PART ONE
Essential concepts of pathophysiology

1 Introduction to clinical science
Judy Craft and Christopher Gordon

Introduction

Essential pathophysiology
Pathophysiology and clinical manifestations, 4
Disorders and diseases, 5
The onset of disease, 5
Population-level indicators of disease, 6
Age groups within the population, 6
Evaluation and treatment, 6

Essential anatomy
Anatomical position, 7
Body sections and planes, 7
Anatomical directional terminology, 8
Body cavities and quadrants, 9
Health science terminology, 10

Essential physiology
The hierarchy from microscopic to whole body level, 11
Organ systems, 12

Essential chemistry
Elements, 12
Ions and electrolytes, 12
Molecules and compounds, 13
Water, 13
Acids and bases, 14
Acidosis and alkalosis, 14
Chemical reactions, 14
Energy, 15
Molecules of life, 15

Essential physics
Pressure within an enclosed area of the body, 16
Pressure from the atmosphere, 17

2 Homeostasis
Judy Craft and Christopher Gordon

Introduction

Homeostasis
The cellular environment, 22
Homeostasis at the cellular and local level, 23
Homeostasis at the body level, 24

Regulation of homeostasis
Disturbances of homeostasis lead to pathophysiology

3 Cellular structure and function
Sarah List

Introduction
Cellular structure and function
Cellular components
The organelles, 35
The cytoplasm, 39
The cell membrane
Lipids, 41
Proteins, 41
Cellular receptors and communication
Membrane transport
Movement of water and solutes, 44
Cellular metabolism
The role of ATP, 48
Tissues
Types of tissues, 50

Ageing and cellular structure and function

4 Altered cellular function
Sarah List

Introduction
Causes of cellular injury
Hypoxia, 59
Chemical agents, 59
Physical agents, 61
Infectious agents, 61
Genetic causes, 62
Mechanisms of cellular injury
Hypoxic injury, 62
The impact of oxygen and oxygen-derived free radicals, 64
Alteration to calcium homeostasis, 65
Cellular adaptation
Atrrophy, 66
Hypertrophy, 67
Hyperplasia, 67
Metaplasia, 68
Dysplasia, 68
Contents

Reversible and irreversible cell injury 69
Reversible cell injury, 69
Irreversible cell injury, 70

Ageing and altered cellular function 74
Death 75

5 Genes 79
Sarah List
Introduction 80
The nucleus 80
Cell proliferation 81
The cell cycle, 81
Control of cell division, 82
DNA, RNA and proteins: heredity at the molecular level 83
Chemical composition of DNA, 83
From genes to proteins, 84
Elements of genetics 85
Genes, alleles and mutations, 85
Phenotype and genotype, 86
Dominance and recessiveness, 87
Inheritance of traits 88
Autosomal and X-linked inheritance, 89
Codominance and multiple alleles, 89
Newborn screening 90

PART TWO
Alterations to regulation and control 95

6 The structure and function of the neurological system 97
Amy Nicole Burne Johnston
Introduction 98
Organisation of the nervous system 98
Cells of the nervous system 98
Neurons, 98
Neuroglia, 101
Nerve injury and regeneration 101
The nerve impulse 102
Membrane potentials, 104
Action potential, 104
Synapses, 105
Neurotransmitters, 106
Myelin, 106
The central nervous system 108
The brain, 108
The spinal cord, 114
Protective structures of the central nervous system, 117
Blood supply of the central nervous system, 120
The peripheral nervous system 124

The autonomic nervous system 127
Anatomy of the sympathetic nervous system, 127
Anatomy of the parasympathetic nervous system, 128
Neurotransmitters and receptors, 128
Physiology of the autonomic nervous system, 132

Sensory function 133
Somatosensory function, 134
Vision, 134
Hearing, 135
Olfaction and taste, 137
Alterations of sensory function, 138

Paediatrics and the nervous system 140

Ageing and the nervous system 141

7 Pain 146
Judy Craft
Introduction 147
The definition of pain 147
Types of pain 148
Nociceptive pain, 148
Neuropathic pain, 149
Psychogenic pain, 149
Pain terminology 149
The physiology of pain 150
Nociceptors, 150
Spinothalamic tract neurons, 153
Thalamocortical neurons, 153
Cortical representation of pain, 154
Neuro modulation of pain, 154
Clinical manifestations of pain 155
Evaluation and treatment 156
Pathophysiology of pain 158
Peripheral neuropathic pain, 158
Paediatrics and pain 160
Central pain syndromes, 160
Ageing and pain 161

8 Concepts of neurological dysfunction 164
Amy Nicole Burne Johnston and Susanne Thompson
Introduction 165
Alterations in cerebral homeostasis 165
Cerebral haemodynamics, 165
Intracranial pressure, 166
Cerebral oedema, 170
Hydrocephalus, 172
Paediatrics and congenital hydrocephalus 172
Alterations in cognitive function 173
Alterations in arousal, 173
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paediatrics and seizures</td>
<td>184</td>
</tr>
<tr>
<td>Cognitive disorders</td>
<td></td>
</tr>
<tr>
<td>Paediatrics and autism spectrum disorders</td>
<td>188</td>
</tr>
<tr>
<td>Alterations in motor function</td>
<td>190</td>
</tr>
<tr>
<td>Alterations in muscle tone</td>
<td></td>
</tr>
<tr>
<td>Alterations in movement</td>
<td></td>
</tr>
<tr>
<td>Ageing and neurological dysfunction</td>
<td>191</td>
</tr>
<tr>
<td>9 Alterations of neurological function across the life span</td>
<td>194</td>
</tr>
<tr>
<td>Matthew Barton and Amy Nicole Burne Johnston</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>195</td>
</tr>
<tr>
<td>Cerebrovascular disorders</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>195</td>
</tr>
<tr>
<td>Cerebral aneurysm</td>
<td>202</td>
</tr>
<tr>
<td>Vascular malformation</td>
<td>203</td>
</tr>
<tr>
<td>Headache and migraine</td>
<td>204</td>
</tr>
<tr>
<td>Trauma to the central nervous system</td>
<td>205</td>
</tr>
<tr>
<td>Brain trauma</td>
<td>205</td>
</tr>
<tr>
<td>Spinal cord trauma</td>
<td>209</td>
</tr>
<tr>
<td>Degenerative disorders of the central nervous system</td>
<td>212</td>
</tr>
<tr>
<td>Alzheimer's disease</td>
<td>212</td>
</tr>
<tr>
<td>Parkinson's disease</td>
<td>214</td>
</tr>
<tr>
<td>Huntington's disease</td>
<td>216</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>217</td>
</tr>
<tr>
<td>Motor neuron disease</td>
<td>218</td>
</tr>
<tr>
<td>Peripheral nervous system and neuromuscular junction disorders</td>
<td>219</td>
</tr>
<tr>
<td>Guillain-Barré syndrome</td>
<td>219</td>
</tr>
<tr>
<td>Myasthenia gravis</td>
<td>219</td>
</tr>
<tr>
<td>Infection and inflammation of the central nervous system</td>
<td>220</td>
</tr>
<tr>
<td>Meningitis</td>
<td>220</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>222</td>
</tr>
<tr>
<td>Abscesses</td>
<td>222</td>
</tr>
<tr>
<td>Tumours of the nervous system</td>
<td>223</td>
</tr>
<tr>
<td>Cranial tumours</td>
<td>223</td>
</tr>
<tr>
<td>Paediatrics and developmental disorders</td>
<td>227</td>
</tr>
<tr>
<td>10 The structure and function of the endocrine system</td>
<td>233</td>
</tr>
<tr>
<td>Sarah List</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>234</td>
</tr>
<tr>
<td>Mechanisms of hormonal regulation</td>
<td>234</td>
</tr>
<tr>
<td>Regulation of hormone release</td>
<td>235</td>
</tr>
<tr>
<td>Mechanisms of hormone action</td>
<td>235</td>
</tr>
<tr>
<td>The structure and function of the endocrine glands</td>
<td>237</td>
</tr>
<tr>
<td>The hypothalamic–pituitary system</td>
<td></td>
</tr>
<tr>
<td>The thyroid and parathyroid glands</td>
<td>241</td>
</tr>
<tr>
<td>The pancreas</td>
<td>243</td>
</tr>
<tr>
<td>The adrenal glands</td>
<td>246</td>
</tr>
<tr>
<td>The pineal gland</td>
<td>251</td>
</tr>
<tr>
<td>The thymus gland</td>
<td>252</td>
</tr>
<tr>
<td>The testes and ovaries</td>
<td>252</td>
</tr>
<tr>
<td>Ageing and the endocrine system</td>
<td>252</td>
</tr>
<tr>
<td>11 Alterations of endocrine function across the life span</td>
<td>255</td>
</tr>
<tr>
<td>Sarah List</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>256</td>
</tr>
<tr>
<td>Mechanisms of hormonal alterations</td>
<td>256</td>
</tr>
<tr>
<td>Alterations of pituitary function</td>
<td>257</td>
</tr>
<tr>
<td>Syndrome of inappropriate antidiuretic hormone secretion</td>
<td>257</td>
</tr>
<tr>
<td>Diabetes insipidus</td>
<td>257</td>
</tr>
<tr>
<td>Alterations of adrenal function</td>
<td>259</td>
</tr>
<tr>
<td>Hyperaldosteronism</td>
<td>259</td>
</tr>
<tr>
<td>Hypercortisolism</td>
<td>260</td>
</tr>
<tr>
<td>Hypoadrenalism</td>
<td>262</td>
</tr>
<tr>
<td>Alterations of pancreatic function</td>
<td>264</td>
</tr>
<tr>
<td>Type 1 diabetes mellitus</td>
<td>264</td>
</tr>
<tr>
<td>Diabetes in pregnancy</td>
<td>266</td>
</tr>
<tr>
<td>Alterations of thyroid function</td>
<td>266</td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>266</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>270</td>
</tr>
<tr>
<td>Alterations of parathyroid function</td>
<td>272</td>
</tr>
<tr>
<td>Hyperparathyroidism</td>
<td>272</td>
</tr>
<tr>
<td>Hypoparathyroidism</td>
<td>274</td>
</tr>
<tr>
<td>PART THREE</td>
<td>279</td>
</tr>
<tr>
<td>Alterations to protection and movement</td>
<td></td>
</tr>
<tr>
<td>12 The structure and function of the immune system</td>
<td>281</td>
</tr>
<tr>
<td>Lynne Hendrick</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>282</td>
</tr>
<tr>
<td>Human defence mechanisms</td>
<td>282</td>
</tr>
<tr>
<td>Innate immunity</td>
<td>282</td>
</tr>
<tr>
<td>Adaptive immunity</td>
<td>287</td>
</tr>
<tr>
<td>Cells of the immune system</td>
<td>289</td>
</tr>
<tr>
<td>Humoral and cell-mediated immunity</td>
<td>291</td>
</tr>
<tr>
<td>Humoral immune response</td>
<td>291</td>
</tr>
<tr>
<td>Cell-mediated immune response</td>
<td>294</td>
</tr>
<tr>
<td>Induction of the immune response</td>
<td>298</td>
</tr>
<tr>
<td>Paediatrics and the immune system</td>
<td>300</td>
</tr>
<tr>
<td>Ageing and the immune system</td>
<td>301</td>
</tr>
</tbody>
</table>
13 Inflammation and fever
Thea F van de Mortel

