

## A GLOBAL PERSPECTIVE

### William A. Satariano , PhD, MPH

Professor, Epidemiology and Community Health Sciences School of Public Health University of California, Berkeley

### Marlon Maus, MD, DrPH, FACS

Adjunct Professor, Community Health Sciences
School of Public Health University of California, Berkeley



JONES & BARTLETT LEARNING



World Headquarters Jones & Bartlett Learning 5 Wall Street Burlington, MA 01803 978-443-5000 info@jblearning.com www.jblearning.com

Jones & Bartlett Learning books and products are available through most bookstores and online booksellers. To contact Jones & Bartlett Learning directly, call 800-832-0034, fax 978-443-8000, or visit our website, www.jblearning.com.

Substantial discounts on bulk quantities of Jones & Bartlett Learning publications are available to corporations, professional associations, and other qualified organizations. For details and specific discount information, contact the special sales department at Jones & Bartlett Learning via the above contact information or send an email to specialsales@jblearning.com.

Copyright © 2018 by Jones & Bartlett Learning, LLC, an Ascend Learning Company

All rights reserved. No part of the material protected by this copyright may be reproduced or utilized in any form, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without written permission from the copyright owner.

The content, statements, views, and opinions herein are the sole expression of the respective authors and not that of Jones & Bartlett Learning, LLC. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not constitute or imply its endorsement or recommendation by Jones & Bartlett Learning, LLC and such reference shall not be used for advertising or product endorsement purposes. All trademarks displayed are the trademarks of the parties noted herein. Aging, Place, and Health: A Global Perspective is an independent publication and has not been authorized, sponsored, or otherwise approved by the owners of the trademarks or service marks referenced in this product.

There may be images in this book that feature models; these models do not necessarily endorse, represent, or participate in the activities represented in the images. Any screenshots in this product are for educational and instructive purposes only. Any individuals and scenarios featured in the case studies throughout this product may be real or fictitious, but are used for instructional purposes only.

#### Production Credits

VP, Executive Publisher: David D. Cella Publisher: Michael Brown

Associate Editor: Lindsey Mawhiney Sousa

Associate Editor: Danielle Bessette

Production Manager: Carolyn Rogers Pershouse Senior Production Editor: Nancy Hitchcock Senior Marketing Manager: Sophie Fleck Teague Production Services Manager: Colleen Lamy Manufacturing and Inventory Control Supervisor:

Amy Bacus

Product Fulfillment Manager: Wendy Kilborn
Composition: Integra Software Services Pvt. Ltd.
Director of Rights & Media: Joanna Gallant
Rights & Media Specialist: Merideth Tumasz
Media Development Editor: Shannon Sheehan
Cover Image (Title Page, Part Opener, Chapter Opener):
Hands: © Shutterstock, Inc./Dewald Kirsten;
Buildings: © Shutterstock, Inc./Bariskina
Printing and Binding: Edwards Brothers Malloy
Cover Printing: Edwards Brothers Malloy

#### Library of Congress Cataloging-in-Publication Data

Names: Satariano, William, author. | Maus, Marlon, author.

Title: Aging, place, and health: a global perspective / William Satariano, Marlon Maus.

Description: Burlington, Massachusetts : Jones & Bartlett Learning, [2018] | Includes bibliographical references and index.

Identifiers: LCCN 2016056018 | ISBN 9781284069389

Subjects: | MESH: Aged | Geography, Medical | Geriatrics | Health Policy | Internationality

Classification: LCC RA418 | NLM WT 100 | DDC 362.1--dc23

LC record available at https://lccn.loc.gov/2016056018

6048

9781284069389\_FMxx\_Print.indd 2 2/7/17 3:15 PM



# **Contents**

Preface	The Ecological Model       .25         An Overview       .26         What Is It?       .28         The Life Course Perspective       .29         An Overview       .29         What Is It?       .30
SECTION I Background 1	The Importance of Place
Chapter 1 Global Aging of the Population: The Significance of an Epidemiological Perspective	Resilience Later in Life
Introduction4	Late-Life Health45
Healthy Aging and Place	Introduction
Model23	War57
Introduction: Why Use an Ecological Model and a Life Course Perspective in the Epidemiology of Aging?	Nonspecific Threats to Cohort Health and Longevity

