conceptual chapters, followed by contributions that address substantive topics within that field. There are very few disease-orientated chapters; rather, major health problems such as cardiovascular disease, cancer, HIV/AIDS, and obesity are explored from multiple perspectives. Our aim is to present behavioral medicine as an integrative discipline, involving diverse methodologies and research paradigms that converge on health and well-being.

As an editor, I should like to express my gratitude to the five associate editors who provided great expertise and support throughout the preparation of this book, to the assistant editor Lydia Poole for her unstinting work, and to the many contributors who have enabled the handbook to be completed in a timely fashion. The editorial team have also greatly benefited from the wisdom of an advisory group of distinguished members of the Academy of Behavioral Medicine Research, namely Ronald Glaser (Ohio State University), Kenneth E. Freedland (Washington University School of Medicine), Kathleen C. Light (University of Utah), Philip M. McCabe (University of Miami), and Andrew Baum (University of Texas, Arlington). Our thanks also go to the editorial and production groups at Springer for their efficiency and helpfulness during the production process.

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Contents

Part I Health Behaviors: Processes and Measures

1 Social and Environmental Determinants of Health Behaviors ........................................ 3
   Verity J. Cleland, Kylie Ball, and David Crawford

2 Cognitive Determinants of Health Behavior .................. 19
   Mark Conner

3 Assessment of Physical Activity in Research and Clinical Practice .......................... 31
   Lephuong Ong and James A. Blumenthal

4 Dietary Assessment in Behavioral Medicine .................. 49
   Marian L. Neuhouser

5 Assessment of Sexual Behavior .................................. 59
   Lori A.J. Scott-Sheldon, Seth C. Kalichman, and Michael P. Carey

6 By Force of Habit ............................................. 73
   Bas Verplanken

7 Adherence to Medical Advice: Processes and Measurement ..................................... 83
   Jacqueline Dunbar-Jacob, Martin P. Houze, Cameron Kramer, Faith Luyster, and Maura McCall

Part II Psychological Processes and Measures

8 Ecological Validity for Patient Reported Outcomes ......... 99
   Arthur A. Stone and Saul S. Shiffman

9 Item Response Theory and Its Application to Measurement in Behavioral Medicine ........ 113
   Mee-Ae Kim-O and Susan E. Embretson

10 Applications of Neurocognitive Assessment in Behavioral Medicine .................. 125
    Shari R. Waldstein, Carrington Rice Wendell, and Megan M. Hosey
11 Lay Representations of Illness and Treatment: A Framework for Action
Howard Leventhal, Jessica Y. Breland, Pablo A. Mora, and Elaine A. Leventhal

12 Conceptualization, Measurement, and Analysis of Negative Affective Risk Factors
Timothy W. Smith

13 Hostility and Health
John C. Barefoot and Redford B. Williams

14 Positive Well-Being and Health
Andrew Steptoe

15 Coping and Health
Charles S. Carver and Sara Vargas

Part III Social and Interpersonal Processes

16 Experimental Approaches to Social Interaction for the Behavioral Medicine Toolbox
Jerry Suls and M. Bryant Howren

17 Social Support and Physical Health: Links and Mechanisms
Tara L. Gruenewald and Teresa E. Seeman

18 Social Networks and Health
Ai Ikeda and Ichiro Kawachi

19 Social Norms and Health Behavior
Allecia E. Reid, Robert B. Cialdini, and Leona S. Aiken

20 Social Marketing: A Tale of Beer, Marriage, and Public Health
Gerard Hastings and Ray Lowry

Part IV Epidemiological and Population Perspectives

21 Assessment of Psychosocial Factors in Population Studies
Susan A. Everson-Rose and Cari J. Clark

22 Socio-economic Position and Health
Tarani Chandola and Michael G. Marmot

23 Race, Ethnicity, and Health in a Global Context
Shawn D. Boykin and David R. Williams

24 Neighborhood Factors in Health
Mahasin S. Mujahid and Ana V. Diez Roux
25 Health Literacy: A Brief Introduction ............................ 355
   Michael S. Wolf, Stacy Cooper Bailey,
   and Kirsten J. McCaffery

26 Screening and Early Detection of Cancer:     
   A Population Perspective ................................. 367
   Laura A.V. Marlow, Jo Waller, and Jane Wardle

27 The Impact of Behavioral Interventions in Public Health  . . 383
   Noreen M. Clark, Melissa A. Valerio,
   and Christy R. Houle