Introduction

Acute inflammation

Cellular components of inflammation
Mast cells and basophils, 309
Neutrophils, 310
Monocytes and macrophages, 310
Eosinophilis, 311
Platelets, 311
Phagocytosis, 312

Inflammatory mediators
Histamine, 313
Chemotactic factors, 314
Leukotrienes, 314
Nitric oxide, 314
Prostaglandins, 315
Platelet-activating factor, 315
Cytokines, 315

Plasma protein systems
The complement system, 316
The coagulation system, 318
The kinin system, 318
Plasma protein system interactions, 318

Chronic inflammation

Clinical manifestations of inflammation
Fever
Body temperature, 321
Thermoregulation, 321
Body temperature abnormalities, 321
The pathogenesis of fever, 322
The benefits of fever, 323
Clinical patterns of fever, 325

Wound healing
The reconstructive phase, 325
The maturation phase, 327
Dysfunctional wound healing, 327

14 Infection
Thea F van de Mortel

Introduction

Infection rates

Definitions

Microorganisms
Normal flora, 335
Pathogens, 336
Classes of microorganisms, 337
Methods of infection, 344

Clinical manifestations of infection, 345
Detection and treatment of microorganisms, 345

Antimicrobials

Vaccines

Infections
Common infections, 350
Infection control and healthcare-acquired infections, 352

Antimicrobial resistance

15 Alterations of immune function across the life span
Lynne Hendrick

Introduction

Hypersensitivity reactions
Type I: IgE-mediated hypersensitivity reactions, 358
Type II: tissue-specific hypersensitivity reactions, 361
Type III: immune complex–mediated hypersensitivity reactions, 361
Type IV: cell-mediated hypersensitivity reactions, 362

Transplantation
Transplantation rejection, 364
Blood transfusion reactions, 364

The ABO blood group system
The Rhesus system, 366
The universal donor, 366

Autoimmune diseases
The breakdown of tolerance, 367
Systemic lupus erythematosus, 367

Immune deficiencies
Primary immune deficiencies, 370
Secondary immune deficiencies, 371

Paediatrics and alterations of immune function

Ageing and alterations of immune function

16 The structure and function of the haematological system
Lynne Hendrick

Introduction

Components of the haematological system
The composition of blood, 384
Lymphoid organs, 388
The mononuclear phagocyte system, 390

The development of blood cells
Haematopoiesis, 390
The development of erythrocytes, 392
The development of leucocytes, 396
The development of platelets, 396

The mechanisms of haemostasis
The function of platelets and blood vessels, 397
The function of clotting factors, 399
Contents

Natural substances that limit coagulation and platelet plug formation, 400
Clot retraction and fibrinolysis, 402

17 Alterations of haematological function across the life span
Moaia Stephens
Introduction 409
Alterations of erythrocyte function 409
Anaemia, 409
Inherited blood disorders, 415
Myeloproliferative red cell disorders, 416
Alterations of platelets and coagulation 417
Platelet disorders, 417
Disorders of coagulation, 419
Haemostasis therapy, 424
Alterations of leucocytes 424
Alterations of leucocyte count, 424
Alterations of leucocyte function, 426
Alterations of lymphoid function 430
Lymphadenopathy, 430
Malignant lymphomas, 431

18 The structure and function of the integumentary system
Adriana Tiziani
Introduction 440
The structure of the skin 440
Layers of the skin, 440
Skin colour, 444
Appendages of the skin 444
Hair, 444
Nails, 445
Sweat glands, 445
Sebaceous glands, 446
The function of the integumentary system 447
Protection, 447
Regulation of body temperature, 447
Cutaneous sensation, 447
Production of vitamin D, 448
Excretion, 448

19 Alterations of the integumentary system across the life span
Adriana Tiziani
Introduction 453
Skin lesions

Skin cancer
Basal cell carcinoma, 457
Squamous cell carcinoma, 459
Melanoma, 460
Inflammatory disorders of the skin
Dermatitis, 462

Paediatrics and nappy rash 464
Acne vulgaris, 465
Acne rosacea, 465
Cutaneous lupus erythematosus, 466
Papulosquamous disorders, 467
Infections of the integumentary system 468
Bacterial infections, 468

Paediatrics and impetigo 469
Viral infections, 470
Fungal infections, 471
Parasitic infestations, 473
Traumatic conditions of the integumentary system 475
Pressure injuries, 475
Skin tears, 477
Burns, 478
Vascular disorders 481
Cutaneous vasculitis, 481
Scleroderma, 481

Paediatrics and haemangioma 482
Port-wine stain, 482

20 The structure and function of the musculoskeletal system
Derek Nash
Introduction 487
The structure and function of bones 487
Elements of bone tissue, 487
Types of bone tissue, 489
Characteristics of bone, 491
Maintenance of bone integrity, 492
The structure and function of joints 493
Fibrous joints, 494
Cartilaginous joints, 494
Synovial joints, 494
The structure and function of skeletal muscles 498
Whole muscle, 498
Components of muscle function, 504
The clinical relevance of skeletal muscle, 509

Paediatrics and the musculoskeletal system 510

21 Alterations of musculoskeletal function across the life span
Derek Nash and Paul McLiesh
Introduction 515
CONTENTS

Musculoskeletal injuries
Skeletal trauma, 515
Support structures, 519

Disorders of bone and joints
Metabolic bone disease, 524

Paediatrics and disorders of bones
Disorders of joints, 533

Paediatrics and disorders of joints
Infectious bone disease, 546

Paediatrics and septic arthritis
Contraction, 549
Stress-induced muscle tension, 549
Disuse atrophy, 550
Fibromyalgia, 550

Integrative conditions related to the musculoskeletal system
Lower back pain, 552
Bone pain, 553
Myasthenia gravis, 553

Paediatrics and integrative conditions

PART FOUR
Alterations to body maintenance

22 The structure and function of the cardiovascular and lymphatic systems
Thomas Buckley

Introduction 563
The circulatory system
The structure of the heart
The size and location of the heart, 564
The heart wall, 565
Heart chambers and great vessels, 567
Valves of the heart, 568
Heart sounds, 569

Paediatrics and fetal circulation
Blood flow during the cardiac cycle
The coronary circulation
Coronary arteries, 573
Collateral arteries, 573
Coronary capillaries, 574
Coronary veins and lymphatic vessels, 575

Structures that control heart function
Myocardial cells, 576
Myocardial excitation–contraction coupling, 577
Myocardial relaxation, 578

Myocardial metabolism, 578
The cardiac conduction system, 579
Action potentials of the cardiac conduction system, 580
Cardiac innervation, 580
The electrocardiogram 581
Factors affecting cardiac performance 583
Preload, 584
Afterload, 585
Myocardial contractility, 586
Heart rate, 586
The physiology of cardiovascular control 587
Cardiovascular control centres in the brain, 587
Neural reflexes, 588
Atrial receptors, 588
Hormones and biochemicals, 589
The systemic circulation 589
Blood vessels, 589
Arteries, 589
Capillaries, 589
Endothelium, 592
Veins, 593
Blood pressure and blood flow 594
Factors affecting blood flow, 595
Regulation of blood pressure, 597
Regulation of the coronary circulation, 601
The lymphatic system 602
Lymphatic capillaries, 602
Lymphatic vessels and ducts, 603
Lymph nodes, 604

Ageing and the cardiovascular system 604

23 Alterations of cardiovascular function across the life span
Thomas Buckley

Introduction 610
Alterations of blood flow and pressure 611
Hypertension, 611
Orthostatic hypotension, 616
Arteriosclerosis, 617
Atherosclerosis, 618
Coronary heart disease, 621
Myocardial ischaemia, 623
The acute coronary syndromes, 627
Aneurysm, 634
Embolism, 637
Peripheral artery disease, 637
Alterations to veins, 638

Paediatrics and alterations of cardiac function 640
Alterations of the heart wall 643
Disorders of the pericardium, 643
Disorders of the myocardium: the cardiomyopathies, 644
Disorders of the endocardium, 644
## Contents

### Alterations of cardiac conduction
- Arrhythmias, 653

### Heart failure
- Left heart failure, 657
- Right heart failure, 661

### Shock
- Impairment of cellular metabolism, 662
- Types of shock, 664
- Multiple organ dysfunction syndrome, 673

### The structure and function of the pulmonary system
*Darrin Penola and Vanessa Marie McDonald*

#### Introduction
681

#### The structure of the pulmonary system
The conducting zone, 681
The respiratory zone, 687
The pulmonary and bronchial circulation, 688
The chest wall and pleura, 688

#### The function of the pulmonary system
The mechanics of breathing, 689
Ventilation, 694
Gas transport, 698

- **Paediatrics and the pulmonary system**

- **Ageing and the pulmonary system**

### Alterations of pulmonary function across the life span
*Vanessa Marie McDonald, Steven Maltby and Darrin Penola*

#### Introduction
711

#### Disorders of the pulmonary system
Obstructive airway diseases, 711

- **Paediatrics and asthma**

- **Ageing and the digestive system**

- **Ageing and the pulmonary system**

### The structure and function of the digestive system
*Kulmira Nurgali*

#### Introduction
762

#### An overview of the digestive system
The gastrointestinal tract and accessory organs, 762
Layers of the gastrointestinal tract, 763
Neural control of the digestive system, 764
Motility, 764
Splanchnic blood flow, 765
The main nutrients, 766