9781284069389\_FMxx\_Print.indd 3 2/7/17 3:15 PM

Chapter 4 Survival, Mortality, and Cause of Death. 69 Introduction. 70 Definitions and Measurements 70 Epidemiology of Mortality. 71 Methodological Issues. 71 Methodological Issues. 71 Changing Causes of Death 74 Socioeconomic Disparities in Mortality. 74 Aging Molecular Biomarkers and Mortality. 77 Measures of Functional Capacity as Predictors of Mortality. 79 Life Course Epidemiology of Mortality 81 Male–Female Survival Paradox. 83 Lifestyle Versus Genetic Risk Factors for Mortality. 84 Compression of Morbidity 86 Conclusion and Future Directions. 87 Chapter 5 Aging and Late-Life Mobility 91 Introduction. 92 Mobility and Aging 92 Background 93 Mobility Measures Focused on Older Adults Aging 92 Approaches to Measurement of Mobility in Aging 97 Self-Report Measures of Mobility 97 Performance-Based Measures of Mobility 97 Instrumented Measures of Mobility 97 Instrumented Measures of Mobility 97 Instrumented Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions. 108 Introduction 114 Ecological Determinants of Late-Life Cognition: Brain Development in Early Life and Perinatal Factors 115 Brain Health in Midlife and Late Life 118 Disease-Related Factors 112 Application of Life Course Models to Cognitive Heater Use Life 112 Life Course Promote Cognitive Health 122 Conclusion and Future Directions 133 Introduction 133 Introduction 134 Measures 133 Introduction 134 Measures 134 Measures 135 Evidence for Utility of Screening 136 Demographic Patterns 136 Age 136 Gender 144 Race and Ethnicity 144 Race and Chonchidites 144 Race and Comorbidities 144 Race and	SECTION II <b>Aging, Health, and</b>	Chapter 6 Aging and Cognitive
Ecological Determinants of Late-Life	Function 67	Functioning113
Cause of Death 69 Introduction 70 Definitions and Measurements 70 Definitions and Measurements 70 Epidemiology of Mortality 71 Methodological Issues 71 Methodological Issues 71 Changing Causes of Death 74 Socioeconomic Disparities in Mortality 74 Aging Molecular Biomarkers and Mortality 77 Measures of Functional Capacity as Predictors of Mortality 77 Measures of Functional Capacity 81 Male-Female Survival Paradox 83 Lifestyle Versus Genetic Risk Factors for Mortality 84 Compression of Morbidity 84 Conclusion and Future Directions 87 Chapter 5 Aging and Late-Life Mobility 91 Introduction 92 Mobility and Aging 92 Background 93 Mobility Measures Focused on Older Adults 93 A Biopsychosocial Framework 94 Definition and Measurement of Mobility 97 Self-Report Measurement of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions 108 Introduction 11 Interventions Promote Cognitive Health 12 Application of Life Course Models to Cognitive Health 12 Application of Life Course Models to Cognitive Health 12 Interventions to Promote Cognitive Health 12 Application of Life Course Models to Cognitive Health 12 Interventions to Promote Cognitive 12 Interventions of Definition on Measurement 13 Intervention in Meas		Introduction114
Life and Perinatal Factors	Chapter 4 Survival, Mortality, and	
Introduction 70 Definitions and Measurements 70 Definitions and Measurements 70 Epidemiology of Mortality 71 Methodological Issues 71 Changing Causes of Death 74 Socioeconomic Disparities in 74 Aging Molecular Biomarkers and 75 Mortality 77 Measures of Functional Capacity as 76 Predictors of Mortality 81 Male–Female Survival Paradox 83 Lifestyle Versus Genetic Risk Factors for 76 Mortality 84 Compression of Morbidity 84 Compression of Morbidity 85 Chapter 5 Aging and Late-Life 86 Mobility 91 Introduction 92 Background 93 Mobility Measures Focused on 71 Older Adults 93 A Biopsychosocial Framework 94 Definition and Measurement of Mobility in Aging 97 Self-Report Measures of Mobility 97 Instrumented Measures of Mobility 97 Instrumented Measures of Mobility 97 Instrumented Measures of Mobility 101 Comparisons Across Types of 89 Measures 101 Conclusion and Future Directions 104 Dementia 104 Dementia 115 Disease-Related Factors 12 Application of Life Course Models to Cognitive Heterogeneity in Late Life 12 Conclusion and Future Directions 12 Caregiving 12 Caregiving 12 Caregiving 12 Caregiving 14 Care	Cause of Death69	. , ,
Definitions and Measurements 70 Disease-Related Factors. 122 Epidemiology of Mortality. 71 Methodological Issues. 71 Changing Causes of Death 74 Interventions to Promote Cognitive Health 122 Mortality. 74 Aging Molecular Biomarkers and Mortality. 77 Measures of Functional Capacity as Predictors of Mortality. 79 Life Course Epidemiology of Mortality 81 Male-Female Survival Paradox. 83 Introduction. 79 Life Course Epidemiology of Mortality 84 Compression of Morbidity 86 Conclusion and Future Directions 87 Definition and Measurement 133 Evidence for Utility of Screening 136 Depression in Different Settings 136 Gender. 146 Mobility Measures Focused on Older Adults 93 A Biopsychosocial Framework 94 Definition and Measurement of Mobility in Aging 97 Self-Report Measures of Mobility 97 Instrumented Measures of Mobility 97 Performance-Based Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions 122 Application of Life Course Models to Cognitive Heatth 125 Heterogeneity in Late Life 124 Interventions to Promote Cognitive Health 125 (Conclusion and Future Directions 122 Conclusion and Heapture Directions 122 Conclusion and Future Directions 122 Conclusion and Heapture Directions 122 Conclusion and Heapture Directions 122 Conclusion and Future Directions 122 Conclusion of Late Life Depression In Different Settings 133 Evidence for Utility of Screening 134 Evidence for Utility of Screeni	Introduction 70	