Part V  Genetic Process in Behavioral Medicine

28 Quantitative Genetics in Behavioral Medicine .................. 399
   Ecode Geus

29 Candidate Gene and Genome-Wide Association      
   Studies in Behavioral Medicine ............................ 423
   Ilja M. Nolte, Jeanne M. McCaffery, and Harold Snieder

30 Functional Genomic Approaches in Behavioral      
   Medicine Research ........................................ 443
   Gregory E. Miller and Steve W. Cole

31 Genetics of Stress: Gene–Stress Correlation      
   and Interaction ............................................. 455
   Stephen B. Manuck and Jeanne M. McCaffery

32 Nicotine Dependence and Pharmacogenetics .......... 479
   Riju Ray, Robert Schnoll, and Caryn Lerman

33 Genetics of Obesity and Diabetes ...................... 499
   Karani S. Vimalesswaran and Ruth J.F. Loos

Part VI Development and the Life Course

34 A Life Course Approach to Health Behaviors:      
   Theory and Methods ....................................... 525
   Gita D. Mishra, Yoav Ben-Shlomo, and Diana Kuh

35 Prenatal Origins of Development Health ............... 541
   Christopher L. Coe

36 The Impact of Early Adversity on Health ............... 559
   Shelley E. Taylor

37 Health Disparities in Adolescence ........................ 571
   Hannah M.C. Schreier and Edith Chen

38 Reproductive Hormones and Stages of Life in      
   Women: Moderators of Mood and Cardiovascular    
   Health ......................................................... 585
   Susan S. Girdler and Kathleen C. Light
Contents

39 Aging and Behavioral Medicine .................. 603
Brenda W.J.H. Penninx and Nicole Vogelzangs

Part VII Biological Measures and Biomarkers

40 Use of Biological Measures in Behavioral Medicine ........ 619
Andrew Steptoe and Lydia Poole

41 Laboratory Stress Testing Methodology ............ 633
William Gerin

42 Stress and Allostasis .................................. 649
Ilia N. Karatsoreos and Bruce S. McEwen

43 Neuroendocrine Measures in Behavioral Medicine .... 659
Petra Puetz, Silja Bellingrath, Andrea Gierens, 
and Dirk H. Hellhammer

44 Immune Measures in Behavioral Medicine Research:\nProcedures and Implications ............................. 671
Michael T. Bailey and Ronald Glaser

45 Circulating Biomarkers of Inflammation, Adhesion, 
and Hemostasis in Behavioral Medicine ............ 685
Paul J. Mills and Roland von Känel

46 The Metabolic Syndrome, Obesity, and Insulin Resistance .. 705
Armando J. Mendez, Ronald B. Goldberg, 
and Philip M. McCabe

47 The Non-invasive Assessment of Autonomic 
Influences on the Heart Using Impedance 
Cardiography and Heart Rate Variability ............ 723
Julian F. Thayer, Anita L. Hansen, 
and Bjorn Helge Johnsen

48 Cardiac Measures ....................................... 741
Gina T. Eubanks, Mustafa Hassan, and David S. Sheps

49 Behavioral Medicine and Sleep: Concepts, Measures, 
and Methods ............................................. 749
Martica H. Hall

Part VIII Brain Function and Neuroimaging

50 Neuroimaging Methods in Behavioral Medicine ........ 769
Peter J. Gianaros, Marcus A. Gray, 
Ikechukwu Onyewuenyi, and Hugo D. Critchley

51 Applications of Neuroimaging in Behavioral Medicine .... 783
Marcus A. Gray, Peter J. Gianaros, 
and Hugo D. Critchley
52 Neuroimaging of Depression and Other Emotional States  803
Scott C. Matthews and Richard D. Lane

53 The Electric Brain and Behavioral Medicine  821
J. Richard Jennings, Ydwine Zanstra,
and Victoria Egizio

Part IX  Statistical Methods
54 Reporting Results in Behavioral Medicine  845
Michael A. Babyak

55 Moderators and Mediators: The MacArthur
Updated View  869
Helena Chmura Kraemer

56 Multilevel Modeling  881
S.V. Subramanian

57 Structural Equation Modeling in Behavioral
Medicine Research  895
Maria Magdalena Llabre

58 Meta-analysis  909
Larry V. Hedges and Elizabeth Tipton

Part X  Behavioral and Psychosocial Interventions
59 Trial Design in Behavioral Medicine  925
Kenneth E. Freedland, Robert M. Carney,
and Patrick J. Lustman

