

Index

A

Abdominal adiposity, 99
Abdominal circumference, 5
Accelerated aging, 38, 233, 234, 274
Acetylation, 154, 158, 171, 221
Adaptive immune system, 61, 62
Adipocyte, 61, 62, 98, 101, 153, 157, 158, 214
Adipokine, 41, 61, 158
Adiponectin, 41–43, 106–108, 216
Adipose tissue, 28, 41–43, 61, 62, 68, 72, 78, 91, 92, 101, 158, 174, 211, 213, 214, 216, 225
Adiposity, 9, 10, 15, 16, 42, 61, 71, 72, 76, 78, 91, 92, 97, 99, 106, 108, 153, 155, 158, 173, 174, 212, 214–216, 220, 222, 224
Adolescence, 3, 9, 15, 89, 95, 96, 112, 125, 143–145, 151, 180, 215, 263, 275
Adrenal glands, 123, 218
Adrenocorticotrophic hormone, 218
Age-at-death, 245, 246, 248, 250–257, 256, 258, 259, 261
Aging rate, 269, 275, 276
Aging trajectory, 269, 271
Agouti viable yellow (A^{vy}) gene, 174
Alcohol, 4, 5, 7, 88, 172, 173, 202, 275
All-cause mortality, 211, 253, 259
Altered blood coagulation, 236
Alzheimer's disease, 134
Ames dwarf mice, 37, 38, 40–49
Amino acids, 78, 124, 171
Amygdala volume, 219
Anabolic hormones, 41
Anaerobic glycolysis, 26

Anemia, 7
Angiogenesis, 98, 143
Anthropometric measure, 7, 15, 110, 288
Anti-inflammatory diet, 167, 177
Antibody, 61
Antigen-presenting cells, 62
Antioxidant defense, 43
Anxiety, 127, 133, 134, 181
Appetite regulation, 131
Assisted reproduction, 59, 202
Astrocytes, 170
Atherogenic lipid profile, 58, 236
Atherosclerosis, 27, 134, 173
Attention deficit hyperactivity disorder (ADHD), 121–124, 133, 172
B
Basal substrate oxidation, 17
Beta cell mass, 59–61
 β -amyloid peptide, 176
Birth weight, 5, 6, 9–12, 17, 18, 28, 40, 57–59, 61, 70, 73, 75, 87, 88, 95, 96, 100, 122, 126, 131, 142–147, 150, 211, 219, 220, 273, 289
Bisphenol A, 173
Blastocyst, 25, 27
Blood brain barrier, 123, 173, 177
Blood pressure, 59, 77, 88, 89, 92, 93, 97–99, 123, 195, 219, 246
Blood vessels, 62
B lymphocyte, 60, 61
Body composition, 3, 9, 10, 16–18, 28, 30, 77, 98, 106, 110, 209, 215, 224, 225, 288