Epidemiology of Mortality. 71 Methodological Issues. 71 Changing Causes of Death 74 Socioeconomic Disparities in Mortality. 74 Aging Molecular Biomarkers and Mortality. 77 Measures of Functional Capacity as Predictors of Mortality. 77 Measures of Functional Capacity as Predictors of Mortality. 79 Life Course Epidemiology of Mortality 81 Male–Female Survival Paradox. 83 Lifestyle Versus Genetic Risk Factors for Mortality. 86 Conclusion and Future Directions. 87 Chapter 5 Aging and Late–Life Mobility 91 Introduction. 92 Mobility and Aging 92 Background 93 Mobility Measures Focused on Older Adults 93 A Biopsychosocial Framework 94 Definition and Measurement of Mobility 96 Approaches to Measurement of Mobility 97 Performance-Based Measures of Mobility 97 Instrumented Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions. 108 Interventions to Promote Cognitive Heterogeneity in Late Life Course Models to Cognitive Heterogeneity in Late Life Course Models to Cognitive Heterogeneity in Late Life Life Course Models to Cognitive Heterogeneity in Late Life Life Course Models to Cognitive Heterogeneity in Late Life Life Course Permote Cognitive Heath 122 Interventions to Promote Cognitive Health 122 Interventions to Promote Cognitive Health 122 Conclusion and Future Directions 122 Conclusion and Future Directions 122 Conclusion and Future Directions 122 Conclusion and Health 122 Conclusion and Future Directions 122 Conclusion and Future Directions 122 Conclusion and Health 122 Conclusion and Future Directions 122 Chapter 7 Aging and the Epidem		
Methodological Issues		
Changing Causes of Death		
Socioeconomic Disparities in Mortality	9	
Mortality		
Aging Molecular Biomarkers and Mortality		
Measures of Functional Capacity as Predictors of Mortality	•	Conclusion and Future Directions
Predictors of Mortality		
Predictors of Mortality	Measures of Functional Capacity as	Chapter 7 Aging and the Epidemiology
Life Course Epidemiology of Mortality Male–Female Survival Paradox. 83 Lifestyle Versus Genetic Risk Factors for Mortality. 84 Compression of Morbidity. 86 Conclusion and Future Directions. 87 Chapter 5 Aging and Late-Life Mobility. 91 Introduction. 92 Mobility and Aging 92 Background 93 Mobility Measures Focused on Older Adults 93 A Biopsychosocial Framework 94 Definition and Measurement of Mobility in Aging 97 Self-Report Measures of Mobility. 97 Performance-Based Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions. 88 Introduction. 134 Definition and Measurement 134 Definition and Measurement 134 Definition and Measurement 135 Depression in Different Settings. 136 Measures. 135 Demographic Patterns. 136 Measures. 135 A Life Course Perspective 135 A Life Course Perspective 135 A Life Course Perspective 135 Social Factors 146 Social Factors 146 Social Factors 146 Social Factors 146 Caregiving 146 Cardiovascular Disease 146 Cardiovascular Disease 146 Cardiovascular Disease 146 Conclusion and Future Directions. 108 Interventions 146 Introduction. 134 Definition and Measurement 134 Definition and Measures. 135 Measures. 135 Demographic Patterns 136 Measures. 135 Conclusion and Measurement 6 Measures 135 Demographic Patterns 136 Measures. 135 Demographic Patterns 136 Measures. 135  Conclusion and Measurement 6 Measures 135 Demographic Patterns 136 Measures. 135  Conclusion and Measurement 6 Measures 135 Demographic Patterns 136 Measures. 135  Conclusion and Measurement 136 Definition and Measurement 136 Measures. 135  Conclusion and Future Directions. 136 Definition and Measurement 136 Measures. 136  Definition and Measurement 136 Measures. 136  Conclusion and Measurement 136 Definition and Measureme	Predictors of Mortality	
Lifestyle Versus Genetic Risk Factors for Mortality		•
Mortality. 84 Definitions 134 Compression of Morbidity. 86 Measures. 135 Conclusion and Future Directions. 87 Evidence for Utility of Screening 136 Chapter 5 Aging and Late-Life Mobility 91 Introduction. 92 Age 139 Mobility and Aging 92 Late-Life Depression Often Includes Background 93 Mobility Measures Focused on Older Adults 93 A Biopsychosocial Framework 94 Definition and Measurement of Mobility in Aging 97 Self-Report Measures of Mobility. 97 Performance-Based Measures of Mobility. 97 Instrumented Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions 108 Interventions 136 Demographic Patterns 136 Demographic Patterns 136 Measures 136 Demographic Patterns 136 Measures 136 Demographic Patterns 136 Measures 136 Demographic Patterns 136 Demographic Patterns 136 Measures 136 Demographic Patterns 136 A Life Course Perspective 137 A Life Course Perspective 137 A Life Course Perspective 137 Social Factors 136 Gender 141 Race and Ethlicity 142 Socioeconomic Status 144 Socioeconomic Status 144 Social Factors 144 Social Factors 144 Social Support 146 Psychological Factors 146 Disease and Comorbidities 146 Dementia 146 Cardiovascular Disease 147 Conclusion and Future Directions 108 Interventions 146		
Compression of Morbidity. 86 Measures. 135 Conclusion and Future Directions. 87 Evidence for Utility of Screening. 136 Chapter 5 Aging and Late-Life Mobility. 91  Introduction. 92 Age 139 Mobility and Aging. 92 Late-Life Depression Often Includes Background. 93 Both Late and Early Onset. 139 Mobility Measures Focused on Older Adults. 93 A Biopsychosocial Framework. 94 Definition and Measurement of Mobility in Aging. 97 Self-Report Measures of Mobility. 97 Performance-Based Measures of Mobility. 97 Instrumented Measures of Mobility. 97 Instrumented Measures of Mobility. 101 Comparisons Across Types of Measures. 101 Conclusion and Future Directions. 108  Depression in Different Settings. 138 Demographic Patterns. 139 A Life Course Perspective. 149 A Life Course Perspective. 149 A Cife Course Persp	,	
Conclusion and Future Directions		
Chapter 5 Aging and Late-Life Mobility		
Chapter 5 Aging and Late-Life MobilityDemographic Patterns136Mobility91A Life Course Perspective136Introduction.92Age.136Mobility and Aging.92Late-Life Depression Often IncludesBackground.93Both Late and Early Onset.139Mobility Measures Focused on Older Adults.93Race and Ethnicity.142A Biopsychosocial Framework.94Socioeconomic Status.143Definition and Measurement of Mobility.96Stressful Events.144Approaches to Measurement of Mobility.97Bereavement.149in Aging.97Bereavement.149Self-Report Measures of Mobility.97Caregiving.149Performance-Based Measures of Mobility.97Psychological Factors.146Instrumented Measures of Mobility.101Disease and Comorbidities.146Comparisons Across Types of Measures.101Cardiovascular Disease.146Measures.101Cardiovascular Disease.146Conclusion and Future Directions.108Interventions.148	Conclusion and Future Directions	,