60 Methodological Issues in Randomized Controlled
Trials for the Treatment of Psychiatric Comorbidity
in Medical Illness  941
David C. Mohr, Sarah W. Kinsinger, and Jenna Duffecy

61 Quality of Life in Light of Appraisal and Response Shift  955
Sara Ahmed and Carolyn Schwartz

62 Behavioral Interventions for Prevention
and Management of Chronic Disease  969
Brian Oldenburg, Pilvikki Absetz, and Carina K.Y. Chan

63 Psychosocial–Behavioral Interventions and Chronic
Disease  989
Neil Schneiderman, Michael H. Antoni,
Frank J. Penedo, and Gail H. Ironson

64 The Role of Interactive Communication Technologies
in Behavioral Medicine  1009
Victor J. Strecher
65 Behavioral Medicine, Prevention, and Health
Reform: Linking Evidence-Based Clinical and Public Health Strategies for Population Health
Behavior Change ........................................... 1021
Judith K. Ockene and C. Tracy Orleans

Subject Index .................................................. 1037
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Part I
Health Behaviors: Processes and Measures
Chapter 1

Social and Environmental Determinants of Health Behaviors

Verity J. Cleland, Kylie Ball, and David Crawford

1 Introduction

Physical activity and healthy eating behaviors have an important role to play in the prevention of a range of adverse health outcomes. An extensive body of epidemiological evidence from large prospective cohort studies demonstrates that compared with those who are less physically active, those who are more active are at lower risk of all-cause mortality, cardiovascular diseases, stroke, type 2 diabetes, obesity, certain cancers (mainly breast and colon), musculoskeletal conditions, and poor mental health (US Department of Health and Human Services, 1996). Similarly, healthy eating behaviors have consistently been found to have positive health benefits: high fruit and vegetable consumption assists in the prevention of ischemic heart disease, obesity, certain cancers, and, to a lesser extent, stroke; fish and fish oil consumption is protective against coronary heart disease; and diets high in fiber protect against obesity and type 2 diabetes (World Cancer Research Fund and American Institute for Cancer Research, 2007; World Health Organization, 2002). Despite these well-documented health benefits, a large proportion of the population living in developed nations fail to meet physical activity and healthy eating recommendations.

Given the importance of physical activity and healthy eating behaviors for health, a number of countries have developed guidelines aimed at educating the public about optimal levels of physical activity and healthy eating patterns. Physical activity and healthy eating guidelines tend to be similar in countries such as the United States (US), Canada, Europe, the United Kingdom (UK), and Australia. Physical activity guidelines for adults generally recommend achieving at least 150 min per week of moderate-intensity activity, and that physical activity can be accumulated in 10-min bouts. Recent Physical Activity Guidelines for Americans suggest that physical activity can alternatively be accumulated through 75 min a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity (US Department of Health and Human Services, 2008). The 2005 Dietary Guidelines for Americans suggest consuming a variety of nutrient-dense foods and beverages within and among the basic food groups, while choosing foods that limit the intake of saturated and trans fats, cholesterol, added sugars, salt, and alcohol (US Department of Health and Human Services, 2005). Dietary Guidelines for Australian Adults recommend enjoying a wide variety of nutritious foods (including plenty of vegetables, legumes, and fruits; wholegrain cereals; lean meat, fish, and poultry; reduced-fat milks, yoghurts, and cheeses; and drinking plenty of water) and taking care to limit saturated fat, moderate total
fat, choose low-salt foods, limit alcohol, and consume only moderate amounts of sugars and foods containing added sugars (National Health and Medical Research Council, 2003).

Despite these guidelines, in many developed countries, a significant proportion of the population eats poorly and is not physically active at levels recommended for good health. It is important to understand why so many people fail to meet physical activity and healthy eating recommendations, in order to inform the development of effective preventive strategies. A broad range of determinants of physical activity and healthy eating behaviors have been identified. Historically, much research examining determinants of health behavior, including physical activity and eating behaviors, has focused on individual and cognitive factors such as knowledge, motivation, and self-efficacy (described in Section 2). While selected individual factors have consistently been shown to be important in predicting physical activity and/or eating behaviors, more recently researchers have begun to examine the broader social and environmental contexts in which physical activity and eating behaviors occur. While research of this nature is new in its application to understanding physical activity and eating behaviors, it is not new in terms of its application to other public health issues. The classic example, where in 1854 John Snow removed the handle of the local public water pump on Broad Street, London, to end a cholera epidemic, highlights the importance of structural changes in influencing public health. A focus on understanding “upstream” determinants, such as social and environmental factors, of physical activity and eating behaviors may offer important opportunities for intervention. However, there are many challenges involved in the definition, conceptualization, and measurement of environments, which must be considered when attempting to understand the role of the environment as a determinant of health behavior.