- Body fat distribution, 9, 10, 16
 Body mass index (BMI), 7, 9, 15, 58, 90–96, 107–111, 128, 131, 132, 145, 174, 175, 201, 210, 211, 213–217, 220, 222–225, 275
 Body size, 10, 37–39, 41, 69, 146, 156
 Bone density, 10, 145, 151, 155
 Bone fragility, 141
 Bone loss, 141, 142, 155
 Bone marrow, 27, 28, 43, 59, 153
 Bone mineral density, 144
 Bone mineralization, 4
 Bone mineral loss, 151
 Brain, 5, 12, 43, 76, 79, 123, 124, 128, 129, 158, 167, 168, 170, 172–182, 191–193, 196, 198, 200, 217, 219, 237, 238, 264
 Brain-derived neurotrophic factor (BDNF), 177, 180, 181
 Breastfeeding, 5, 95, 104, 106, 107, 111, 292, 293
 Brown adipose tissue, 43
 Butyric acid, 176
- C**
 Caenorhabditis elegans, 45
 Caesarean section, 69, 93, 94, 214, 223
 Cafeteria feeding, 99, 101
 Calcium supplementation, 150, 151
 Caloric intake, 15, 67, 100
 Caloric restriction, 88, 131, 233, 234
 Calorie restriction mimetic, 49
 Calories, 4, 6, 15, 235
 Cancer, 10, 38, 41, 50, 69, 77, 88, 197, 200, 236, 289
 Cancer mortality, 6
 Carbohydrate metabolism, 74
 Carbohydrate to protein ratio, 131
 Carbonyl group, 170
 Cardiac energy metabolism, 199
 Cardiac hypertrophy, 29
 Cardiometabolic disorder, 68, 76, 79, 80
 Cardiovascular disease, 57, 58, 87–89, 95, 134, 142, 152, 174, 194, 195, 197, 199–201, 209, 211, 223, 236, 237, 288, 291, 293, 296
 Carotenoids, 167, 177
 Carotid artery, 123
 Catch-up growth, 11, 12, 74, 75, 79, 88
 Catecholamine neurotransmitter, 123
 Cell cycle, 24, 27, 158
 Cell fate, 23–25
 Cell lineage, 23, 25, 28, 271
 Cellular homeostasis, 167
 Central adiposity, 3, 15
 Central fat, 15
 Cerebrovascular disease, 122
 Chaperone proteins, 156
 Chemokines, 61–63
 Chinese Famine, 7, 9, 11, 12, 18, 192–196
 Cholesterol, 5, 41, 196
 Chondrocytes, 143, 152, 155
 Chromatin accessibility, 75
 Chromatin structure, 75, 154, 167, 170, 173, 221
 Chromosome instability, 270
 Chronic disease, 3–7, 11, 13, 16–19, 134, 174, 287–289, 291, 293, 298
 Cognition, 7, 12, 219, 238
 Cognitive impairment, 27, 177, 180, 181, 194, 296
 Cognitive performance, 12, 122, 123, 211, 274
 Cohort study, 5, 9, 19, 57, 95, 108, 122, 143, 144, 150, 158, 159, 193, 195, 197, 213, 248, 269, 275
 Collagen synthesis, 155
 Conception, 4, 8, 28, 76, 109, 153, 167, 174, 175, 198, 202, 291, 298
 Confounding factor, 11, 15, 16, 58
 Coronary artery disease, 127
 Coronary heart disease, 58, 122, 195, 211
 Corticosteroid exposure, 71
 Corticosteroids, 57, 60, 219
 Corticosterone, 40
 Corticotropin releasing hormone (CRH), 218, 220
 Cortisol, 4, 73, 218–221
 CpG site, 156
 C-reactive protein, 174
 Critical period, 11, 87, 121, 122, 181, 233, 237, 238, 240, 242, 291
 Critical periods of growth, 4, 242
 Curcumin, 167, 177, 179
 Cytokines, 42, 62, 63, 143, 173, 176, 177, 212
- D**
 Dementia, 168, 181, 193, 194, 201
 Depression, 121–123, 125–127, 180, 236, 274
 Developmental origins of adult health and disease (DOHaD), 4–6, 8, 10, 12, 13, 17–19, 49, 67, 68, 70, 87–89, 97, 123, 142, 143, 246, 285, 288–299
 Developmental programming, 23, 67, 68, 70, 74–77, 79, 80, 200, 212, 221, 234, 263, 269, 271–274, 276, 278
 Diabetic retinopathy, 77
 Diastolic blood pressure, 58, 126
 Dietary habits, 58
 Dietary protein intake, 148