Mobility91A Life Course Perspective138Introduction.92Age.138Mobility and Aging.92Late-Life Depression Often IncludesBackground.93Both Late and Early Onset.138Mobility Measures Focused on Older Adults.93Race and Ethnicity.142A Biopsychosocial Framework.94Socioeconomic Status.142Definition and Measurement of Mobility in Aging.96Stressful Events.144Self-Report Measures of Mobility.97Bereavement.145Self-Report Measures of Mobility.97Caregiving.146Mobility.97Psychological Factors.146Instrumented Measures of Mobility.97Psychological Factors.146Comparisons Across Types of Measures.101Disease and Comorbidities.146Conclusion and Future Directions.108Interventions.148	Chapter 5 Aging and Late-Life	
Introduction		
Mobility and Aging92Late-Life Depression Often IncludesBackground93Both Late and Early Onset135Mobility Measures Focused on Older Adults93Race and Ethnicity147A Biopsychosocial Framework94Socioeconomic Status147Definition and Measurement of Mobility96Stressful Events147Approaches to Measurement of Mobility97Bereavement147in Aging97Caregiving147Self-Report Measures of Mobility97Caregiving147Performance-Based Measures of Mobility97Psychological Factors146Instrumented Measures of Mobility101Disease and Comorbidities146Comparisons Across Types of Measures101Cardiovascular Disease147Conclusion and Future Directions108Interventions148	·	
Background 93 Both Late and Early Onset 133  Mobility Measures Focused on Older Adults 93 Race and Ethnicity 142  A Biopsychosocial Framework 94 Socioeconomic Status 143  Approaches to Measurement of Mobility 101 Aging 97  Performance-Based Measures of Mobility 97  Instrumented Measures of Mobility 101  Comparisons Across Types of Measures 104  Conclusion and Future Directions 108  Both Late and Early Onset 133  Gender 144  Socioeconomic Status 144  Social Factors 144  Social Factors 144  Social Factors 144  Social Support 145  Caregiving 145  Social Support 146  Psychological Factors 146  Dementia 146  Cardiovascular Disease 147  Conclusion and Future Directions 108  Interventions 148		
Mobility Measures Focused on Older Adults A Biopsychosocial Framework Definition and Measurement of Mobility in Aging Self-Report Measures of Mobility Performance-Based Measures of Mobility Mobility  Instrumented Measures of Mobility Instrumented Measures of Mobility Instrumented Measures of Mobility Measures Measures Measures Mobility Mobilit		
A Biopsychosocial Framework 94  Definition and Measurement of Mobility 96  Approaches to Measurement of Mobility in Aging 97  Self-Report Measures of Mobility 97  Performance-Based Measures of Mobility 97  Instrumented Measures of Mobility 101  Comparisons Across Types of Measures 104  Conclusion and Future Directions 108  Race and Ethnicity 142  Socioeconomic Status 143  Social Factors 144  Stressful Events 144  Social Factors	_	
A Biopsychosocial Framework 94  Definition and Measurement of Mobility 96  Approaches to Measurement of Mobility in Aging 97  Self-Report Measures of Mobility 97  Performance-Based Measures of Mobility 97  Instrumented Measures of Mobility 101  Comparisons Across Types of Measures 108  Conclusion and Future Directions 108  Socioeconomic Status 142  Social Factors 144  Social Factors		
Definition and Measurement of Mobility Approaches to Measurement of Mobility in Aging 97 Self-Report Measures of Mobility 97 Performance-Based Measures of Mobility 97 Instrumented Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions 108  Social Factors 144 Stressful Events 144 Caregiving 145 Social Support 145 Social Support 146 Psychological Factors 146 Dementia 146 Cardiovascular Disease 147 Cardiovascular Disease 147 Conclusion and Future Directions 108  Social Factors 144 Stressful Events 144 Caregiving 145 Social Factors 146 Caregiving 146 Caregivin		
Approaches to Measurement of Mobility in Aging 97 Self-Report Measures of Mobility 97 Performance-Based Measures of Mobility 97 Instrumented Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions 108  Stressful Events 144 Caregiving 145 Social Support 146 Social Support 146 Psychological Factors 146 Disease and Comorbidities 146 Cardiovascular Disease 147 Cardiovascular Disease 147 Conclusion and Future Directions 108  Stressful Events 144 Caregiving 144 Social Support 146 Social Support 146 Caregiving 146 Caregiving 146 Caregiving 146 Caregiving 146 Social Support 146 Social Support 146 Social Support 146 Caregiving 146 Social Support 146 Social Support 146 Social Support 146 Caregiving 146 Social Support 146 S		
Approaches to Measurement of Mobility in Aging	•	
Self-Report Measures of Mobility. 97 Performance-Based Measures of Mobility. 97 Instrumented Measures of Mobility 101 Comparisons Across Types of Measures 101 Conclusion and Future Directions. 108  Caregiving. 146 Social Support. 146 Psychological Factors 146 Disease and Comorbidities 146 Cardiovascular Disease 147 Cardiovascular Disease 147 Conclusion and Future Directions. 108  Caregiving. 145 Social Support. 146 Cardiovascular Factors 146 Disease and Comorbidities 146 Dementia 146 Cardiovascular Disease 147 Cardiovascular Disease 147	, ,	
Performance-Based Measures of Mobility. 97 Psychological Factors. 146 Instrumented Measures of Mobility 101 Disease and Comorbidities 146 Comparisons Across Types of Dementia 146 Measures 101 Cardiovascular Disease 147 Conclusion and Future Directions 108 Interventions 146		
Mobility97Psychological Factors146Instrumented Measures of Mobility.101Disease and Comorbidities.146Comparisons Across Types of Measures.101Dementia.146Conclusion and Future Directions.108Interventions.148		
Instrumented Measures of Mobility101Disease and Comorbidities146Comparisons Across Types of MeasuresDementia146Conclusion and Future Directions108Interventions148		Psychological Factors
Comparisons Across Types of MeasuresDementia146Conclusion and Future Directions101Cardiovascular Disease147Conclusion and Future Directions108Interventions148		Disease and Comorbidities
Measures101Cardiovascular Disease147Conclusion and Future Directions108Interventions148	•	Dementia 146
		Cardiovascular Disease 147
Acknowledgments	Conclusion and Future Directions 108	Interventions
	Acknowledgments	Conclusion and Future Directions