While the challenges inherent in investigating environmental influences on health behavior have been discussed elsewhere (Ball et al, 2006c), their significance warrants mention here. Defining environments is difficult because people live and function in multiple contexts or settings (e.g., family, home, and work environments) and in multiple geographic areas (e.g., streets, neighborhoods, cities). Furthermore, there are different types of environmental influences, including factors within the built and natural environment, the social environment, the cultural environment, and the policy environment. Even defining a “neighborhood” environment, which has often been used as the unit of study in much of the research on environmental influences on health behavior, poses unique challenges. For instance, administratively classified definitions, such as postal (zip) codes or census block areas, may conflict with community perceptions of what constitutes a neighborhood. While defining neighborhoods with specificity to individuals (e.g., a 1 km radius of the home) may improve the ability to detect associations, studying environments at such a specific level can be time- and labor-intensive, and there is not yet agreement in defining appropriate geographical boundaries. For example, some studies have used a range of definitions including 400 m, 800 m, 1 km, 1 m, or 5 km. Another key issue is identifying which aspects of the environment to measure from thousands of potential exposure variables. Clear justification based on careful theoretical considerations must be provided in combination with thoughtful hypotheses, and consideration of the outcome being measured and the target group under investigation is recommended.

For the purposes of this chapter, social determinants are defined as the subjective social norms, support, and other social influences on physical activity and eating behaviors (Brug et al, 2008). Environments are defined here as the neighborhoods within which individuals, families, and communities exist, which in the health behavior literature has typically focused on aspects of the built environment. This chapter will focus primarily on the social and environmental determinants of physical activity and eating behaviors using evidence from systematic and narrative reviews and original research studies. It is acknowledged that other social and environmental influences are likely to be important in influencing physical activity and
eating behaviors, but this chapter will focus on those determinants that have been most comprehensively examined in the scientific literature. Furthermore, because the social and environmental determinants of physical activity and eating behaviors are likely to be dramatically different in developing countries, this chapter is limited to research conducted in developed nations.

2 Theoretical Frameworks

In attempting to understand the determinants of physical activity and eating behaviors, theoretical frameworks offer a useful starting point to conceptualize the multitude of potential determinant factors. Many different theories have been developed in an attempt to explain behavior, and these can be broadly classified as intra-personal theories or inter-personal theories. Intra-personal theories, such as the health belief model (Becker and Maiman, 1975) and the theory of planned behavior (Ajzen, 1985), are primarily concerned with psychological factors and are based on the premise that behavior is largely choice-driven by individuals (see Chapter 2). In contrast, inter-personal theories, such as social cognitive theory (Bandura, 1986) and ecological models (Sallis and Owen, 2002; Stokols, 1992), posit that there are multiple layers of influence on behavior and emphasize the role of the broader environment in enabling or hindering individuals in their efforts to make healthy choices.

To date, much research on the determinants of physical activity and eating behavior has been atheoretical or has been largely driven by intra-personal theories (Baranowski et al, 1999; Cliska et al, 2000). This chapter will be based on social–ecological models because these give consideration to the broader social and environmental contexts in which physical activity and eating behaviors occur. Social–ecological models posit that there are multiple levels of influence, including individual factors, social factors, and environmental factors, and that these interact with each other to predict behavior (Fig. 1.1).

3 Social and Environmental Determinants of Physical Activity

Physical activity comprises a complex set of behaviors and as a result is difficult to measure. A detailed discussion of physical activity assessment is provided in Chapter 3, but is described briefly here. Physical activity can be classified by its type (e.g., swimming, walking, skiing, tennis, and basketball), intensity (e.g., light, moderate, vigorous), frequency (how many times per day/week/month/year), duration (how long per session), and the domain in which it occurs (e.g., leisure, transport, occupation, domestic). Self-reported (e.g., surveys and interviews) and objective (e.g., pedometers and accelerometers) measures of physical activity each have strengths and limitations, and a combination of both have been recommended for use. When considering the influence of social and environmental determinants of physical activity, it is important to measure context-specific physical activity behaviors (Brug et al, 2008; Giles-Corti et al, 2005). For instance, when trying to understand whether the presence of a walking trail influences physical activity, it may be more important to assess walking behaviors undertaken during leisure time, as opposed to a global measure of physical activity, since the latter may have been
accumulated in other domains such as at work or in the home and is hence less likely to be related to the local presence of a walking trail.