- Differential susceptibility hypothesis, 129, 134
- Differentiation, 4, 23–27, 30, 72, 132, 143, 152, 155, 157, 158, 167, 168, 170, 222
- DNA damage, 27, 43
- DNA demethylation, 170, 180
- DNA methylation, 74–76, 79, 157, 167–176, 201, 202, 221–223, 225, 269, 270, 272–275, 297
- DNA methyltransferase (DNMT), 154, 169
- DNA repair, 43, 50, 78
- Docosahexaenoic acid (DHA), 178–180
- Dopamine neurons, 121
- Dopaminergic plasticity, 134
- Dopaminergic system, 123, 124
- Dopamine transporter, 124, 133
- Drosophila melanogaster*, 272
- Dutch famine, 6, 7, 9, 11, 12, 57, 69, 192–200, 233–236, 238–240, 274
- Dutch Hunger Winter, 155, 175, 193, 201
- Dyslipidemia, 28
- E**
- Early gestation, 58, 144, 193, 194, 197, 198, 200, 233, 236–238, 241
- Early life adversity, 67, 79, 121, 123, 126, 130, 133, 135
- Eating behaviour, 131
- Economic status, 14
- Education, 14, 17–19, 109, 111, 197, 246, 285, 286, 288, 291, 292, 295
- Embryo, 25, 154, 157, 298
- Embryonic stem cells, 25, 221
- Emotional eating, 132
- Endocrine disruptor, 3, 297
- Endocrine response, 4
- Endoderm, 25, 26
- Endoplasmic reticulum, 62
- Endothelial cells, 27
- Endothelial function, 77, 123
- Energy balance, 69, 98, 106, 211, 212
- Energy expenditure, 16, 17
- Energy intake, 131
- Energy metabolism, 16, 17, 43, 45, 49, 180
- Energy restriction, 4
- Enterocyte, 4
- Environmental exposure, 17, 24, 79, 133
- Environmental toxins, 4, 16
- Epidemiological study, 3, 19, 87, 95, 168
- Epigallocatechin gallate (EGCG), 177
- Epigenetic age, 263, 264, 269, 275, 277, 278
- Epigenetic aging clock, 269
- Epigenetic drift, 269–271, 273
- Epigenetic marks, 79, 167, 168, 174, 175, 269–271
- Epigenetic mechanisms, 8, 154, 158, 167, 168, 173, 201, 221, 269, 272, 274
- Epigenetic memory, 167, 179, 180, 182, 271, 272
- Epigenetic profile, 8, 75, 270, 271, 274
- Epigenetic programming, 168, 171, 175, 272, 298
- Epigenetic regulation, 68, 74–76, 79, 159, 272
- Epigenetic remodeling, 167
- Epigenetics, 8, 19, 28, 68, 74, 75, 77, 79, 97, 154–159, 167, 168, 171, 172, 174, 175, 179–182, 201, 209, 211, 212, 214, 221, 222, 225, 240, 245, 247, 263–265, 269–278, 291, 295, 297, 298
- Epigenome wide association study (EWAS), 223
- Epimutations, 270, 276–278
- Essential amino acid, 157
- Exercise, 50, 58, 109, 298
- Extended longevity, 38, 39, 41, 42, 50, 272, 277
- Extracellular matrix, 143
- F**
- Famine, 6–9, 11–13, 18, 69, 79, 192–197, 199–202, 233–238, 240–242, 274
- Fasting blood glymphocyteucose, 61
- Fasting glucose, 59, 91
- Fat mass, 9, 10, 15–17, 67, 77, 96, 98, 100, 101, 105, 107, 144, 147, 159, 214, 216, 224, 225, 275
- Fat storage, 17
- Fatty acids, 42, 43, 62, 99, 108, 157, 174, 180, 212, 214
- Fecundity, 41
- Fertilization, 59
- Fetal alcohol syndrome, 4
- Fetal growth, 4, 18, 25, 28, 30, 68–73, 75, 76, 78, 105, 122, 123, 130–132, 213, 219, 223, 225, 273
- Fetal programming, 29, 110, 132, 209, 215, 221
- Fetus, 9, 25, 29, 57–60, 70, 73, 78, 92, 97, 98, 109, 123, 174, 178, 181, 211–214, 218, 221, 234, 236, 242, 298
- Fibroblast, 42
- Fibroblast growth factor, 25
- Finnish cohort study, 211
- Finnish famine, 8
- First 1,000 Days Concept, 15
- First trimester of gestation, 175, 195
- Flavonoids, 167, 176, 177
- Foetal skeleton, 143, 146
- Folate, 4, 76, 94, 147, 157, 169, 173, 175

Folate absorption lipopolysaccharide, 173, 175
 Folate deficiency, 4, 76
 Folate metabolism, 94
 Folate-rich diet, 169, 175
 Folate supplementation, 94, 157
 Folic acid supplementation, 77, 169, 175
 Follow-up, 6, 10, 89, 95, 96, 110, 209, 216,
 217, 224, 225, 250, 253, 254, 256, 260,
 275
 Food preferences, 101, 103–105, 131
 Fructose, 174, 178, 180