9781284069389\_FMxx\_Print.indd 4 2/7/17 3:15 PM

Chapter 8 Disease, Comorbidity,	Physiologic Risk Factors for Frailty and
and Multimorbidity159	Geriatric Syndromes
Introduction	Latest Findings from Frailty Research
Background	Prevalence and Incidence of Frailty 206
Definitions	Natural History of Manifestations of the Frailty Syndrome
Measurement	Current Issues and Challenges of Frailty
Epidemiology of MM	Research
Patterns and Classifications of MM 167	Clarifying Conceptualization and
Sociodemographics	Measurement
Age and MM	Frailty as a Multidimensional Construct:
Gender and MM	Physical and Cognitive Frailty 211
Ethnicity and MM170	Physiotypes of Frailty
Socioeconomic Factors	Frailty, Stress, and Compensation 213
Socioeconomic Status and MM 171	Summary
Immigration and MM	Conclusion and Future Directions
Living Arrangements, Social Networks, Social	Chantan 10 Anima and Falls
Support, and MM 173	Chapter 10 Aging and Falls229
Social Capital and MM	Introduction
Genetics and MM174	Heterogeneity and Classification of Falls 231
Lifestyle 175	Measurement Methods
Psychological Factors	Personal Risk Factors
Mental Health and Physical MM 176	Environmental Risk Factors
Health Locus of Control and MM 177	Increasing Falls Risks with Advancing Age 237
Psychosocial Factors	Sex Differences in Indoor and Outdoor Falls 238
Adverse Childhood Experiences	Racial Differences in Activity Patterns
and MM	and Fall Risks 239
Psychosocial Factors in Adults and MM 178	Geographic Variations in Fall Rates 240
Polypharmacy and MM	Nutrition and Falls
Conclusion and Future Directions 179	Physical Activity and Falls
Chapter 9 Frailty and Geriatric	Prevention Strategies
Syndromes189	Fall Prevention Technologies
·	Conclusion and Future Directions 245
Introduction	
Geriatric Syndromes	Chapter 11 Motor Vehicle Crashes and
Frailty: Theories and Definitions	Other Traffic-Related Causes
Biology of Frailty	of Injury and Death in Older
Frailty Instruments and Measurement 198	Populations
Links Between Frailty and Geriatric	•
Syndromes	Introduction
Studies of Associations Between Geriatric	Why Crashes?
Syndromes and Frailty	Driving Demographics

#### vi Contents

Crash and Injury Risk	Specific (Practical) Aspects of Establishing,
Exposure	Managing, and Maintaining International
Risk Factors	Cohorts of Older Adults
Gender	
Medical Conditions	Summary
Functional Impairments	Chapter 13 Roadmap for Statistics
Interventions	in Aging Studies291
Driving Cessation and Its Effects	
Transitioning from Driving	Introduction
Pedestrians	Data (and Notation)
Noncollision Injuries in Public Transport 265	Model
Conclusion and Future Directions	Causal Models
	Statistical Models
SECTION III Conduct and Analysis 271	Mixed Models
SECTION III COILUCT AIIU AII AII AII SIS 27 I	Generalized Estimating Equations
Chanter 12 Conducting International	Semiparametric to Nonparametric Models 299
Chapter 12 Conducting International	Model Assumptions About Missing Data ("Missingness")
Epidemiological Studies	Parameter of Interest
of Aging273	
Introduction	Parameter Interpretation in Misspecified  Models
Rationale	Estimation
Why Should We Conduct International	Measures of Uncertainty
Studies?	Parametric Models and Maximum Likelihood 306
What Are the Contributions of International Studies to Science? 275	Semiparametric Inferences
Design Features of Current Epidemiological	Conclusion and Future Directions
Studies in Aging	Conclusion and ruture Directions
Survey of Health, Ageing, and	CECTION IN E. L.A. LE.
Retirement277	SECTION IV <b>Translation and Future</b>
World Health Organization's Study	Directions 313
on Global Ageing and Adult Health 277	
The 10/66 Dementia Research	Chapter 14 Healthy Aging and Its
Group	Implications for Public
SAGE-Plus: A Post Hoc Harmonization	<b>Health: Social and Behavioral</b>
Study	Interventions315
Design Features of Epidemiological Aging	Introduction316
Studies	Risk Factors
Types of Epidemiological Studies	
of Aging	Exemplars
General Features of a Proper Cohort Study for International Aging Research 282	Built and Natural Environment
ioi international Aging Nesealch 202	Dant and Natural Environment