#### The mouth, pharynx and oesophagus
Anatomy and physiology of the mouth, pharynx and oesophagus, 767
Digestion in the mouth, pharynx and oesophagus, 770

#### The stomach
Anatomy and physiology of the stomach, 771
Digestion in the stomach, 774
Absorption from the stomach, 774

#### The small intestine
Anatomy and physiology of the small intestine, 774
Intestinal motility, 775
Digestion in the small intestine, 777
Absorption from the small intestine, 777

#### Accessory organs of digestion
The liver, 779
The gallbladder, 785
The pancreas, 785

#### The large intestine
Anatomy and physiology of the large intestine, 787
Digestion in the large intestine, 788
Absorption in the large intestine, 790
Fluid movements in the digestive system, 790

#### An overview of nutrition
791

- **Paediatrics and the digestive system**

- **Ageing and the digestive system**

### Alterations of digestive function across the life span
*Kulmira Nurgali and Carolyn Wildbore*

#### Introduction
799

#### Disorders of the gastrointestinal tract
Cancers of the gastrointestinal tract, 799
Inflammatory disorders of the gastrointestinal tract, 807

- **Paediatrics and necrotising enterocolitis**

- **Nutritional disorders, 818**
PART FIVE
Alterations to continuity 947

31 The structure and function of the reproductive systems 949
Karole Hogarth

Introduction 950
The structure and function of the male reproductive system 950
External structures, 950
Internal structures, 951

The structure and function of the female reproductive system 954
External structures, 954
Internal structures, 955
Breast structure, 957

Puberty in males and females 958
The effects of testosterone in males, 959
The effects of oestrogen and progesterone in females, 959

Gametogenesis 961
General principles, 961
Meiosis, 961
Spermatogenesis, 961
Oogenesis, 964
The ovarian cycle, 965
The uterine (menstrual) cycle, 965
Ovarian and uterine cycle timing, 968

Male and female sexual responses 968
The female sexual response, 968
The male sexual response, 969

Conception, gestation and parturition 969
Fertilisation, 970
Implantation, 971
The development and function of the placenta, 971
The embryonic sac, 973
The origin, composition and significance of amniotic fluid, 973
The mother's adaptations to pregnancy, 974
Fetal development, 976
The neonate, 977

PART SIX
Contemporary health issues 1031

33 Introduction to contemporary health issues 1033
Margaret Williamson

Introduction 1034
Australia and New Zealand: demographics 1034
Current population, 1034
Population projections, 1034
Ageing, 1035
Hospitalisations, 1036
Mortality, 1036

Chronic diseases 1039
Mental health 1040
Indigenous health 1040
Contemporary lifestyle 1041
Stress, 1041
Dietary factors, 1041
Physical activity, 1042

Obesity 1043
Health promotion initiatives 1046

Stress, 1041
Dietary factors, 1041
Physical activity, 1042

Obesity 1043
Health promotion initiatives 1046

34 Stress and chronic disease 1049
Sarah List
Introduction 1050
The general adaptation syndrome 1051
Stressors
Physical stress, 1051
Psychological stress, 1051
Contemporary stressors, 1051
The detection of stress
The alarm stage, 1052
The resistance stage, 1052
The exhaustion stage, 1052
Physiological processes of the stress response
The sympathetic nervous system, 1053
The hypothalamic–pituitary–adrenal axis, 1054
Physiological effects of the stress response
Increased cardiac output and breathing rate, 1055
Elevated blood pressure, 1056
Increased blood glucose and lipid levels, 1057
Altered immune response, 1058
Suppression of pain, 1060
Benefits of the stress response 1060
Health alterations with chronic stress 1060
Stress, inflammation and chronic disease, 1061
Modulation of the stress response
Psychological influences on stress, 1063
Personality characteristics and stress, 1066
Sex hormone influences on stress, 1066
Strategies for coping with stress, 1066
Stress and sleep
Hormonal fluctuations with circadian rhythm, 1067
Sleep and circadian regulation of stress hormones, 1068
Sleep, stress and immunity, 1069
Shift work and disease, 1069

35 Obesity 1074
Elizabeth Anne Cayanan
Introduction 1075
The progression to overweight and obesity 1075
Evaluation of body size
Body mass index, 1076
Waist circumference, 1077
Body composition, 1078

36 Type 2 diabetes 1097
Carolien Koreneff
Introduction 1098
Diabetes mellitus
The extent of the issue, 1098
Diagnosis of diabetes, 1099
Risk factors for the development of type 2 diabetes, 1101
Understanding the relationship between obesity and diabetes 1103

37 Cancer 1121
Sarah List and Julija Sipavicius
Introduction 1122
Cancer is a chronic disease 1122
Cancer characteristics and terminology 1122
What is cancer? 1122
Carcinogenesis, 1123
Cancer names, 1123
The genetic basis of cancer 1123
Types of gene mutations in cancer 1124
Alteration of progrowth and antigrowth signals — epigenetics, 1124
Genetics and cancer risk in families, 1128
Cancer growth rates, 1128
Cancer growth, spread and metastasis, 1129
Cancer, immunity, inflammation and infection 1133
Cancer and the immune system, 1133
Chronic inflammation, 1134
Viral causes of cancer, 1135
Bacterial causes of cancer, 1136
Gene–environment interaction 1136
Factors that increase the risk of cancer, 1137
Cancer prevention, 1141
Diagnosis and evaluation of cancer 1142
Tumour markers, 1143
Evaluation, 1143
Clinical staging, 1143
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common threads — factors contributing to health problems</td>
<td>1237</td>
</tr>
<tr>
<td>Injuries, 1237</td>
<td></td>
</tr>
<tr>
<td>Smoking, 1237</td>
<td></td>
</tr>
<tr>
<td>Alcohol misuse, 1238</td>
<td></td>
</tr>
<tr>
<td>Social determinants of Indigenous health</td>
<td>1238</td>
</tr>
<tr>
<td>Education, 1238</td>
<td></td>
</tr>
<tr>
<td>Employment, 1240</td>
<td></td>
</tr>
<tr>
<td>Housing, 1240</td>
<td></td>
</tr>
<tr>
<td>Closing the Gap</td>
<td>1240</td>
</tr>
<tr>
<td>41 Māori health in Aotearoa New Zealand</td>
<td>1243</td>
</tr>
<tr>
<td>Karole Hogarth and Mereana Rapata-Hanning</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>1244</td>
</tr>
<tr>
<td>The New Zealand Māori population</td>
<td></td>
</tr>
<tr>
<td>Distribution, 1244</td>
<td></td>
</tr>
<tr>
<td>Māori health</td>
<td>1245</td>
</tr>
<tr>
<td>Mortality, 1245</td>
<td></td>
</tr>
<tr>
<td>Morbidity, 1245</td>
<td></td>
</tr>
<tr>
<td>Fertility, 1246</td>
<td></td>
</tr>
<tr>
<td>Conditions affecting the wellbeing of Māori</td>
<td>1246</td>
</tr>
<tr>
<td>Cardiovascular disease, 1247</td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus, 1248</td>
<td></td>
</tr>
<tr>
<td>Chronic kidney disease, 1249</td>
<td></td>
</tr>
<tr>
<td>Cancer, 1250</td>
<td></td>
</tr>
<tr>
<td>Asthma, 1250</td>
<td></td>
</tr>
<tr>
<td>Mental illness, 1250</td>
<td></td>
</tr>
<tr>
<td>Infection, 1252</td>
<td></td>
</tr>
<tr>
<td>Oral health, 1252</td>
<td></td>
</tr>
<tr>
<td>Paediatrics and infection</td>
<td>1253</td>
</tr>
<tr>
<td>Factors contributing to health problems</td>
<td>1254</td>
</tr>
<tr>
<td>Injuries, 1254</td>
<td></td>
</tr>
<tr>
<td>Smoking, 1254</td>
<td></td>
</tr>
<tr>
<td>Alcohol misuse, 1255</td>
<td></td>
</tr>
<tr>
<td>Social determinants of Māori health</td>
<td>1256</td>
</tr>
<tr>
<td>Poverty, 1256</td>
<td></td>
</tr>
<tr>
<td>Education, 1256</td>
<td></td>
</tr>
<tr>
<td>Income and employment, 1257</td>
<td></td>
</tr>
<tr>
<td>Housing, 1257</td>
<td></td>
</tr>
<tr>
<td>Appendix A: Normal reference laboratory values, 1261</td>
<td></td>
</tr>
<tr>
<td>Appendix B: Prefixes, suffixes and root words commonly used in health sciences, 1265</td>
<td></td>
</tr>
<tr>
<td>Glossary, 1269</td>
<td></td>
</tr>
<tr>
<td>References, 1281</td>
<td></td>
</tr>
<tr>
<td>Image and text credits, 1325</td>
<td></td>
</tr>
<tr>
<td>Index, 1365</td>
<td></td>
</tr>
</tbody>
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PREFACE

We are delighted to present the third edition of *Understanding Pathophysiology*. The aim of this new edition was to revise and update the previous edition to meet the ever-changing landscape of pathophysiology for health professional students. We recognise that students need the latest evidence about diseases and disorders and that these disorders and diseases need to have high relevance to students’ clinical practice. Therefore we have drawn together a team of clinical and scientific experts for each chapter. The synergy between the scientific and clinical experts provides a unique perspective; one that we believe enhances the textbook.

One main aspect that is new to this edition is the separation of obesity and type 2 diabetes into separate, stand-alone chapters within Part 6. As the populations of Australia and New Zealand encounter increasing rates of both these conditions, exploring them in distinct chapters has allowed greater focus on the most relevant pathophysiology and clinical issues of these topics. As with other health problems, discussion of the body systems affected by diseases, disorders and syndromes are highlighted in the chapters to allow students to see that pathophysiological changes are often interrelated.