G

Gene expression, 23–27, 60, 61, 68, 74–76, 97,
 103, 127–129, 132, 133, 154, 157, 158,
 167, 168, 170–172, 180, 182, 201, 211,
 218, 221, 222, 263, 270, 271, 273, 274,
 297
 Genetic difference, 17
 Genome-wide association study (GWAS),
 127–129
 Genomic imprinting, 168
 Genomic profiling, 128
 Gestation, 9–12, 29, 58, 59, 68–70, 72, 73, 76,
 78, 91, 93, 94, 102, 143, 144, 146, 148,
 150, 156, 178, 192, 193, 197–199, 201,
 217, 219–221, 225, 233, 236–238, 240,
 241
 Gestational age, 9, 28, 73, 93, 110, 122, 123,
 126, 133, 144, 223–225
 Gestational diabetes, 57, 58, 91, 92, 111, 215
 Gestational growth retardation, 5
 Ghrelin, 106, 108
 Glucocorticoid exposure, 217–221
 Glucocorticoid receptor, 156, 157
 Gluconeogenesis, 157, 222
 Glucose homeostasis, 43, 49, 58, 60, 61, 71
 Glucose-insulin metabolism, 196
 Glucose tolerance, 11, 58, 96, 99, 105, 199,
 213, 214
 Glucose transporter protein (GLUT), 213–215
 Glucose uptake, 27
 Grandmother hypothesis, 264
 Great Finnish famine, 197
 Growth hormone (GH), 37–50, 67–80, 92, 152,
 155
 Growth hormone-insulin-like growth factor
 (GH-IGF) axis, 67–70, 73, 74, 76,
 78–80
 Growth restriction, 69–71, 73, 75, 78, 105,
 131, 174, 246
 Growth retardation, 14, 15, 17, 18, 152
 Gut-brain axis, 175
 Gut microbiome, 175, 211

H

Health care, 13, 109, 168, 286, 287
 Healthspan, 37, 40, 42, 43
 Healthy aging, 23, 24, 27, 29, 30, 37, 38, 42
 Height, 3, 9, 12, 13, 15–18, 96, 144–147, 149,
 275
 Hematopoietic stem cells, 59
 High dietary fat intake, 17
 High fat diet, 71, 98, 153, 173, 177, 179
 High fat feeding, 89, 98, 99
 Hip fracture, 141, 145
 Histocompatibility class I antigen, 61
 Histocompatibility class II antigen, 61
 Histone acetyltransferase, 171
 Histone deacetylase, 171
 Histone methyltransferase (HMT), 181, 272
 Histone modification, 74–76, 79, 154, 157,
 168, 171, 221, 269
 Historical cohort, 8, 89
 Homeostasis, 63, 74, 134, 148, 156, 168, 173,
 176, 180, 182, 199, 214, 271, 274
 Homocysteine, 147, 169
 Hormonal signal, 49, 50
 Hormone replacement therapy, 40
 5-hydroxymethyl-cytosine, 170
 Hypercaloric diet, 71
 Hypercholesterolaemia, 99
 Hyperglycaemia, 98, 99, 214–216, 224
 Hyperinsulinaemia, 98, 99, 214
 Hyperleptinaemia, 98
 Hypertension, 7, 11, 18, 28, 29, 57–59, 67, 69,
 70, 92, 105, 107, 134, 194, 195, 199,
 202, 240, 289, 293
 Hypomethylation, 58, 76, 155, 157
 Hypothalamic paraventricular nucleus, 181
 Hypothalamic-pituitary-adrenal (HPA) axis,
 209, 212, 217–221, 225, 247
 Hypoxia, 27, 29
 Hypoxia-inducible factor, 26, 29

I

IL-1, 62, 63, 173
 IL-2, 61
 IL-4, 60–62
 IL-6, 41, 173, 174
 IL-10, 62, 63
 Immune cells, 27, 57, 61, 62, 176, 223
 Immune response, 59, 60, 62, 178, 223
 Immune system, 57, 59–63, 176, 277
 Implantation, 29, 199
 Imprinted genes, 147, 154
 Impulsivity, 121, 123, 124, 130, 134
 Infancy, 6, 7, 9, 88, 89, 106, 109, 111, 123,
 143, 147, 151, 155, 178, 209, 216, 289