9781284069389\_FMxx\_Print.indd 6 2/7/17 3:15 PM

Research Evolution: From Determinants to Dissemination	Compensation       339         Control       340         Connection       340         Contribution       340         Challenge/Comfort       341         The Ecological Framework of Place       342         Physical Setting       342         Program       342         Examples of Place-Based Initiatives to Promote         Healthy Aging       343         Visitability       343         Complete Streets       345         Age-Friendly Community Initiatives       347         Support-Oriented Initiatives       349
Policy	Conclusion and Future Directions
Programmatic Efforts	Chapter 16 Aging and Public Health: New Directions359 Introduction359 Themes360
Chapter 15 Healthy Aging and Its Implications for Public Health: Healthy Communities337	Life Course Perspective
Introduction	International Studies
Human Development and the Negotiation of Person–Environment Fit	Conclusion
Continuity	Index367

Contents

vii



## **Preface**

#### William A. Satariano and Marlon Maus

n older Dutch couple, out for an evening stroll in Amsterdam in 1995, turn a corner and are startled by the sight of advancing German soldiers marching down the street, as they had marched each night on patrol in 1944.

This unsettling sight is the centerpiece of the 1995 installation "The Neighbor Next Door" by artist Shimon Attie, which presents a visceral multimedia interpretation of the experiences of those driven into hiding by the Nazi regime that reflects on the relationships among place, memory, and identity (Shainman, 2014).

Attie's art, in his own words, is designed to "unlock the memory of place" by projecting, with an elaborate system of lasers, documentary film footage of where the events took place so many years before. By projecting the film from 1944 onto the street in Amsterdam, he unlocked the memory of that place through



Shimon Attie. Scene from *Prinsengracht*.
On-location film projection, from the project *The Neighbor Next Door*, Amsterdam, 1995.
Courtesy of the artist and Jack Shainman Gallery, New York.

the image of life-size German soldiers. Some of the other people walking that night stop, turn, and avoid the exhibition; others walk among the figures, directly confronting the images of the German soldiers who had occupied their country during World War II.

"Unlocking the memory of place" is central to the thesis of this book. We argue that to understand the epidemiology of aging and health, it is important to incorporate information about place across the life course. As Robert Bevan (2007) writes, a place represents a "touchstone for collective memory."

In 2006, one of us published a book titled Epidemiology of Aging: An Ecological Approach (Satariano, 2006). That book sought to provide an overview of research and practice in the epidemiology of aging. An ecological model was employed to provide coherence to the consideration of aging: "Patterns of health and well-being are due to a dynamic interplay of biological, behavioral, social, and environmental factors that play out over the life course of individuals, families, neighborhoods, and communities." Each chapter of the book addressed an important topic in aging from survival to function, depression, and health conditions. At the end of the book, the translation of the aging research into practice and policy was considered. While the current text builds on the 2006 book and a general, ecological model, a number of important differences and enhancements exist.

First, and most important, this text represents a collaboration among experts in the field of aging and public health. What was a challenging endeavor barely a decade ago became a Sisyphean task given the truly

viii

9781284069389\_FMxx\_Print.indd 8 2/7/17 3:15 PM

exponential growth of information in research, teaching, and policy related to the area of aging studies, and in particular the epidemiology of aging. What a single author could have hoped to review and summarize back then, now requires proficiency in multiple areas of expertise.

We came to the field of aging and public health along different paths. While one of us (Satariano) entered the field from the social sciences, the other (Maus) approached aging and public health from clinical medicine and ophthalmology. We invited the authors whose work is presented in this text to join the project based on their expertise in particular areas of aging research, practice, and policy. Each set of authors kindly agreed to prepare a chapter, treating their topic (e.g., cognitive function) as an outcome in epidemiological research. In addition to addressing the significance of the topic, each author reviewed conceptual and measurement issues, implications for practice and policy, and future directions for research. We asked the authors to look broadly and identify key research throughout the world.

Second, this text is written from a global perspective. As noted previously, each author was asked to adhere to that perspective and identify work from countries throughout the world, not just the United States. Our purpose, then, is to provide a comprehensive examination of aging research by topic, and not by country. Therefore, this text does not provide a compendium of aging research from each country, as has been done by other authors. For example, Robinson and colleagues (2007) developed an excellent book on global aging, which uses that approach.

Third, an ecological model, in many ways, captures the intersection of time and place. While the 2006 book addressed the topics of life course and place, it did so very briefly and did not reflect at all the state of outstanding research today. The current text has been expanded to capture the nuances of these important topics.