As in previous editions, local clinical terminology and current health statistics are integrated to identify and examine the conditions with the highest incidence, prevalence and relevance in our communities. The third edition also incorporates revisions to the Focus on Learning questions, Case Studies and the chapter Review Questions; answers for all of these are available online via the Evolve platform.

ORGANISATION OF CONTENT

The textbook is organised into six parts, which group areas of common pathophysiological concepts.

Part 1 (Chapters 1–5) provides the necessary background knowledge of health science principles and processes relevant to pathophysiology. This includes an exploration of what constitutes pathophysiology, and how the disease process manifests in clinical signs and symptoms. It also encompasses relevant information about the population-level measures of disease, such as incidence, prevalence and mortality rates, to allow students to successfully interpret these in subsequent chapters. Chapter 1 provides an overview of the essentials of anatomy, physiology, chemistry and physics that are relevant to the study of pathophysiology. Chapter 2 is devoted to homeostasis — arguably one of the most important themes underlying all aspects of health, since disease results when homeostasis cannot be maintained. Chapter 3 explores the normal structure and function of the cell, and Chapter 4 deals with alterations to cellular biology. Finally in this part, Chapter 5 examines genes and how genetic information controls events within the cell.

Parts 2–5 provide an in-depth examination of body systems, and are grouped into areas of common and key concepts. Each part has chapters on normal anatomy and physiology, as well as pathophysiology. Although this textbook focuses on pathophysiology, we have included chapters on anatomy and physiology because an understanding of normal body processes is vital for an understanding of pathophysiology. Part 2 (Chapters 6–11) encompasses the nervous and endocrine systems, which undertake overall control and coordination of the body systems. Part 3 (Chapters 12–21) covers the different features relating to immunity, haematology, the integumentary system (skin) and the musculoskeletal system. Part 4 (Chapters 22–30) focuses on major body systems that provide the constituents essential for life: the cardiovascular and lymphatic systems, the pulmonary system, the digestive system and the urinary system. Part 5 (Chapters 31 and 32) explores the reproductive systems.

Finally, Part 6 (Chapters 33–41), examines those diseases and disorders that have greatest significance in the current health environment in Australia and New Zealand. The main emphasis is on issues that are more encompassing than the body system diseases covered in Parts 2–5. Many of the concepts discussed in Part 6 are advanced, drawing on the knowledge that has been laid down earlier in the book. Chapter 34 looks at the impact of our modern lifestyle and the types of diseases that are strongly related to stress. Chapter 35 and 36 considers two conditions whose incidence has increased tremendously in recent years: obesity and type 2 diabetes; as these conditions now have an increasing impact on the health of our citizens, these topics have been moved to stand-alone chapters. Chapter 37 examines themes relating to a variety of cancers, the current state of cancers in Australia and New Zealand and current screening and prevention programs. Chapter 38 discusses the role of genes and the environment in disease pathogenesis — a hot topic given that so many conditions seen in developed countries are described as preventable. Chapter 39 explores the biological bases of mental illnesses, which remain poorly understood and yet are prevalent in our community. Chapters 40 and 41 examine the health of the Indigenous populations in Australia and New Zealand, respectively. We investigate the overall health of the Indigenous populations, often comparing it to the non-Indigenous population.
THE AUSTRALIAN AND NEW ZEALAND CONTEXT

While many say that pathophysiology is similar the world over, this is not the case. Australia and New Zealand both have disease and disorder profiles that are different from other countries. For instance, both countries have very high rates of asthma; Australia has the world’s highest rates of melanoma and the Indigenous populations have poor health outcomes, especially in comparison to other first world Indigenous peoples. Therefore, the diseases and disorders relevant to the Australian and New Zealand landscape are given precedence in this text. The pathophysiology of these diseases and disorders is explained in detail with an epidemiological focus relevant to the particular country.

CONCEPT MAPS: A UNIQUE FEATURE OF THE TEXT

We have populated the text heavily with concept maps, which are easily identified by their bright green background. Concept maps are a useful learning tool as they link concepts and processes in a visually stimulating way — our students often comment that using such maps helps the information to fall into place.

The concepts within each map are boxed and may be an anatomical abnormality, a physiological process, a risk factor or an alteration of homeostasis. The different concepts are then linked by lines and arrows, and in many cases descriptive joining words are included to provide a crucial link demonstrating how the concepts relate to each other.

We have included both simple and complex concept maps: simple maps are to be read from top to bottom, while to read the more complex maps start at the top and follow each loop around back to the starting point to complete a process.

ACKNOWLEDGMENTS

A textbook this size is constructed with a team of people. As such, we would like to formally acknowledge our colleagues whose expertise was sought in the refinement of this new edition and who have been part of the process of creating this text. We are particularly indebted to the many clinicians and academics who provided expert knowledge from their specialty domains. We thank them for their contribution and the time they gave to the contributors.

Of course, we also are indebted to the Australian Elsevier team, which has provided the guidance and support needed in the construction of a new edition. We would particularly like to thank Libby Houston and Karthikeyan Murthy for assisting us in the completion of this edition. A special mention must also go to Vanessa Ridehalgh, our wonderful Developmental Editor who was part of the journey.

And finally, we would like to thank our families who provided support and love during the writing of this textbook. They are at the coalface and often don’t see us for extended periods of time when we are in writing and editorial modes, but they are always there for us and this is greatly appreciated.

Judy Craft
Christopher Gordon
TEXT FEATURES

Key terms
Key terms are listed (with page numbers) at the beginning of each chapter. Important terms are also defined in the glossary at the back of the book.

Chapter outline
Chapter outlines summarise the content of each chapter (with page numbers) to help students navigate their way through the chapters.

Research in focus
Research in focus sections highlight areas of research that may offer insights or future treatments for particular pathophysiological conditions.

Focus on learning
Focus on learning boxes are scattered throughout each chapter and ask students to reflect on the main points just discussed. Answer guidelines are available online.
Compare and contrast signs and symptoms.

5 Using anatomical directional terminology, compare the ADULT his blood. Mr Jones takes the opportu nity to talk with you to neural defects, thereby reducing the actual prevalence malformations account for one-third of all apparent Central nervous system malformations are responsible congenital malformations, and 90% of CNS malformations commonly associated with the defect. It may also occur supplementation have been implemented in many EU stages of pregnancy increases the risk for neural tube appearance before birth, but the causes of this are poor, as it is not understood.

Neural tube defects occur in approximately 4.6 out of 10,000 live births in Australia each year, with about 25% of defects of neural tube closure. A = encephalos (Greek for "encephalos = brain), whereby embryonic neural tube fails to close properly producing a cavity. B = encephalocele (Greek for "encephalos = brain", and "kelyon = protrude") in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. C = neural tube defect of encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. D = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. E = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. F = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. G = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. H = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. I = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. J = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. K = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. L = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity. M = encephalocele in which the neural tube protrudes through a hole in the skull and extends into the cranial cavity.
This part focuses on health issues of particular concern for contemporary Australia and New Zealand. Our current lifestyles include modifiable risk factors that significantly increase our likelihood of developing major diseases. For example, stress, which is commonplace, is related to many chronic diseases, and obesity, which is in epidemic proportions, is a risk factor for the development of diabetes mellitus. Unless managed strictly, diabetes mellitus can have devastating complications. Furthermore, one in three adults will be affected by cancer, a leading cause of mortality. We also explore the interactions between genetics and environmental factors, which have an important role in many modern diseases. Finally, we examine the mental health of contemporary Australia and New Zealand, followed by issues specific to the Indigenous populations of Australia and New Zealand.
Introduction to contemporary health issues

Margaret Williamson

Chapter outline

Introduction, 1034
Australia and New Zealand: demographics, 1034
Current population, 1034
Population projections, 1034
Ageing, 1035
Hospitalisations, 1036
Mortality, 1036
Chronic diseases, 1039

Mental health, 1040
Indigenous health, 1040
Contemporary lifestyle, 1041
Stress, 1041
Dietary factors, 1041
Physical activity, 1042
Obesity, 1043
Health promotion initiatives, 1046
Introduction

Until this point in the textbook, we have explored pathophysiological processes at both a cellular level and an organ level. We have examined diseases of an organ system and explained how the pathophysiology and clinical manifestations of signs and symptoms arise. However, many diseases, such as atherosclerosis, affect more than one organ system, resulting in a range of clinical disorders. Moreover, while some diseases such as hepatitis may be primarily associated with only one organ system, they can greatly affect other body systems too. For instance, hepatitis can alter the coagulation, digestive, immune and nervous systems.

Unfortunately, in industrialised Western countries such as Australia and New Zealand, a large percentage of the population have been, or are currently, exposed to conditions that predispose them to altered health status and diseases that can affect several organ systems. The most obvious example of this is obesity, which can lead to a range of diseases. While most Australians and New Zealanders have a life expectancy that is among the longest in the world, our contemporary lifestyles expose us to a range of environmental circumstances that significantly contribute to poor health and morbidity (illnesses that contribute to decreased quality of life). Add to this a genetic predisposition to particular diseases and it can be seen that many individuals may not have optimum health. The areas of greatest concern are the expanding ageing population and the associated risk of disease (particularly cancer), increasing rates of obesity and diabetes mellitus in adults and children, the impact of stress on disease, the prevalence of mental health issues, and groups within the population who have poor health outcomes, such as the Indigenous population.

Health services in Australia and New Zealand face an overarching and paradoxical problem: on the one hand the population is getting older and advances in medical technology mean that life can be prolonged, but on the other hand, rates of morbidity and disease are increasing, due predominately to environmental and lifestyle factors. Many individuals you will encounter in the health service are likely to have poor health, with complicated pathophysiological conditions due to an increasing number of comorbidities. Accordingly, this section explores common contemporary health conditions affecting our populations. We also examine relationships between these altered health conditions and how they affect the whole body, rather than a single organ.

Contemporary health refers to the current health of individuals and the health status of the populations as a whole. In Western countries like Australia and New Zealand, individuals typically have a long life expectancy; life expectancy has increased as a result of comprehensive national childhood and at-risk group immunisation programs, improvements in public hygiene and an elevation in living standards. Furthermore, the majority of individuals have access to advanced medical technology, which significantly contributes to their quality of life. However, despite these factors, a number of health conditions and diseases significantly contribute to the poor health and morbidity of a large percentage of the population. The majority of diseases causing mortality in Australia and New Zealand are not the same as those causing mortality in developing nations. The World Health Organization identifies the leading cause of death in high income countries as coronary heart disease, followed by stroke and other cerebrovascular disease, then tracheal, bronchial and lung cancers.2

Although the medical management of such diseases has improved dramatically, lengthening life expectancy, larger numbers of individuals are now living with these diseases, which impact on their lifestyle.3 In this section, we address the issue of why these ‘Western diseases’ are so prevalent in our population.