- Infant formula, 88, 105, 106
 Inflammasome, 43, 63
 Inflammation, 23, 27, 30, 43, 45, 46, 58, 62, 63, 92, 126, 172–177, 201, 211
 Inheritance of longevity, 246, 247, 260, 261, 264
 Innate immune system, 61, 62
 Insulin, 10, 41–43, 49, 58, 59, 62, 63, 67–69, 72, 78, 88, 91, 92, 96–98, 101, 106, 108, 122, 128, 131, 158, 174, 175, 177, 199, 212–216, 222, 224, 225
 Insulin-like growth factor 1 (IGF-1), 40
 Insulin-like growth factor 2 (IGF-2), 69, 72, 73, 75, 76, 78, 155
 Insulin production, 176
 Insulin receptor, 62, 63, 180, 215
 Insulin resistance, 10, 62, 63, 67, 68, 75, 79, 91, 93, 96, 98, 99, 106, 142, 194, 213–216, 219, 292, 293
 Insulin secretion, 60, 61, 63, 105, 174, 199, 223
 Insulin sensitivity, 42, 43, 67–69, 80, 98, 209, 212, 213, 215, 216, 225
 Intergenerational effect, 172
 Intergenerational transmission, 245, 262
 Interleukin, 41, 57, 61–63, 223
 Intima media thickness, 199
 Intrauterine growth, 10, 18, 87
 Intrauterine growth restriction, 57, 60, 69, 123, 130
 Intrauterine period, 3
 IQ, 12, 193
 Ischemic heart disease, 5
In utero, 3, 4, 6, 8, 9, 11, 12, 16–19, 25, 28, 30, 57, 73, 78, 96, 110, 122, 141–146, 149, 152, 154, 155, 157, 158, 192, 195, 196, 199–201, 209, 214, 215, 217, 240
 In vitro fertilization, 91, 203, 298
- J**
- J-shaped relationship, 95, 96
 Junk food, 99–105
- K**
- Kidney, 28, 29, 88, 89, 97, 200
- L**
- Lactation, 40, 76, 88, 89, 97, 100–108, 150, 151, 167, 172–174, 192
 Late gestation, 9, 58, 72, 78, 105, 144, 236, 274
 Lean body mass, 72, 214
 Leptin, 62, 72, 80, 91, 106–108, 158, 159, 174, 177, 216, 223
- Life expectancy, 38, 48, 50, 197, 246, 269, 272, 277, 291
 Lifespan, 24, 30, 37, 43, 45, 49, 88, 89, 123, 178, 182, 191, 192, 194, 196, 197, 200, 209, 233, 234, 245, 247, 248, 258, 259, 261, 262, 271, 272, 298
 Lifespan extension, 247, 272
 Linear regression analysis, 16, 216
 Lipid, 9, 42, 43, 45, 58, 69, 71, 74, 78, 101, 128, 174, 176, 178, 180, 196, 212, 216, 274
 Lipid metabolism, 41, 77, 178, 196
 Lipid profile, 174
 Lipogenesis, 41, 43, 97, 214
 Lipolysis, 41, 80, 214
 Lipopolysaccharide, 62, 173
 Liver, 5, 28, 29, 43, 45, 59, 62, 74, 75, 158, 173–175, 217
 Longevity, 27, 37, 38, 40–43, 46–50, 88, 181, 192, 193, 195–197, 199, 200, 202, 203, 240, 245–248, 250, 252, 258, 260–265, 270, 272, 286
 Longevity genes, 248
 Long-lived mice, 37
 Long-lived mutants, 37, 41
 Low density lipoprotein, 5, 62
 Low income countries, 210
 Low physical activity, 17
 Low-protein diet, 179, 272
- M**
- Macronutrient intake, 17, 88
 Macrophage, 43, 59, 61, 62, 173, 174
 Macrosomia, 69, 211, 220
 Major histocompatibility complex, 59, 62
 Malnutrition, 4, 122, 192, 198, 201, 202, 272
 Mammal, 19, 48, 171, 221, 271
 Maternal diabetes, 108
 Maternal obesity, 69, 71, 72, 76, 90, 91, 93–99, 108, 109, 111, 112, 174, 176, 209–216, 222, 223, 225
 Maternal smoking, 28, 108, 126, 146, 147
 Maternal undernutrition, 67, 70–75, 77–79, 97, 112, 199
 Matrix metalloproteinases, 143
 Maturation, 37, 40, 49, 50, 125, 126, 155, 158, 170, 176, 178, 217
 Melatonin, 167, 178, 179, 181
 Menarche, 9
 Menopause, 142
 Mental disorder, 7, 12, 133, 134, 238, 298
 Mental health, 7, 12, 126, 133, 135, 180, 236
 Mesenchymal stem cells, 143, 157
 Mesoderm, 26