Fourth, in addition to key topics in the epidemiology of aging, this text includes two important chapters on the translation of research into practice and policy. These chapters are

written from different perspectives—one focusing on social and behavioral programs and the other emphasizing more place-based programs.

Fifth, we have included a chapter on the conduct of international studies on aging, with a particular focus on research from developing countries.

Sixth, we address key statistical issues as a roadmap for future research in aging.

Finally, we conclude with a chapter on final directions. As noted previously, we asked each author to discuss future research: which research is anticipated? Which research should be conducted? In the final chapter, we attempted to look across the chapters and provide a summary of key areas for future research. Each of the authors collaborated in the preparation of the final chapter.

This edition is intended for a wide audience that includes not only other experts in the field and academics, but also students, practitioners, and interested researchers from other disciplines. We hope that our text will help inspire further progress in the global effort toward a "state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity" (World Health Organization, 1946) of our older population.

Note that the words "epidemiologic" and "epidemiological" are used interchangeably throughout the book.

### References

Bevan, R. (2007). The destruction of memory: Architecture at war. London, UK: Reaktion Books.

Robinson, M., Novelli, W., Pearson, C., & Norris, L. (2007). Global health and global aging. San Francisco, CA: Jossey-Bass.

Satariano, W. (2006). *Epidemiology of aging: An ecological approach*. Sudbury, MA: Jones and Bartlett.

Shainman, J. (2014). Shimon Attie: Artist page: Jack Shainman Gallery. YouTube. Available at https://www .youtube.com/watch?v=wUkWcfyx8hk

World Health Organization. (1946). Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946. Official Records of the World Health Organization, 2, 100; entered into force on 7 April 1948.



# **Acknowledgments**

We and several of the authors of this volume (Ory, Prohaska, Smith, Snowden, and Steinman) were very fortunate to be members of the Centers for Disease Control and Prevention (CDC) Healthy Aging Research Network (HAN). HAN comprises a network of research institutions and scholars conducting research practice in healthy aging. For its members, it represents a welcoming forum for the exchange of ideas on this important topic. Leaders of HAN include Lynda Anderson and Basia Belza. In addition to these colleagues, we would like to thank our colleagues and associates for their steadfast support in the task of preparing this book, including, but not limited to, Brenda Eskenazi, Meredith Minkler,

S. Leonard Syme, John Swartzberg, Debbie Jan, Dion M. Shimatusu-Ong, and Susan Ivey.

And, of course, we wish to express our love and gratitude to our families and friends:

- William: My wife, Enid Satariano; my daughter, Erin Schwass, and her family Kenneth, George, and Nate; and my son, Adam Satariano, and his family Nickie, Leo, and Kai
- Marlon: My partner, Alan Selsor; my mother, Josele Cesarman; my father, Teodoro Maus; and my sister, Tamara, and her family Marcos, Alexis, Jose, and Ivan

X



## **About the Authors**

William A. Satariano obtained a BA degree from Santa Clara University (1968), a PhD in sociology from Purdue University (1973), as well as an MPH (1978) and an MS in epidemiology (1979) from University of California, Berkeley. Prior to returning to Berkeley in 1989 as a faculty member, he served as Deputy Director of Epidemiology at the Michigan Cancer Foundation (now the Karmanos Cancer Institute) (1980-1989). He is the recipient of grants and contracts from the National Cancer Institute, the National Institute of Aging, the Centers for Disease Control and Prevention, and the Robert Wood Johnson Foundation. He held the Berkeley Endowed Chair in Geriatrics from 2012-2015. He is the author of *The Epidemiology of Aging*: An Ecological Approach (Jones & Bartlett, 2006). His research interests include aging, health, and function; cancer survival; the effects of the built environment on health behavior and health status in older populations; and technology and aging. Most recently, he and Marlon Maus and other colleagues have been collaborating on the development and evaluation of an iPad-based app ("WordWalk") to encourage walking and brain health among older adults.

Marlon Maus was born and raised in Mexico. He received a BA degree from Brown University (1981) and a medical degree from Jefferson Medical College (1985). His ophthalmology residency at Wills Eye Hospital (1989) was followed by an orbital surgery and neuro-ophthalmology fellowship (1990) and an oculoplastic fellowship at Massachusetts Eye and Ear Infirmary through Harvard University (1991). He then became director of the residency and emergency services at Wills Eye Hospital, where he did research and published extensively on surgical techniques and oculoplastics. He then joined the School of Public Health at University of California, Berkeley, receiving an MPH degree and a doctorate in public health (2011). His present research centers on the relationship between the built environment and public health, including visual disabilities, with a focus on aging. He is collaborating with William Satariano and other colleagues on various projects.

