

CONTENTS

Preface xi
Acknowledgments xiv
Introduction xv

PART ONE

Introduction to Physical Activity Epidemiology

• 1 •

1	Origins of Physical Activity Epidemiology	3
	Ancient History of Physical Activity and Health	4
	Modern History of Physical Activity and Health	6
	Physical Activity for Health Promotion in the United States and the World	10
	Summary	13
	Bibliography	14
2	Concepts and Methods in Physical Activity Epidemiology	17
	Epidemiologic Measures	19
	Crude, Specific, and Standardized Rates	20
	Research Design in Epidemiologic Studies	21
	Evaluating Associations in Epidemiologic Studies	25
	Models in Physical Activity Epidemiology	30
	Inferring Cause in Epidemiologic Studies	32
	Criteria for Causation	33
	Summary	35
	Bibliography	36
3	Measurement and Surveillance of Physical Activity and Fitness	37
	Why Is Behavioral Epidemiology Important?	38
	What Is Physical Activity?	39
	Measures of Physical Activity	39
	What Is Physical Fitness?	49
	Surveys and Surveillance of Physical Activity	57
	Summary	68
	Bibliography	70

PART TWO

Physical Activity and Disease Mortality

• 75 •

4

All-Cause Mortality

77

Life Expectancy at Birth	78
Major Causes of Mortality	79
Physical Activity and All-Cause Mortality	79
Sedentary Behavior and All-Cause Mortality	84
Physical Fitness and All-Cause Mortality	85
Changes in Physical Activity or Fitness and All-Cause Mortality	87
Are the Associations Real?	89
Strength of the Evidence	90
How Much Physical Activity Is Needed to Decrease Risk of Premature Mortality?	91
Summary	92
Bibliography	92

5

Coronary Heart Disease

95

History and Magnitude of the Problem	96
Coronary Heart Disease Risk Factors	96
Coronary Heart Disease Etiology	97
Physical Activity and Coronary Heart Disease	100
Sedentary Behavior and Coronary Heart Disease Risk	107
Physical Fitness and Coronary Heart Disease Risk	107
Individuals With Other Risk Factors or Existing Coronary Heart Disease	109
Physical Inactivity Compared With Other Risk Factors	109
Are the Associations Real?	110
Strength of the Evidence	111
How Much Physical Activity Is Needed to Decrease Coronary Heart Disease Risk?	115
Summary	116
Bibliography	117

6

Cerebrovascular Disease and Stroke

123

Magnitude of the Problem	125
Risk Factors for Stroke	127
Etiology of Stroke	128
Physical Activity and Stroke Risk: The Evidence	129
Strength of the Evidence	136

Summary	137
Bibliography	137

PART THREE

Physical Activity and Risk Factors

• 143 •

7	Physical Activity and Hypertension	145
Magnitude of the Problem	147	
Treating Hypertension	149	
Hypertension Etiology	150	
Autonomic Nervous System	151	
Physical Activity and Reduced Hypertension Risk: The Evidence	152	
Physical Activity and Treatment of Hypertension: The Evidence	157	
Strength of the Evidence	158	
Summary	162	
Bibliography	162	
8	Physical Activity and Dyslipidemia	167
Magnitude of the Problem	169	
Drug Treatment	174	
Dyslipidemia Etiology and Physical Activity	177	
Physical Activity and Lipoprotein Levels: The Evidence	179	
Strength of the Evidence	188	
Summary	189	
Bibliography	189	
9	Physical Activity and Obesity	197
Magnitude of the Problem	200	
Treatment of Overweight and Obesity	204	
Assessing and Defining Overweight and Obesity	204	
Etiology of Overweight and Obesity: Set Point or Settling Point?	208	
Physical Activity and Fitness and the Health Risks of Obesity: The Evidence	209	
Physical Activity and Prevention of Excess Weight Gain: The Evidence	215	
Physical Activity and Weight Loss: The Evidence	219	
Physical Activity and Weight Maintenance: The Evidence	227	
Strength of the Evidence	228	
The Ultimate Goal: Weight Loss or Risk Reduction?	231	
Summary	231	
Bibliography	231	

PART FOUR

Physical Activity and Chronic Diseases

• 241 •

10

Physical Activity and Diabetes 243

Magnitude of the Problem	244
Demographics of Diabetes	245
Clinical Features	247
Health Burden of Diabetes	248
Risk Factors	249
Insulin and Glucose Transport	249
Etiology of Type 2 Diabetes	250
Effects of Physical Activity on Diabetes Risk: The Evidence	254
Strength of the Evidence	262
Summary	265
Bibliography	265

11

Physical Activity and Osteoporosis 273

Magnitude of the Problem	275
Fractures and Mortality	275
Etiology of Osteopenia and Osteoporosis	277
Risk Factors and Prevention	280
Bone Measurement Techniques	282
Physical Activity and Osteoporosis: The Evidence	283
Strength of the Evidence	292
Summary	296
Bibliography	297

PART FIVE

Physical Activity, Cancer, and Immunity

• 305 •

12

Physical Activity and Cancer 307

Magnitude of the Problem	308
Etiology of Cancer	309
Risk Factors	311
Population Studies of Physical Activity: Specificity of Protection?	311
Colon and Rectal Cancer	312
Breast Cancer	322
Other Cancers	335

Physical Activity and Cancer Survivors	336
Summary	337
Bibliography	337

13 Physical Activity and the Immune System 343

An Abridged History of Immunology	345
HIV and AIDS	346
The Immune System	347
Immunomodulation by the Nervous and Endocrine Systems	357
Physical Activity and Immunity: The Evidence	359
Mechanisms of Alterations in Monocytes, Granulocytes, and Natural Killer Cells After Acute Exercise	367
Exercise and Cytokines	367
Summary	369
Bibliography	370

PART SIX

Physical Activity and Special Concerns

• 377 •

14 Physical Activity and Mental Health 379

Depression	383
Magnitude of the Problem	385
Results From the National Comorbidity Survey	385
Etiology of Depression	386
Brain Neurobiology in Depression	387
Treatment of Depression	389
Physical Activity and Depression: The Evidence	391
Anxiety Disorders	408
Magnitude of the Problem	410
Etiology of Anxiety Disorders	410
Brain Neurobiology in Anxiety Disorders	410
Treatment of Anxiety Disorders	411
Physical Activity and Anxiety: The Evidence	413
Cognitive Function and Dementia	420
Physical Activity and Cognitive Function: The Evidence	421
Summary	425
Bibliography	426

15 Physical Activity and Special Populations 441

Physical Activity Among Diverse Racial–Ethnic Populations	442
Physical Activity and Disability	448

16

Adverse Events and Hazards of Physical Activity 469

Inactivity and Aging.....	454
Physical Activity and Long-Term Health Among People With Disabilities	456
Role of Physical Activity in the Prevention of Secondary Complications.....	458
Summary.....	460
Bibliography.....	460

17

Adopting and Maintaining a Physically Active Lifestyle 503

Individual Barriers to Physical Activity	508
How Do People Decide to Be Active?	510
Environmental Barriers to Physical Activity	512
Genetics of Physical Activity	521
Environmental Intervention and Self-Regulation	523
Effectiveness of Physical Activity Interventions	527
Interventions to Increase Physical Activity	528
Mediators and Moderators of Physical Activity Change and Interventions	535
Features of Physical Activity That Promote Adoption and Maintenance ..	537
Summary.....	540
Bibliography.....	541

Glossary 555

Index 571

About the Authors 585