- Mesodermal cells, 28
 messenger RNA (mRNA), 27, 60, 71, 72, 75, 76, 101, 153, 154, 156, 171, 201, 214, 215, 222
 Metabolic adaptation, 15–17
 Metabolic disorder, 10, 11, 16, 62, 80, 104, 111, 112, 123, 272
 Metabolic syndrome, 96, 173, 176, 195, 214, 215, 288, 289, 293
 Metabolism, 3, 17, 24, 26, 45, 48, 76, 88, 94, 96, 104, 121, 123, 133, 134, 152, 156–158, 168, 169, 171, 175, 178, 196, 200, 201, 214, 222, 273, 274
 Metabolomics, 19
 Metformin, 49, 224, 225
 Methionine, 157, 169, 175
 Methylation, 28, 74–76, 154–158, 168–171, 173, 175, 180, 181, 201, 221–223, 263, 270, 273–275
 5-methylcytosine, 169
 Methyl donor diet, 175
 Methyl donors, 157, 175
 Methyl groups, 168, 169, 171, 175
 Micro-albuminuria, 238
 Microbial colonization, 176
 Microbiota, 172, 175–177, 179, 181
 Microchimerism, 59
 Microenvironment, 143
 Micronutrient deficiency, 4, 67, 88
 Micronutrients, 3, 4, 8, 15, 58, 67, 97, 100, 109, 168, 175
 MicroRNA, 76, 168, 171, 176, 221
 Mid-gestation, 71–73
 Mineral content, 10, 18, 144
 Mitochondria, 200, 272
 Mitochondrial dysfunction, 62, 200
 Mitogen-activated protein kinase (MAPK), 25, 45, 223
 Mitosis, 23
 Mitotic divisions, 157
 Mitotic machinery, 24
 Monozygotic (MZ) twin studies, 270, 273
 Monozygous twins, 145
 Mood disorder, 134
 Morbidity, 28, 93, 96, 97, 121, 123, 141, 194, 210, 211, 217
 Mortality, 5–8, 11, 28, 38, 93, 122, 141, 152, 192, 194, 197, 209–211, 217, 233, 236, 238, 242, 245–248, 250, 252–265, 269, 274, 276, 288, 289
 Mouse, 40, 59, 71, 89, 98, 154, 173, 174, 181, 198, 221
 MTOR, 41, 73
 Multipotent stem cells, 26
 Murine model, 76
 Mutation rate, 42, 43
N
 Natural experiment, 274
 Natural killer T cells, 61, 62
 Nematode, 45, 272
 Neoplastic disease, 41
 Neural development, 4
 Neural tube defects, 4, 94, 175
 Neurobehavioural disorders, 67
 Neurodegeneration, 134, 167, 168, 172–174, 176–178, 181, 182
 Neurodevelopment, 122, 126, 127, 133, 175, 179, 181, 211, 219
 Neuroinflammation, 176, 177, 181
 Neurological development, 5
 Neurologic impairment, 4
 Neuronal health, 167, 168, 178
 Neuronal maturation, 170, 171
 Neuronal progenitor cells, 170
 Neurotransmission, 134
 Neurotransmitter imbalance, 172
 Newborn, 4, 8, 9, 60, 76, 110, 123, 130, 131, 149, 178, 214, 288
 Non-alcoholic liver disease (NAFLD), 99
 Nuclear factor-kappa B (NF- κ B), 62
 Nucleic acid, 62
 Nutrients, 4, 12, 13, 18, 28, 71–73, 75, 99, 145–147, 149, 152, 153, 168, 171, 173, 175, 176, 178, 182, 197–199, 201, 212, 213, 234, 240, 292
 Nutrigenomics, 167, 179, 182
 Nutrition, 3, 4, 9, 10, 12–16, 18, 19, 23, 50, 67, 69–71, 75, 76, 79, 80, 87, 89, 97, 105, 107, 109, 110, 112, 146, 147, 150, 151, 153, 158, 159, 171, 174, 179, 180, 191, 192, 195, 198, 202, 224, 225, 233, 234, 236, 241, 242, 288, 291, 292, 297
 Nutritional deprivation, 8, 79, 193
 Nutritional insufficiency, 3
O
 Obesity, 3, 8–11, 15, 57, 58, 61, 67, 69–71, 74, 76, 79, 87, 89–101, 104–112, 127, 130, 132, 142, 147, 153, 159, 176, 177, 194–196, 209–212, 214–217, 220–225, 240, 274, 275, 291, 293
 Obesogenic diet, 71, 79, 99, 105
 Offspring, 4, 8, 9, 11, 12, 38, 41, 57–60, 63, 67, 69–73, 75–80, 87–89, 91, 97–101, 103, 104, 107, 108, 112, 122, 126, 130, 143,