Australia and New Zealand: demographics

Current population

Compared with the rest of the world, the populations of Australia and New Zealand are tiny. Collectively, as of 2016 the population of the two countries was approximately 29.0 million people (Australia: 24.3 million, New Zealand: 4.7 million), within a global population of just over 7.5 billion, making Australia and New Zealand the 53rd and 127th most populous countries in the world, respectively.4

Australia is one of the most sparsely populated countries in the world, but it is highly urbanised. Population density varies greatly across Australia, ranging from very low population density in remote areas to very high population density in some major cities, with almost 71% of Australia’s population living in metropolitan areas, mostly near the coast, and concentrated in the south-east corner (see Fig. 33.1). More than three out of every four New Zealand residents live in the North Island, and the majority live in one of New Zealand’s major cities (see Fig. 33.2). Collectively, these findings highlight the fact that rural residents are in the minority and that the majority of people choose to live in coastal regions, particularly urban settlements near the coast. This has several implications, as geographical location influences rates of morbidity and mortality. For example, it has been shown that rural residents have a lower life expectancy and higher rates of injury and disease than their urban counterparts.5 The reasons for this are likely to be multifactorial, but are strongly influenced by higher rates of behaviours that adversely affect their health, poorer access to education, employment and health services and a significantly lower life expectancy for the Indigenous population (see 'Indigenous health' below).

Population projections

The Australian Bureau of Statistics projects the population in Australia will increase to between 36.8 and 48.3 million people by 2061, and to between 42.4 and 70.1 million people by 2101.7 New Zealand’s projected population is approximately 5.4 million by 2036 and 6 million by 2061.10 The main reasons for this increase are a longer life expectancy and immigration.
While these two populations do not appear to be large, especially compared with countries such as China (1.4 billion), large sections of Australia are uninhabitable, and so the population growth will be predominantly in the cities. This future growth in the population will greatly expand the size of the ageing population.

**Ageing**

The Australian population is continuing to age, and this trend is expected to continue. This is due to a combination of sustained low levels of fertility combined with increasing life expectancy at birth. The median age of Australia's population is projected to increase to between 38.6 years and 40.5 years in 2031 and to between 41.0 years and 44.5 years in 2061.9 This change in age composition is projected to change considerably as a result of population ageing. By 2056 there will be a greater proportion of people aged 65 years and over and a lower proportion of people aged less than 15 years. The proportion of people between 5 and 15 years is projected to decrease to between 10% and 12% in 2061. The number of individuals aged 85 years and over in Australia is projected to grow rapidly to between 4.5% and 6% by 2061 and to between 5.6% and 7.8% by 2101. As a result, the population is becoming more elderly.11

The median age of New Zealand's population is projected to increase from 37.1 years in 2016, to 41.9 years in 2038 and to 46 years in 2068. Overall population growth is likely to slow after 2018, while the population aged 65 years and over is expected to double between 2016 and 2068, as the large baby-boomer generation enters this age group.10 By 2068, there will be 1.84 million New Zealanders aged 65 years and over, who are expected to make up 28% of all New Zealanders by 2068. In 2016, there are about three-quarters as many elderly New Zealanders as children. By 2068, there are projected to be at least twice as many elderly New Zealanders as children.

However, the dramatic increase in life expectancy seen over the last century is unlikely to continue in both countries, as projections are that while life expectancy in general is still increasing slightly, there is also an expectation of this decreasing due to obesity (refer to Chapter 35). Based on assumptions about continuing living standards, by 2055 projected life expectancy is expected to increase to 96.6 years of age for females and 95.1 years for males in Australia (see Table 33.1).11

In New Zealand, median life expectancy will increase to 89.1 years for males and 91.3 years for females by 2068.10 This highlights an important paradox touched on earlier: despite individuals in Australia and New Zealand having an increased life expectancy, the aged population will not necessarily be healthier. In fact, the ageing population will live with more morbidity, particularly the conditions and...
million days of patient care at 698 public and 624 private hospitals in Australia. The aged population require more hospitalisations than younger Australians — although those aged 65 and over make up 13% of the population, they made up the 41% of the hospitalisations and almost half of the patient days in hospitals. Women were admitted to hospital more frequently than men, particularly those in the younger and child-bearing age group between 15 and 44 years. Obese Australians were hospitalised for cardiovascular disease more frequently than those who were not obese.

In New Zealand, there were around 2 million admissions in public and private hospitals in 2013–14. Bed occupancy and hospital admission rates increased with age. Thirty-eight per cent of hospitalisations were for patients 65 years and over. In a pattern similar to the Australian statistics, females in the age group 15 to 44 years were hospitalised more frequently than males.

**Mortality**

In Australia, there were approximately 159,052 deaths in 2015. The leading underlying cause of death was coronary heart disease (including angina, blocked arteries of the heart and heart attacks; see Table 33.2) which was responsible for 19,777 deaths, 12.4% of all deaths registered in 2015. Dementia and Alzheimer’s disease were the second leading cause of death, followed by cerebrovascular diseases which include stroke, haemorrhages, infarctions and blocked arteries of the brain in 2015. The number of deaths due to dementia has increased by 193% over the past decade from 6,550 in 2006 to 12,625 in 2015.

In New Zealand, there were 31,168 deaths in 2014. As in Australia, coronary heart disease accounted for more deaths than any other disease, and was followed by cerebrovascular disease and lung cancer.

### TABLE 33.2 Causes of death: Australia 2015

<table>
<thead>
<tr>
<th>RANK</th>
<th>MALES</th>
<th>FEMALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coronary heart disease</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td>2</td>
<td>Lung cancer</td>
<td>Dementia and Alzheimer's disease</td>
</tr>
<tr>
<td>3</td>
<td>Dementia and Alzheimer's disease</td>
<td>Cerebrovascular diseases</td>
</tr>
<tr>
<td>4</td>
<td>Cerebrovascular diseases</td>
<td>Chronic lower respiratory diseases</td>
</tr>
<tr>
<td>5</td>
<td>Chronic lower respiratory diseases</td>
<td>Lung cancer</td>
</tr>
<tr>
<td>6</td>
<td>Prostate cancer</td>
<td>Breast cancer</td>
</tr>
<tr>
<td>7</td>
<td>Blood and lymph cancer</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>8</td>
<td>Diabetes mellitus</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>9</td>
<td>Colorectal cancer</td>
<td>Heart failure</td>
</tr>
<tr>
<td>10</td>
<td>Suicide</td>
<td>Kidney disease</td>
</tr>
</tbody>
</table>

### TABLE 33.1 Australians’ projected life expectancy (in years)

<table>
<thead>
<tr>
<th>LIFE EXPECTANCY AT BIRTH</th>
<th>2015</th>
<th>2025</th>
<th>2035</th>
<th>2045</th>
<th>2055</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91.5</td>
<td>92.6</td>
<td>93.6</td>
<td>94.4</td>
<td>95.1</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>93.6</td>
<td>94.5</td>
<td>95.3</td>
<td>96.0</td>
<td>96.6</td>
<td></td>
</tr>
</tbody>
</table>

diseases of arthritis, cancer, hypertension, coronary heart disease, osteoporosis, dementia, obesity and type 2 diabetes. The prevalence of disease is already higher in the aged population and this trend is expected to continue. Therefore, the aged population will be even more reliant on the healthcare system.

**Hospitalisations**

The bedrock of our healthcare system is our hospitals. In 2014–15, there were about 10.2 million admissions and 29
Fig. 33.3 shows the death rate per 100,000 people by gender and age group. Males have a higher death rate than females at all ages and death rates increase exponentially with age.

Diseases which prematurely cause death in developing countries do not cause significant mortality in Western countries. For example, rates of infant mortality from infections are very high in developing countries but are low in Western countries.

While individual causes of death provide evidence about the health of a nation, to obtain a more accurate depiction of the mortality of a nation, we need to examine the causes of death for various age groups. For instance, coronary heart disease is common in the aged population, cancer is more prevalent as individuals become older, injury, self-harm and poisoning are the major causes of death in the younger population, and perinatal conditions and congenital anomalies are the most common causes of infant mortality (see Table 33.4).

**FOCUS ON LEARNING**

1. Describe the likely changes in the populations of Australia and New Zealand in the next 50 years.
2. Examine the effect of an ageing population on hospitalisations and the average length of hospital stay.
3. Discuss the major causes of death in Australia and New Zealand and why they differ from the major causes in developing countries.

**TABLE 33.3 Causes of death: New Zealand 2014**

<table>
<thead>
<tr>
<th>RANK</th>
<th>MALES</th>
<th>FEMALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coronary heart diseases</td>
<td>Coronary heart diseases</td>
</tr>
<tr>
<td>2</td>
<td>External causes (e.g.</td>
<td>Cerebrovascular diseases</td>
</tr>
<tr>
<td></td>
<td>accidents and self-harm)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Dementia and Alzheimer’s</td>
<td>Dementia and Alzheimer’s</td>
</tr>
<tr>
<td></td>
<td>disease</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cerebrovascular diseases</td>
<td>Chronic lower respiratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>diseases</td>
</tr>
<tr>
<td>5</td>
<td>Lung cancer</td>
<td>Lung cancer</td>
</tr>
<tr>
<td>6</td>
<td>Chronic lower respiratory</td>
<td>Other forms of heart</td>
</tr>
<tr>
<td></td>
<td>diseases</td>
<td>disease^</td>
</tr>
<tr>
<td>7</td>
<td>Other forms of heart</td>
<td>External causes (e.g.</td>
</tr>
<tr>
<td></td>
<td>disease^</td>
<td>accidents and self-harm)</td>
</tr>
<tr>
<td>8</td>
<td>Prostate cancer</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>9</td>
<td>Colorectal cancer</td>
<td>Breast cancer</td>
</tr>
<tr>
<td>10</td>
<td>Diabetes mellitus</td>
<td>Diabetes mellitus</td>
</tr>
</tbody>
</table>

^Other heart diseases include pericardial diseases, valvular disorders, myocarditis, cardiomyopathy, conduction disorders, cardiac arrest and heart failure.