### 3.1 Social Determinants of Physical Activity

There are a large number of potential social determinants of physical activity. This section focuses on four key social influences commonly examined in the literature: socioeconomic position, social support, personal safety/crime, and social capital/participation.

#### 3.1.1 Socioeconomic Position

While there is some contention over the most appropriate indicator of socioeconomic position, there is relatively consistent evidence of a socioeconomic gradient in physical activity, whereby those experiencing the greatest socioeconomic disadvantage are least likely to report participating in physical activity during their leisure time. These findings tend to be independent of the measure of socioeconomic position used. A review of 57 studies examining relationships between socioeconomic position and physical activity found a socioeconomic gradient in physical activity in 90% of studies ($n = 10$) that used social class as the socioeconomic position indicator, 61% of studies ($n = 18$) that used income as the indicator, 71% that used education ($n = 24$), 50% that used an asset-based indicator ($n = 2$), and 100% that used an area-based indicator of socioeconomic position ($n = 3$) (Gidlow et al, 2006). In the United Kingdom, where social classification by employment grade is commonly used as an indicator of socioeconomic position, an examination of over 10,000 adults involved in the Whitehall II study found that men and women of low employment grade had significantly greater odds of no or low exercise compared with those of high employment grade, independently of spousal social class (Bartley et al, 2004).

There is also some evidence of differences in the barriers to participation in physical activity according to socioeconomic position. For instance, a qualitative study conducted in Australia found that negative early life/family physical activity experiences and lack of time due to work commitments were consistent themes among women of lower socioeconomic position, but not among those of higher socioeconomic position (Ball et al, 2006b). A study in the United Kingdom of over 6000 adults found barriers such as lack of motivation, lack of time, lack of money, and lack of transport to be differentially distributed across different indicators of socioeconomic position (which included education, housing tenure, employment status, household social class, car ownership, and household income), with a higher proportion of adults of lower socioeconomic position identifying barriers to activity than those of higher socioeconomic position (Chinn et al, 1999).

#### 3.1.2 Social Support

Social support is one of the strongest and most consistent predictors of physical activity behavior (Sallis and Owen, 1999; Trost et al, 2002). In their systematic review of articles published between 1998 and 2000, Trost and colleagues reported that a significant positive relationship was evident between social support and physical activity in each of the nine studies reviewed that included a measure of social support. Another review of studies published between 1980 and 2004 concluded that there was convincing evidence for a positive relationship between social support and general physical activity, vigorous physical activity/sports, moderate-to-vigorous physical activity, and walking (Wendel-Vos et al, 2007). Most evidence comes from cross-sectional studies, for example, an Australian study of 1803 adults aged 18–59 years found that perceptions of high social support for walking in the neighborhood were associated with an 80% increase in the odds of
walking for recreation and a 50% increase in the odds of walking six times per week for at least 30 min each session (Giles-Corti and Donovan, 2002). Little evidence from prospective cohort studies is available. However, one Danish study examined changes in physical activity over 6 years among nearly 3000 adults aged 16 years and older and found in multivariable analyses that the only significant predictor of moving from the inactive category at baseline to the active category at follow-up was regularity of meeting with family, which may be an indirect indicator of social support (Zimmermann et al, 2008).

3.1.3 Personal Safety and Crime

The evidence surrounding the associations between personal safety, crime, and physical activity is equivocal, with inconsistencies in findings likely due to substantial differences in definitions, measures (perceived or objective), sampling, and the unit of analysis (individual, neighborhood, or state level) across studies. A lack of prospective and intervention studies also limits firm conclusions. A study of an ethnically diverse sample of 2338 urban and rural older women found no evidence of a relationship between perceived high levels of crime or lack of a safe place and participation in regular physical activity (Wilcox et al, 2000), while a smaller study of 291 adult women of low socioeconomic position identified no relationship between perceived neighborhood safety and meeting leisure time physical activity recommendations (McGinn et al, 2008). In a sub-sample of 303 participants from the same study, objective measures of low total crime and low criminal offences, but not incivilities or traffic offences, were associated with higher odds of meeting leisure time physical activity recommendations, particularly outdoor physical activity.