- 147–159, 167, 172, 173, 175, 176, 180, 192, 194, 198–202, 209, 211–225, 241, 248, 258, 260, 261, 264, 272–274, 298
- Omega-3, 178, 180
- Oral glucose tolerance test, 217
- Organ structure, 23, 88
- Osteoblasts, 143, 152, 153, 155, 157–159
- Osteoclasts, 143, 155
- Osteoporosis, 10, 141–144, 148, 159
- Overfeeding, 78
- Overweight, 9, 11, 28, 69, 70, 87, 89–96, 106–108, 112, 132, 175, 195, 213, 214, 217, 224
- Oxidative damage, 42, 200
- Oxidative stress, 23, 26, 27, 30, 42, 172, 173, 177, 200
- Oxygen, 26, 27, 29, 45, 200
- P**
- Pancreas, 62, 88, 89, 199
- Pancreatic beta cells, 42, 199, 215
- Parkinson's disease, 124
- Peak bone mass, 141–145, 149
- Periconceptual period, 78
- Period effect, 7, 8
- Peripheral blood cells, 201
- Peroxisome proliferator activated receptors (PPARs), 101, 156, 157
- Phosphorylation, 26, 62, 63, 154, 171, 221
- Physical performance score, 194, 237
- Placenta, 25, 60, 72, 91, 92, 98, 143, 146, 154, 173, 213, 218, 222
- Placental calcium transport, 156
- Placental cells, 156
- Plasticity genes, 126, 130, 132, 134
- Pluripotent stem cells, 26, 27, 154
- Polycystic ovary syndrome, 91
- Polyunsaturated fatty acid (PUFA), 178
- Ponderal index, 9, 214, 288, 289
- Poor growth, 3, 8, 9, 11–15, 17
- Postnatal growth, 28, 200
- Poverty, 14, 15, 17, 129, 203, 288
- Pre-conception, 4, 24, 67
- Predictive adaptive response (PAR) hypothesis, 70, 271
- Preeclampsia, 76
- Prefrontal cortex, 128, 132, 133
- Preimplantation, 25
- Primates, 41, 73, 97
- Pro-inflammatory cytokine production, 172
- Proinflammatory cytokines, 43
- Proliferation, 4, 24, 29, 143, 152, 153, 158, 199
- Protein content, 100, 106, 108
- Protein intake, 8, 100, 106, 192
- Proteomics, 19
- Psychiatric conditions, 121, 123, 134
- Pubertal development, 18, 41
- Puberty, 16, 41, 263
- Q**
- Quasi-experimental design, 233, 274
- Quercetin, 167, 177
- R**
- Rapid postnatal growth, 38
- Reactive oxygen species (ROS), 26, 42, 43, 62, 178, 200
- Redox state, 177
- Regenerative potential, 23, 30
- Resilience, 28, 129, 134, 167, 168, 178–182, 245–248, 250, 253, 258–265
- Resistin, 106
- Resveratrol, 167, 177, 181
- Rhesus monkey, 73, 214
- Risk of fractures, 141, 149
- Rodent model, 70, 88, 98, 105, 159, 192
- Rodents, 17, 38, 40, 41, 70, 71, 77–79, 88, 89, 97–101, 105–107, 159, 171, 182, 192, 198, 272
- Rural area, 7
- S**
- S-adenosylmethionine, 157, 169
- Same-sex siblings, 175, 201
- Sample size, 7, 11, 16, 122, 127, 194, 215, 223
- Sanitation, 13, 18, 286, 290
- Sarcopenia, 68
- Schizophrenia, 12, 122, 124, 128, 133, 134, 180, 236, 238, 240
- Second trimester, 59
- Sedentary behaviour, 70, 210
- Sedentary lifestyle, 98, 291, 293
- Senescence, 26, 50, 158, 200, 277
- Senescent cells, 42, 43
- Serotonin transporter, 129, 132
- Serum lipid levels, 41
- Sex, 5, 9, 11, 37, 67, 71, 73, 105, 128, 143, 147, 153, 197, 218, 219
- Sheep model, 72, 78, 79
- Short chain fatty acids, 176
- Single nucleotide polymorphism (SNP), 127, 155
- SIRT1, 181
- Size at birth, 8, 9, 18, 23, 30, 236
- Skeletal development, 10, 143, 146, 148
- Skeletal growth, 24, 143, 145, 155
- Skeletal muscle, 62, 71, 72, 74, 77, 213
- Small for gestation age, 69