**TABLE 33.4 Causes of death by age group (top three causes): Australia**

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>MALES</th>
<th>FEMALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>Perinatal conditions and</td>
<td>Perinatal conditions and</td>
</tr>
<tr>
<td></td>
<td>congenital anomalies</td>
<td>congenital anomalies</td>
</tr>
<tr>
<td></td>
<td>Sudden infant death</td>
<td>syndrome (SIDS)</td>
</tr>
<tr>
<td></td>
<td>Other ill-defined causes</td>
<td>Other ill-defined causes</td>
</tr>
<tr>
<td>1–14 years</td>
<td>Land transport accidents</td>
<td>Land transport accidents</td>
</tr>
<tr>
<td></td>
<td>Accidental drowning and</td>
<td>Perinatal conditions</td>
</tr>
<tr>
<td></td>
<td>submersion</td>
<td>and congenital anomalies</td>
</tr>
<tr>
<td></td>
<td>Perinatal conditions and</td>
<td>Brain cancer</td>
</tr>
<tr>
<td></td>
<td>congenital anomalies</td>
<td></td>
</tr>
<tr>
<td>15–24 years</td>
<td>Suicide</td>
<td>Suicide</td>
</tr>
<tr>
<td></td>
<td>Land transport accidents</td>
<td>Land transport accidents</td>
</tr>
<tr>
<td></td>
<td>Accidental poisoning</td>
<td>Accidental poisoning</td>
</tr>
<tr>
<td>25–44 years</td>
<td>Suicide</td>
<td>Suicide</td>
</tr>
<tr>
<td></td>
<td>Accidental poisoning</td>
<td>Breast cancer</td>
</tr>
<tr>
<td></td>
<td>Land transport accidents</td>
<td>Accidental poisoning</td>
</tr>
<tr>
<td>45–64 years</td>
<td>Coronary heart disease</td>
<td>Breast cancer</td>
</tr>
<tr>
<td></td>
<td>Lung cancer</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>Suicide</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td>65–74 years</td>
<td>Coronary heart disease</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>Lung cancer</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td></td>
<td>Chronic obstructive</td>
<td>Breast cancer</td>
</tr>
<tr>
<td></td>
<td>pulmonary disease (COPD)</td>
<td></td>
</tr>
<tr>
<td>75–84 years</td>
<td>Coronary heart disease</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td></td>
<td>Lung cancer</td>
<td>Cerebrovascular disease</td>
</tr>
<tr>
<td></td>
<td>Cerebrovascular disease</td>
<td>Dementia and Alzheimer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disease</td>
</tr>
<tr>
<td>85+ years</td>
<td>Coronary heart disease</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td></td>
<td>Dementia and Alzheimer</td>
<td>Dementia and Alzheimer</td>
</tr>
<tr>
<td></td>
<td>disease</td>
<td>disease</td>
</tr>
<tr>
<td></td>
<td>Cerebrovascular disease</td>
<td>Cerebrovascular disease</td>
</tr>
</tbody>
</table>
FIGURE 33.3
Death rate per 100 000 according to age and sex.
Most deaths occur in the older population. A Australia. B New Zealand.
Chronic diseases

Patients in acute-care hospitals in Australia and New Zealand are considerably different to those of 20 years ago. Patients now have more complex health problems, and are more likely to be older and require specialist care. Furthermore, they are statistically more at risk of developing problems during their hospital stay, such as infections, deep vein thromboses and cardiac events.

Chronic diseases are the leading cause of illness, disability and death in Australia. A measure called ‘burden of disease and injury’ has been developed to better quantify the impact of disease on the population and compare the various conditions associated with illness, disability and premature death. In 2011, in Australia the conditions that caused the greatest burden were cancer, cardiovascular disease, mental health and substance use disorders, musculoskeletal disorders, and injuries. In New Zealand, neuropsychiatric disorders were the leading cause of health loss followed by cancer, cardiovascular diseases and musculoskeletal disorders.

The burden of disease and injury changes according to age. For example, mental and substance use disorders were the main cause of disease burden in Australians 15 to 49 years, while cancer caused the most burden for those aged 50 to 79, and cardiovascular disease for those 80 years and older.

Cardiovascular disease remains one of the most significant contributors to disability and death in older people. In more recent years the death rate has decreased, mainly due to reduction of risk factors such as smoking (decreased now to 12% of Australians; see Chapter 37), and improvements in the treatment of the diseases. See Chapter 23 for more detail about the various conditions which make up cardiovascular disease.

As the population ages, there is an increasing number of people living with and dying from cancer and dementia. The good news is that some cancers are on the decline. For instance, cervical cancer is likely to continue to decline, primarily due to improvements in early screening, and the mass introduction of the vaccine Gardasil, which provides protection against human papillomaviruses thought to be responsible for 80% of cervical cancers in Australia. The rates and types of cancers in the Australian and New Zealand populations are discussed more thoroughly in Chapter 37.

In 2011, it was estimated that more than a quarter of a million Australians had dementia. Estimates suggest that by 2030, more than half a million Australian will have dementia and by 2050, more than 950 000. See Chapter 9 for a more detailed discussion of dementia and Alzheimer’s disease.

Another major chronic disease that is likely to be encountered by healthcare professionals is diabetes mellitus. Rates of obesity are strongly related to the development of type 2 diabetes. It has been estimated that by 2050 approximately 14% of Australians (1 in 7) will have type 2 diabetes. Therefore, individuals with type 2 diabetes will be very prevalent in the hospital patient population and associated healthcare services. Chapter 36 explores type 2 diabetes in detail.

Table 33.5 lists the risk factors for selected chronic disease. Physical inactivity and diet are discussed below.

### Table 33.5 Risk factors for chronic disease

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>TOBACCO USE</th>
<th>PHYSICAL INACTIVITY</th>
<th>ALCOHOL MISUSE</th>
<th>DIETARY RISKS</th>
<th>OBESITY</th>
<th>HIGH BLOOD PRESSURE</th>
<th>ABNORMAL BLOOD LIPIDS</th>
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<td>Coronary heart disease</td>
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<tr>
<td>Depression</td>
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</tbody>
</table>

* Dietary risks relate to high intake of saturated fat
* Dietary risks relate to insufficient calcium and vitamin D
* Associated with liver and oral cancers
* Dietary risks relate to high intakes of processed (preserved) meat and a high intake of red meat is associated with colorectal cancer
* Associated with breast cancer in post-menopausal women
* Associated with rheumatoid arthritis
* Associated with osteoarthritis
Mental health

Until this point, we have explored the pathophysiology of common diseases and disorders which mainly have a physical origin. However, mental illness is known to have an enormous impact on contemporary health in Australia and New Zealand. Estimates from the 2007 National Survey of Mental Health and Wellbeing (SMHWB) suggest that more than 7 million Australians will experience a common mental disorder (such as depression, anxiety, or a substance use disorder) during their lifetime. Each year, 20% of the population, or 3 million Australians, aged 16–85 years are estimated to experience symptoms of a mental disorder.

The second National Survey of People Living with Psychotic Illness, conducted in March 2010, estimated that almost 64,000 people in Australia had a psychotic illness and were in contact with public specialised mental health services each year. Psychotic illnesses are less common, but usually more severe, forms of mental illness than those covered in the SMHWB. Schizophrenia is the most common psychotic illness.

When looking at access to mental health services, about 1.8 million Australians (8% of the population) received public or private mental health services in 2009–10. Around half a million people received mental health services from general practitioners. Over $8 billion, or $344 per Australian, was spent on mental health-related services in 2013–14 with state and territory expenditure on specialised mental health services accounting for most of this ($4.9 billion).

The aetiology of mental health is complex. There are many theories about the pathophysiology of these disorders, and while many have limitations, these theories have greatly enhanced our ability to treat people with pharmacological agents. It has been shown that some mental illnesses are likely to have a strong genetic component; however, the effect of the environment is also strongly implicated. In recent years, advancements in neuroimaging have assisted in understanding the pathogenesis of mental illness. Chapter 39 is entirely devoted to our current understanding of the neurobiology of mental illness.

Indigenous health

The Indigenous populations in Australia and New Zealand have poorer health outcomes than the non-Indigenous populations. Compared with their non-Indigenous counterparts, Indigenous Australians and New Zealanders are extremely disadvantaged, in terms of morbidity, mortality and life expectancy.

Life expectancy for Indigenous Australians is much lower than for the non-Indigenous. Indigenous males born in 2010–12 can expect to live to 69.1 years, 10.6 years less than for the non-Indigenous. Indigenous females born in the same time period can expect to live to 73.7 years, 9.5 years less than non-Indigenous females. In 2011–12, age-specific death rates were higher for Indigenous people than for non-Indigenous people across all age-groups, but the rate ratios were highest in the young and middle adult years. The infant mortality rate is also considerably higher than that for non-Indigenous people (6 per 1000 live births compared to 4 per 100,000 live births).

Indigenous Australians rate their health as considerably lower than that of non-Indigenous Australians (see Fig. 33.4). Indigenous Australians are also almost four times as likely to die with chronic kidney disease as a cause of death than non-Indigenous Australians.

These are just a few examples of the poor health status of the Indigenous Australian population. In Chapter 40, we focus on diseases and conditions that are common to Indigenous Australians and the factors associated with these pathophysiological states.

The health of the Māori population in New Zealand is poor compared with that of the non-Māori. For example, the life expectancy in 2012–14 for Māori males was 73.0 years, more than 7 years less than that for non-Māori males, 80.3 years. Similarly, the life expectancy for Māori females was 77.1, which is more than 7 years less than that for non-Māori females, 83.9 years.

There is also a higher infant mortality rate in Māori compared with non-Māori in New Zealand (6.8 deaths per 1000 live births versus 4.5 deaths per 1000 live births). Māori also experience higher prevalence and mortality for a number of chronic diseases including cardiovascular disease, cancer, diabetes and asthma. These examples are elaborated further in Chapter 41, where the health of Māori is explored in greater detail.

