# Childhood Obesity

Prevalence, Pathophysiology, and Prevention



Editor
Rexford S. Ahima, MD, PhD

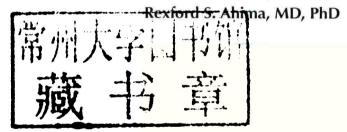




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Edited by





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# **CHILDHOOD OBESITY**

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Rexford S. Ahima, MD, PhD, is a Professor of Medicine at the University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania. He received a BSc from the University of London, an MD from the University of Ghana, and a PhD from Tulane University in New Orleans, Louisiana. After an internship and residency training in internal medicine at the Albert Einstein College of Medicine in New York, Dr. Ahima did his specialty training in endocrinology, diabetes and metabolism, and postdoctoral research at the Beth Israel Deaconess Medical Center and Harvard Medical School in Boston, Massachusetts. Dr. Ahima's research is focused on the central and peripheral actions of adipose hormones on energy homeostasis and glucose and lipid metabolism. He is an attending endocrinologist at the Hospital of the University of Pennsylvania, Director of the Obesity Unit of the Institute for Diabetes, Obesity and Metabolism, and Director of the Diabetes Research Center Mouse Phenotyping Core. He was elected to the American Society for Clinical Investigation and the Association of American Physicians, and he is a Fellow of the American College of Physicians and The Obesity Society.

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The chapters in this book were previously published in various places and in various formats. By bringing them together here in one place, we offer the reader a comprehensive perspective on recent investigations of childhood obesity. Each chapter is added to and enriched by being placed within the context of the larger investigative landscape.

We wish to thank the authors who made their research available for this book, whether by granting their permission individually or by releasing their research as open source articles. When citing information contained within this book, please do the authors the courtesy of attributing them by name, referring back to their original articles, using the credits provided at the end of each chapter.

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# LIST OF ABBREVIATIONS

AA African American

AAP American Academy of Pediatrics

ADMA asymmetric dimethylarginine

AGE advanced glycation end-products

AHA advanced hip analysis
AHI apnea/hypopnea index

ALSPAC Avon Longitudinal Study of Parents and Children

ANOVA analyses of variance

AUROC area under the receiver operating curve

BF body fat

BIA bioelectrical impedance analysis

BM behavioral modification

BMC bone mineral content

bone mineral density

BMD bone mineral density
BMI body mass index

BP blood pressure

CAC circulating Angiogenic cells

CATSS Child and Adolescent Twin Study in Sweden

CCHS Canadian Community Health Survey

CDC U.S. Center for Disease Control and Prevention

CETP cholesteryl ester transfer protein

CEVQ-SF Childhood Experiences of Violence Questionnaire Short-

Form

CFU-EC Endothelial Cell Colony Forming Unit

CHQ-PF28 Child Health Questionnaire Parent Form 28

CV cardiovascular

CVD cardiovascular diseases DTR Danish Twin Registry

DXA dual energy X-ray absorptiometry

DZ dizygotic twins

ECFC endothelial colony forming cells

EDC expanded diagnostic cluster EDS excessive daytime sleepiness

EHR electronic health record

EMP endothelial microparticles

eNOS endothelial nitric oxide synthase

EPC endothelial progenitor cells

FFA free fatty acid FFM fat-free mass fl oz fluid ounce

FMD flow-mediated dilation

FMS fundamental movement skills

GNPDA2 glucosamine–6–phosphate deaminase 2

GP general practitioner

GWAS genome-wide association studies

HDL high-density lipoprotein

HOMA homeostasis model assessment

HRV heart rate variability

ICAM-1 Intercellular Adhesion Molecule-1 ICC intraclass correlation coefficient

INSIG2 Insulin-induced gene 2

ISAAC International Study of Asthma and Allergies in Childhood ISHAGE International Society of Hematotherapy and Graft Engineering

kcal kilocalorie

KCTD15 potassium channel tetramerisation domain containing 15

kg kilogram

LDL low-density lipoprotein LVMI left ventricular mass index

m meter

MCP monocyte chemotactic protein

MCP-1 Macrophage Chemo attractant Protein-1

MCS mental component score

MEND Mind, Exercise, Nutrition, Do it program

MetS metabolic syndrome

MICE multiple imputation by chain equations

MIF macrophage inhibitory factor