χi



## **Contributors**

#### **Jose Almirall**

Adjunct Professor Université de Sherbrooke Québec, Canada

#### Karen Bandeen-Roche, PhD

Hurley-Dorrien Professor and Chair of Biostatistics John Hopkins Bloomberg School of Public Health Baltimore, Maryland

#### Cynthia Boyd, MD, MPH

Associate Professor of Medicine
Division of Geriatric Medicine and
Gerontology
Johns Hopkins University School of
Medicine
Baltimore, Maryland

#### W. Thomas Boyce

Lisa and John Pritzker Distinguished Professor of Development and Behavioral Health

Departments of Pediatrics and Psychiatry University of California, San Francisco San Francisco, California

#### Paul Brewster, PhD

Institute on Aging and Lifelong Health University of Victoria Victoria, British Columbia, Canada

#### **Brian Buta, MHS**

Program Manager Center on Aging and Health Division of Geriatric Medicine & Gerontology Johns Hopkins University School of Medicine Baltimore, Maryland

#### Ralph Catalano, PhD

Professor of the Graduate School, Public Health University of California, Berkeley Berkeley, California

#### Paulo Chaves, MD, PhD

Leon Medical Centers Chair in Geriatrics in the Herbert Wertheim College of Medicine Director of the Benjamin Leon Center for Geriatric Research and Education Florida International University Miama, Florida

#### April M. Falconi, PhD

Postdoctoral Research Scholar Stanford University Stanford, California

#### Martin Fortin, MD, MSc

Professor
Department of Family Medicine and
Emergency Medicine
Université de Sherbrooke
Ouebec, Canada

#### Lori A. Goehring, BA

Research Assistant Health and Disability Research Institute Boston University School of Public Health Boston, Massachusetts

#### Emily A. Greenfield, PhD

Associate Professor School of Social Work Affiliate of the Institute for Health, Health Care Policy, & Aging Research Rutgers, The State University of New Jersey New Brunswick, New Jersey

xii

#### Alan E. Hubbard

Professor of Biostatistics School of Public Health, University of California, Berkeley Berkeley, California

#### Alan M. Jette, PhD

Director, Health and Disability Research Institute

Boston University School of Public Health Boston, Massachusetts

#### Julene K. Johnson, PhD

Professor, Institute for Health & Aging and Center for Aging in Diverse Communities

University of California, San Francisco San Francisco, California

#### Wenjun Li, PhD

Associate Professor of Medicine University of Massachusetts Medical School

Worcester, Massachusetts

#### Molly E. Marino, MPH

Health and Disability Research Institute Boston University School of Public Health Boston, Massachusetts

#### Richard Marottoli, MD, MPH

Professor of Medicine Yale University School of Medicine New Haven, Connecticut

#### María J. Marguine, PhD

Assistant Professor University of California, San Diego San Diego, California

#### Christine M. McDonaugh, PhD, PT, MS

Research Assistant Professor, Health and Disability Research Institute Department of Health Law, Policy, and Management Boston University School of Public Health Boston, Massachusetts

#### Nadia Minicuci, PhD

Biostatistician

National Research Council, Neuroscience Institute

Padova, Italy

#### Keith Diaz Moore, PhD, AIA

Dean, College of Architecture + Planning University of Utah Salt Lake City, Utah

#### Dan M. Mungas, PhD

Adjunct Professor

Associate Director, University of California, Davis Alzheimer's Disease Research Center Sacramento, California

#### Anna Napoles, PhD, MPH

Professor, Department of Medicine University of California San Francisco San Francisco, California

#### Desmond O'Neill, MD, FRCPI

Professor of Medical Gerontology Trinity College Dublin Dublin, Ireland

#### Marcia G. Ory, PhD, MPH

Health Promotion and Community Health Sciences

School of Public Health, Texas A&M University,

College Station, Texas

#### Thomas R. Prohaska

Dean

College of Health and Human Services George Mason University Fairfax, Virginia

#### Aline Ramond, MD, PhD

Postdoctoral Fellow University of Sherbrooke Quebec, Canada

#### Taina Rantanen

Professor of Gerontology and Public Health University of Jyväskylä Jyväskylä, Finland

#### xiv Contributors

#### Bruce Reed, PhD

Director, Division of Neuroscience,
Development, and Aging
Center for Scientific Review, National
Institutes of Health
Bethesda, Maryland

#### Andrew Scharlach, PhD

Kleiner Professor of Aging School of Social Welfare University of California, Berkeley Berkeley, California

#### Matthew Smith, PhD, MPH, CHES, FAAHB

Associate Professor
Institute of Gerontology, Department of
Health Promotion and Behavior, College of
Public Health
The University of Georgia
Athens, Georgia

#### Mark Snowden, MD, MPH

Associate Professor

Department of Psychiatry and Behavioral
Sciences

Linversity of Washington School of Medi

University of Washington, School of Medicine Seattle, Washington

#### Leslie Steinman, MSW, MPH

Research Scientist, Health Promotion Research Center University of Washington, School of Public Health Seattle, Washington

#### Sarah L. Szanton, PhD, ANP, FAAN

Professor and PhD Program Director
Associate Director for Policy, Center on
Innovative Care in Aging,
Joint Appointment with the Department of
Health Policy and Management,
Johns Hopkins School of Nursing and
Bloomberg School of Public Health
Baltimore, Maryland

#### Afshin Vafaei, MD, PhD

Post-Doctoral Fellow Centre for Addiction and Mental Health Toronto, Ontario, Canada

#### Ravi Varadhan, PhD

Associate Professor Division of Biostatistics and Bioinformatics, Department of Oncology John Hopkins University Baltimore, Maryland

#### Jeremy D. Walston, MD

Raymond & Anna Lublin Professor of Geriatric Medicine Johns Hopkins University School of Medicine Baltimore, Maryland

#### Qian-Li Xue, PhD

Associate Professor of Medicine, Biostatistics, Epidemiology Johns Hopkins School of Medicine, Department of Medicine Division of Geriatric Medicine and Gerontology, and Johns Hopkins Center on Aging and Health Baltimore, Maryland

#### Maria Victoria Zunzunegui

Honorary Professor School of Public Health, University of Montreal Montreal, Canada