![Figure 33.4](image-url)

**Figure 33.4**

Self-reported health ratings by Indigenous and non-Indigenous Australians.

More non-Indigenous Australians rate their health as excellent/very good, while more Indigenous Australians rate their health as fair/poor.
FOCUS ON LEARNING
1. Discuss which diseases are likely to be major causes of morbidity and mortality in the future.
2. Describe reasons why the health status of the Indigenous populations in Australian and New Zealand are poor.

Contemporary lifestyle
While we are now living longer, an increasing number of older people are living with chronic illness. Unfortunately, in our society ageing is associated with an increasing prevalence of chronic diseases such as diabetes mellitus, depression, hypertension, coronary heart disease, arthritis, osteoporosis, cancer and neurological deterioration like dementia. In this section we look at some of the conditions that impact on the development of these chronic diseases.

A range of genetic, social, economic and environmental factors are recognised as increasing the risk of developing a particular health condition. Specific lifestyle and related factors which have been identified as negatively impacting health include:
- poor diet and nutrition
- lack of physical activity
- being overweight or obese
- smoking and excessive alcohol consumption.

Dietary factors, lack of physical activity, and overweight and obesity are discussed in the next sections, as these impact on chronic diseases that affect multiple body systems. Smoking is discussed in Chapter 25 in relation to its effects on the lungs, and alcohol is discussed in Chapter 27 in relation to alcoholic liver disease. However, it must be remembered that in addition to the effects of alcohol on the liver, alcohol also provides energy which can be in excess of body requirements, and as such it contributes to overweight and obesity.

Stress
One aspect of contemporary lifestyle that has been shown to influence the development of disease and our response to disease is the impact of stress. Stress can be both physical and psychological. The stimuli for stress are referred to as stressors and they can vary, both in their manifestation and how they affect an individual. For instance, exercise can be considered a physical stressor. Over time, with repeated sessions and in prescribed amounts, exercise can have a positive effect on an individual and lead to significant increases in cardiorespiratory fitness. However, exercise can also cause depression of the immune system, especially in the period immediately after the exercise session. Moreover, prolonged endurance-type exercise in environmental conditions with an elevated air temperature may lead to heat stroke, which in turn can lead to death. Therefore stress can be both beneficial and detrimental. The outcome depends on many factors, but it should be remembered that individuals respond differently to apparently similar stress situations. It also should be remembered that excess exercise is not common in our populations, as indeed insufficient physical activity is a common health risk.

Physical stressors, such as pain and exercise, are the most obvious examples of stress. However, psychological stressors can also impact negatively on an individual. It has been suggested that psychological stress occurs when the environmental demands that the individual perceives are greater than the individual's adaptive capability. Whichever way the stress is perceived, the main physiological response is activation of the sympathetic nervous system with a release of the hormones cortisol, adrenaline and noradrenaline. This effect is termed the hypothalamic–pituitary–adrenal axis, because it involves all of these glands. The release of hormones from these glands has a wide-ranging effect, and in prolonged activation can lead to dysfunction of organ systems, such as the cardiovascular, respiratory, hepatic and immune systems. In addition, psychological stress can influence or cause the development and progression of disease, and psychological stress is a major risk factor in our populations.

Many diseases have been implicated with stress, including autoimmune disorders, cancers, osteoporosis, dementia, cardiovascular disease and diabetes mellitus. The development of autoimmune disorders is likely to be multifactorial, with genetic, hormonal and immunological factors influencing the pathogenesis. However, in up to 50% of all autoimmune disorders the onset of disease has been attributed to unknown trigger factors. It has been suggested that either physical or psychological stress may be the unknown trigger in some instances and that this may influence the development of autoimmune diseases such as rheumatoid arthritis. The likely link arises from stressors triggering the neuroendocrine hormones, causing immune dysfunction by changing cytokine production. This can lead to autoimmune disorder manifestation.

Stress, the development of stress and the impacts on disease pathogenesis are discussed in detail in Chapter 34.

Dietary factors
Overweight and obesity are caused when energy intake from diet and drinking is greater than energy expended from physical activity and essential bodily functions such as metabolism. Recent surveys have shown that more than one-third of Australian and New Zealanders adults are overweight and a further 30% are obese, meaning that overall, approximately two-thirds of our populations are carrying excess weight. The long-term, regular consumption of fast food has been linked to weight gain through overconsumption of high energy density foods and large portion sizes. Australian studies have found...
that fast foods are high in energy, total and saturated fat and sodium, and that the average fast food meal can provide approximately half of an adult's daily energy requirement. In addition, it has been estimated that almost one-third of the average energy intake is now derived from takeaway food, demonstrating a fundamental shift in dietary habits away from food being prepared in the home.44 Evidence shows that takeaway and fast-food consumption is linked to weight gain and insulin resistance, which often lead to obesity and the development of type 2 diabetes.45 While being higher in overall energy, fast foods also have fewer micronutrients, such as vitamins and minerals, and may cause nutritional deficiencies.46

Individuals from lower socioeconomic groups have been shown to consume more fast foods than individuals from higher socioeconomic groups.42 The prevalence of overweight and obesity is highest in inner, outer and remote regions, and among those in lower socioeconomic groups.

As well as the types of food that Australians and New Zealanders are consuming, the frequency and amounts of food being consumed have changed. For instance, Australian children are now consuming more 'extra' food, eating more meals than required each day. Such foods are often high in energy, fat and sugar, are referred to as 'energy dense' foods and have been shown to make up almost half of their daily energy intake.43 The other major concern is the marketing strategy of 'upsizing' that has occurred in the fast-food industry. Although this has been driven by large multinational companies, a survey of Australian fast-food outlets has shown that for each percentage increase in cost, there is a doubling of the energy value of the food items, comprising mainly fats and sugars.44 This is particularly of concern for individuals aged 15–24 years, as they are the greatest consumers of fast food.40,44 Thus overconsumption of food is a major problem in contemporary society.

Dietary guidelines provide simple effective information about what the population should be eating, including the types of foods and the portions. A broad outline of the Australian dietary guidelines is shown in Box 33.1.

In Chapter 38 we consider the relative importance of genetic factors and the environment or lifestyle factors in disease development. Dietary factors are a significant part of contemporary lifestyles in this context.

Physical activity

The other area of significance to modern lifestyles is the amount of physical activity that the general population undertakes. We are not simply referring to formal sport here, but rather to the overall decrease in physical activity that has occurred due to the use of modern conveniences. Think of the multitude of devices that lower the amount of physical activity we undertake daily: cars, escalators, lifts, television remote controls, the internet (including online purchasing, email, social media), washing machines, microwaves, home delivery of groceries, domestic services (e.g. cleaning, ironing, washing), fast-food shops and mobile phones. Although many of these devices have increased productivity and accessibility for the majority of the population and are therefore seen as great advances, they have undoubtedly also contributed to a decline in physical activity in the general population.

The national physical activity guidelines for Australians recommend approximately 30 minutes of moderate-intensity exercise most days of the week (see Box 33.2). In Australia and New Zealand large national surveys have been carried out asking participants to report their exercise activity levels over a specified period, usually the previous 1–2 weeks. Accordingly, these statistics are based on a snapshot of physical activity, rather than longitudinal analysis. In Australia, more than 50% of adults (18–64 years old) participated in sufficient physical activity in the last week. Thirty per cent were insufficiently active and 15% were inactive (had no exercise in the last week).46 New Zealand has similar levels of physical activity, with 48% classified as physically active and 15% as physically inactive.47 Around 70% of Australian children and young people aged 5–17 years watched 2 or more hours of screen-based entertainment per day and so are participating in activities that do not require increased energy expenditure.45

The prevalence of physical inactivity increases with age; this is consistent in both Australia and New Zealand (see Fig. 33.5).

The number of new bicycles sold has increased over the last decade; in fact, new bicycle sales outnumbered new motor vehicle sales. While this would seem encouraging,
it should be emphasised that just because bicycle sales are high, this does not translate into increased levels of physical activity. Although many people are taking steps to increase their physical activity levels, adherence to physical activity programs is generally weak. A number of factors contribute to this poor adherence, including the person's age, gender, type of exercise, obesity and external motivators. Unfortunately, the positive aspects of regular physical activity are far outweighed by inactivity in the population.

When coupling these facts with the changes taking place in eating habits, it will be seen that energy intake (eating) is more than energy expenditure (physical activity) for a large percentage of the population, hence the large numbers of overweight and obese individuals.

**BOX 33.2 Physical activity and sedentary behaviour guidelines**

**Physical activity**
- Any physical activity is better than none at all. Even if you currently do no physical activity, you can build up gradually to the recommended amount by commencing with a small amount each day.
- Try to be active on most days of the week.
- Accumulate 150 to 300 minutes of moderate intensity physical activity or 75 to 150 minutes of vigorous intensity physical activity each week. This can be an equivalent combination of both moderate and vigorous activities.
- Do muscle strengthening activities on at least 2 days each week.

**Sedentary behaviour**
- Minimise the amount of time you spend sitting down.
- Break up long periods of sitting as often as possible.

**FOCUS ON LEARNING**
1. Describe how stress can contribute to the development of disease.
2. Discuss how changes in nutrition and eating habits have changed in Australia and New Zealand over the last three decades.
3. Discuss how changes in contemporary lifestyle have contributed to a reduction in physical activity levels.

**Obesity**

By far the greatest impact that contemporary lifestyle has had on health status is the increased prevalence of overweight and obese individuals in the population. A simple yet precise explanation for the cause of overweight and obesity, which is a more extreme category of overweight, is that energy intake exceeds energy expenditure and causes an energy imbalance over time, leading to the development of obesity (see Fig. 33.6). In 2014–15, 35.0% of Australians aged 18 years and over were overweight and a further 27.9% obese. Only approximately 35.0% were of healthy weight and 1.6% were underweight.

Similar proportions of New Zealand adults were overweight and obese. More males were overweight or obese compared with females (70.8% vs 56.3%). Worryingly, the number of overweight and obese adults in Australia has doubled since the 1980s. Children are not spared from the issue, with 27.4% of children classified as either overweight or obese, which is a significant increase since the 1970s.