3.1.4 Social Capital

Social capital has been defined as those features of social relationships, such as inter-personal trust, social participation, group membership, and norms of reciprocity, that facilitate collective action and cooperation for mutual benefit (Kawachi, 1999). While there is debate over whether social capital should be operationalized at the individual or community level (Putnam, 2000; Rose, 2000; Veenstra, 2000), it has been argued that a multilevel analytical approach is most appropriate because social capital may influence health at both levels (Kawachi et al, 2004). Although a number of studies have assessed relations between social capital and health outcomes, fewer have examined the association between social capital and physical activity.

Despite difficulties in conceptualizing and measuring social capital, of those studies that have examined relations with physical activity, findings have tended to suggest a positive association. For instance, a study of 11,837 Swedish adults found that those reporting lower levels of social participation had significantly higher odds of low leisure time physical activity, and social participation explained most of the association observed between socioeconomic position and leisure time physical activity (Lindstrom et al, 2001). A multilevel analysis of data from another Swedish survey found that an individual-level indicator of social capital (social participation), but not a neighborhood-level indicator of social capital (out-migration), was positively associated with leisure time physical activity (Lindstrom et al, 2003). A state- and county-level analysis of social capital and physical activity among 167,000 adults in 48 states in the United States identified positive associations between social capital and physical activity in multilevel, multivariable analyses (Kim et al, 2006).
3.2 Environmental Determinants of Physical Activity

There are a large number of potential determinants of physical activity in the physical environment, although research examining these is still relatively new. As discussed earlier, issues around definitions, measurement, and conceptualization of the environment and the infancy of this field make it difficult to draw firm conclusions about associations with physical activity. For instance, a recent review has highlighted an extensive range of issues associated with measuring the physical activity built environment and provides a useful summary of the many measurement tools currently available (Brownson et al, 2009). This section will focus on four key physical environment influences that have commonly been examined in the literature: availability and accessibility; aesthetics; infrastructure; and road safety.

3.2.1 Availability and Accessibility

Evidence from studies of the influence of the physical environment on physical activity suggests a positive association between availability of and access to facilities such as recreation centers, cycle paths, footpaths and swimming pools, and physical activity. While most studies examining this association have been cross-sectional in design, findings have been relatively consistent. For example, a population-based study of 1796 adults in the United States found that those who reported access to places to be physically active had more than twice the odds of doing any activity and of doing recommended amounts of activity, after adjusting for sociodemographic and other environmental factors (Huston et al, 2003). The same study also found that those reporting access to neighborhood trails had significantly higher odds of achieving recommended levels of leisure time physical activity, independent of other sociodemographic and environmental factors. A number of studies have also found positive associations between physical activity and access to local parks (Booth et al, 2000; Foster et al, 2004; Nagel et al, 2008), residing in coastal areas (Ball et al, 2007; Bauman et al, 1999), convenience of physical activity facilities (De Bourdeaudhuij et al, 2003; Duncan et al, 2009; Humpel et al, 2004b), and negative associations between distance to cycle paths (Troped et al, 2001). A recent study of adults from 11 countries found the odds of being physically active were significantly higher among those who had access to low-cost recreational facilities, bicycle facilities, and sidewalks on most local streets (Sallis et al, 2009). Furthermore, the odds of being active improved with increasing number of favorable environmental characteristics, suggesting that “clusters” of activity friendly environmental features may be important for promoting physical activity.

3.2.2 Aesthetics

Consistent positive associations have been documented between aesthetic features of neighborhoods and participation in different types of physical activity (Humpel et al, 2002). Aesthetic features are often assessed through self-reported perceptions of the attractiveness of the environment, the amount of greenery or trees, the pleasantness of housing or the neighborhood, or the presence of enjoyable scenery. Cross-sectional evidence of a relationship between aesthetics and physical activity comes from a study of 3392 Australian adults which found those who reported less aesthetically pleasing environments had 28–39% lower odds of walking for exercise or recreation in the previous 2 weeks, compared with those reporting more aesthetically pleasing environments (Ball et al, 2001). Further longitudinal evidence of an association is provided by a 10-week prospective study of 512 Australian adults which found that men who reported positive changes in perceived aesthetics had twice the odds of increasing walking, although no relationship was observed among women (Humpel et al, 2004b), who are possibly more influenced by factors such as safety or accessibility.