- Small non-coding RNAs, 74, 171
- Smoking, 5, 11, 29, 58, 95, 111, 133, 146, 172, 262, 293
- Social class, 5, 196, 245, 247, 248, 250–253, 255, 257–260, 262–264
- Socio-economic environment, 16
- Socio-economic factors, 4
- Socio-economic status, 18, 58
- Somatotropic axis, 47
- Spermatogenesis, 40
- Sprague-Dawley rats, 180
- Starvation, 72, 155, 233
- Stem cell, 23, 25–27, 30, 152, 157
- Stem cell niches, 27
- Stress hormone, 17
- Stress response, 49, 181, 182, 218, 247, 273
- Stress responsiveness, 236
- Striatum, 124
- Stroke, 58, 211, 293
- Stunting, 3, 12–16, 18, 293
- Substantia nigra, 124
- Sulforaphane, 167, 177, 180
- Synaptic connections, 171
- Synaptic plasticity, 170, 180
- Systolic blood pressure, 10, 58
- T**
- T cell, 59–62
- Telomere length, 200, 297
- Third trimester, 73, 143, 147, 213, 215, 216, 219
- Thrifty phenotype hypothesis, 195
- Thyroid function, 5
- Thyroid hormone, 40, 41, 49, 74
- Tobacco consumption, 7
- Toll-like receptors, 62
- Toxin, 3, 146
- Transcription, 23, 24, 26, 63, 74, 75, 101, 154, 158, 170, 171, 180, 221
- Transcriptional activation, 24, 75
- Transcription factors, 26, 157, 158, 170
- Transgenerational effect, 71, 157, 272, 291
- Transgenerational hypothesis, 245
- Transgenic mice, 38
- Triglyceride level, 58
- Triglycerides, 43, 196, 201
- Tumor necrosis factor alpha (TNF α), 41, 60, 62
- Tumor suppressor genes, 270
- Type 2 diabetes, 27, 57, 58, 60–62, 69, 87, 88, 91, 92, 95, 96, 142, 194–196, 211, 236, 240, 241, 274, 289, 293
- Tyrosine, 124, 131, 171
- U**
- Ubiquitination, 154, 171
- Umbilical cord blood, 97, 222
- Umbilical cords, 148, 155, 156, 158, 214, 216, 222
- Undernutrition, 13, 15, 16, 19, 70–72, 88, 89, 159, 191–203, 233–238, 240–242, 288, 289
- U-shaped association, 122
- Uteroplacental insufficiency, 58, 105
- V**
- Vascular dysfunction, 199
- Vascular invasion, 143
- Ventricular hypertrophy, 123
- Vessel wall, 27
- Vitamin B9, 175
- Vitamin B12, 58, 148, 169, 175
- Vitamin D, 4, 144, 147–150, 153, 154, 156
- Vitamin D supplementation, 150, 153, 154
- Vulnerability, 129, 130, 133, 134, 197, 246
- W**
- Waist circumference, 10, 131, 217, 225
- Weaning, 37, 40, 47, 75–77, 88, 100, 101, 103–106, 152, 271
- Weight gain, 4, 9, 10, 42, 91, 93, 98, 106, 109–111, 144, 147, 222–225
- World Health Organization (WHO), 90, 111, 210
- World War II, 192
- Worm, 42, 272
- X**
- Xenobiotic detoxification, 45, 47, 49
- Y**
- Yeast, 42