Australians living in rural or remote areas are more likely to be overweight or obese (see Fig. 33.7). The number of people who are overweight or obese is likely to continue to increase. It has been estimated that almost 7 million Australians will be classified as obese by 2025 (see Fig. 33.8).

The prevalence of diseases associated with obesity will also continue to increase. Already in Australia some 300 000 excess hospitalisations due to cardiovascular-related conditions have been attributed to obesity.

The high rates of obesity and overweight may be related to people's perceptions of their body mass. Evidence is emerging that people do not consider themselves to be overweight or obese, despite calculations clearly showing that they are in the overweight or obese range. In fact, within the population who are either overweight or obese, almost half of men and about one-fifth of women consider their weight to be in the acceptable range. One reason for this may be the incremental increase in people's weight over time: individuals often acquire excess body mass over months or years so their weight gain may pass unnoticed. It also may be that with the majority of our population being overweight or obese, an individual may perceive their body size as being similar to the size of other people, and therefore not realise that they are overweight.
there is no correction such as a reduction in food intake at the next meal or an increase in energy expenditure, and so this excess energy is converted to fat for storage. As a result, over time these small increases accumulate, and the individual will eventually have a significant increase in body mass. The individual can be considered in a state of altered homeostasis, as no correction is readily available in the short term, and as a result, the obesity may lead to significant health problems. Fig. 33.9 illustrates this example.

Another consideration for overweight and obese individuals is the estimated reduction in their life expectancy. A recent meta-analysis of 189 studies of almost 4 million adults, including Australians and New Zealanders, found that being overweight or obese is associated with an increased risk of premature death, which is second only to smoking. The risk of premature death (before age 70) among those who are overweight or obese is increased by 10.5% for men and 3.6% for women. Studies have shown that if a younger adult is obese, the likelihood of premature death increases, although this is more strongly correlated with the severely obese. As the current obese population ages, the extent of the presumed reduction in life expectancy will become more apparent. It should be noted that this needs to be balanced against the advancements in medical technology and healthcare, which are projected to continue to improve in the future.

The last area that links the contemporary health issue of obesity with chronic disease is its impact on the pathogenesis of chronic diseases. We now have clear evidence linking obesity with disease development and progression. Based on the rates of obesity in the current population, it is estimated that obesity causes 20 to 25% of type 2 diabetes mellitus, cardiovascular disease, colorectal and breast cancer. In fact, there are strong links between obesity and a variety of diseases, with causal links with the diseases listed in Fig. 33.10.
FIGURE 33.8
The projected increase in the prevalence of obesity in Australia until 2028. Projections demonstrate that obesity is expected to affect more Australians into future years.

FIGURE 33.9
Altered homeostasis leading to overweight and obesity.
A An acute alteration in blood glucose level is counteracted by the release of insulin to restore the blood glucose level to normal levels. This is an example of a negative feedback response and usually occurs in seconds to minutes, and importantly, homeostasis is now restored. B The individual starts with normal body mass, but incremental changes in physical activity level and energy intake (type of food and portion sizes) can lead to increases in body mass. Over time, usually months to years, this imbalance in energy intake and expenditure can lead to overweight or obesity. This can be considered a semi-permanent homeostatic imbalance. If the individual can lose weight and return to a normal body mass, homeostatic balance will be restored.
Department of Health and Ageing, and State/Territory Departments of Health in the development and implementation of programs for the prevention of chronic disease
• work cooperatively with other organisations, including Aboriginal and Torres Strait Islander health organisations, which are active in the field of chronic disease prevention, as appropriate.  

The New Zealand government has a similar approach and has published a wide range of objectives to improve the overall health of New Zealanders. The objectives are to:
• reduce smoking
• improve nutrition
• reduce obesity
• increase the level of physical activity
• reduce the rate of suicides and suicide attempts
• minimise the harm caused by alcohol and illicit and other drug use to individuals and the community
• reduce the incidence and impact of cancer
• reduce the incidence and impact of cardiovascular disease
• reduce the incidence and impact of diabetes
• improve oral health
• reduce violence in interpersonal relationships, families, schools and communities
• improve the health status of people with severe mental illness
• ensure access to appropriate child healthcare services, including well child and family healthcare and immunisation.

In addition, there are now physical activity guidelines to help New Zealanders aged 65 years and over live longer, healthier, and more independent lives. These include:
• spending more time being physically active and less time sitting down
• any activity is better than nothing, and it all adds up
• daily activities such as walking to the shops, vacuuming or gardening, all count
• aiming for at least 30 minutes of activity, 5 days a week, that increases breathing and heart rates is ideal — such as brisk walking, cycling, swimming, or playing with grandchildren.

**FOCUS ON LEARNING**
1. Discuss reasons for the high numbers of overweight and obese individuals in the population.
2. Discuss the links between obesity and disease progression.

## Health promotion initiatives

The Australian Chronic Disease Prevention Alliance (ACDPA) is an alliance of five non-government health organisations which are working together in the primary prevention of chronic disease, with particular emphasis on the shared risk factors of poor nutrition, physical inactivity, overweight and obesity and their social determinants.

The members of the ACDPA are:
- Cancer Council Australia
- Diabetes Australia
- Kidney Health Australia
- National Heart Foundation of Australia
- The National Stroke Foundation.

The aims of the alliance are to:
• develop evidence-based recommendations and initiatives that will contribute to the prevention of chronic disease and to provide leadership and a strong unified advocacy voice for the prevention of chronic disease
• make evidence-based recommendations on priorities for action in the prevention of chronic disease to government
• develop initiatives contributing to the prevention of chronic disease, which may be best achieved through the collaborative work of ACDPA members, while complementing the activities of member organisations
• work cooperatively with government and members of parliament at all levels, including the Australian
Australia and New Zealand: demographics

- The populations of Australia and New Zealand are small compared with most other countries: Australia and New Zealand are the 53rd and 127th most populous countries in the world, respectively.
- Australia’s population is projected to increase to between 37 and 48 million by 2050.
- Life expectancy in Australia is one of the highest in the world; New Zealand is not far behind in life expectancy rates.
- The aged population is projected to increase dramatically in the next 40 years, which will significantly impact on health services.
- In 2014–15, there were about 10.2 million admissions to hospital in Australia and in 2013–14, there were around 2 million admissions to hospital in New Zealand.
- Each year, approximately 159 000 Australians and 30 000 New Zealanders die. There are more male deaths than female deaths.
- Coronary heart disease remains the greatest single cause of death in both countries.

Contemporary lifestyle

- Stress activates the sympathetic nervous system and causes a release of the hormones cortisol, adrenaline and noradrenaline, which can lead to organ dysfunction and the development and progression of disease.
- The dietary habits of contemporary lifestyles have changed over the last 30 years. Takeaway and fast foods are consumed regularly in Australian and New Zealand households, and there is strong evidence linking this to weight gain.
- For a large percentage of the Australian and New Zealand populations, physical activity levels have declined below the recommended 30 minutes of exercise most days of the week.

Obesity

- Approximately 63% of the Australian population are either overweight or obese.
- More males are classified as overweight or obese compared to females.
- Approximately 27% of children aged 5–17 are overweight or obese.
- Rates of overweight and obesity do not appear to be confined to the urban populations of Australia and New Zealand.
- Almost 7 million Australians are expected to be classified as obese by 2025.

Health promotion initiatives

- The Australian and New Zealand governments have identified a range of national health priorities, including preventing and managing diseases and conditions that cause significant morbidity to the community.
- The Australian and New Zealand governments have initiated multiple programs to improve the health of their populations, essentially in response to contemporary health issues.
ADULT
Mary is a 24-year-old Aboriginal Australian about to give birth to her third child. She lives with her partner, aged 32 years, and her extended family in a remote area of Western Australia that has a grocery store and a fuel station. The nearest access to medical care is a medical centre over 5 kilometres away, where a weekly antenatal clinic is held. She has been diagnosed with gestational diabetes, which was also apparent with her two previous pregnancies. A general practitioner visits the medical centre twice a week but Mary will have to attend the nearest hospital (which is 30 kilometres away) to give birth.

1. What is the life expectancy of an Aboriginal Australian compared to a non-Aboriginal individual?
2. Discuss the incidence of diabetes in the Aboriginal population.
3. Compare the infant mortality rate for Aboriginal babies to those of non-Aboriginal.
4. Highlight the problems Mary may encounter due to limited provisions at the grocery store.
5. Outline the challenges that may arise for Mary following the birth of her baby due to limited access to healthcare.

CASE STUDY
AGEING
Max is 75 years old. He lives in the country and is married to Jess (who is 73 years old), has four children and seven grandchildren. He has never smoked, drinks two beers every Friday evening with his mates at the local hotel, eats a nutritionally balanced diet and is a normal weight for his height. He worked in a timber mill for all his working life and was physically active, playing sport regularly until recently. His eldest son, John, aged 54, has just been diagnosed with coronary heart disease with an 8-year history of type 2 diabetes mellitus. John is obese. His siblings are overweight but have not been diagnosed with any diseases.

1. Explain why John may have type 2 diabetes and coronary heart disease but his father does not.
2. John has developed coronary heart disease at a relatively young age. Discuss the influence of genetic and environmental factors on ‘Western diseases’.
3. Outline the diseases that are likely to affect Max and Jess and which may contribute to their deaths.
4. Describe the changes in contemporary lifestyle that may have contributed to Max and Jess’s children’s weight and medical problems.
5. Discuss the possibility that Max and Jess’s grandchildren may have a lower life expectancy than their grandparents and parents.

REVIEW QUESTIONS
1. Describe the population demographics of either Australia or New Zealand.
2. Describe how the ageing population will change the demographics of Australia.
3. Outline how many people die each year in Australia and New Zealand and list the 5 most common reasons.
4. Name 5 conditions that contribute most to the burden of disease in Australian or New Zealand.
5. Discuss why the average length of stay in hospital is decreasing.
6. Describe how stressors in contemporary lifestyles have contributed to disease.
7. Provide reasons for dietary changes in both the child and the adult populations in the last 30 years.
8. List the 4 recommendations associated with physical activity to achieve good health.
9. Explain why obesity and overweight rates are high in the Australian and New Zealand populations.
10. List measures the governments of Australia and New Zealand are undertaking to improve the health of their populations.