GERIATRIC MEDICINE AND ELDERLY CARE

Lecture Notes

Claire G. Nicholl
K. Jane Wilson
Shaun D'Souza

Ninth Edition

with website

WILEY Blackwell

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Claire G. Nicholl

MB FRCP
Consultant Geriatrician (Emerita)

K. Jane Wilson

MB FRCP
Consultant Geriatrician

Shaun D'Souza

MB MRCP
Consultant Geriatrician

All of:
Department of Medicine for the Elderly
Addenbrooke's Hospital
Cambridge University Hospitals NHS Foundation Trust
Cambridge, UK

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Preface

The ninth edition was commissioned before COVID-19, but the pandemic and its aftermath diverted attention from book writing, and the landscape of medicine has changed since the previous edition in 2012. Much of the text has been completely rewritten to reflect this.

Whatever branch of medicine you are studying or working in, with a few exceptions such as obstetrics or paediatrics, most of your patients will be older, or very old. Apart from Africa, this is now true across the world. Geriatricians have always promoted treating a person's 'biological age' rather than their 'chronological age', but this was difficult to define. The concept of frailty and simple ways to assess it are making this a reality. Outcomes across a range of specialties are linked to frailty rather than age, and older people who are likely to benefit are getting better access to new drugs and surgical procedures. All 21st century doctors need a solid grounding in geriatric medicine to be comfortable treating the majority of the patients they will see.

The biggest change for UK undergraduates is the upcoming Medical Licensing Assessment. Some medical schools still teach a 'geriatrics-light' version of the medical curriculum, but the General Medical Council content map focuses on topics that doctors are likely to encounter during the UK Foundation Programme. This obviously includes medicine that is relevant to older people, the biggest users of the health service.

The British Geriatrics Society published an updated curriculum for undergraduates in 2023, and this book covers this as well as the current European version. Global aspects of ageing are explained, and there is some detail on the organisation and delivery of health care in the UK. This can be difficult for students to grasp and will be particularly helpful for overseas-trained doctors taking the Professional and Linguistic Assessments Board (PLAB) examinations to work here. With increasing differences across the four nations, most detail is given about England, but the main differences are highlighted. The content will also provide a useful starting point for trainees revising for their Specialty Certificate Examination.

When so much information is instantly available online, is there still a place for textbooks? We believe so! The clue is the amount of information. Consider a well-defined topic such as 'Parkinson's disease' (PD). The National Institute for Health and Care Excellence (NICE) website currently lists 18 'products' about PD, with hundreds of pages, dating back to 2003. NICE Clinical Knowledge Summaries are shorter but also run to tens of pages, require multiple clicks to navigate, and sometimes give different advice to NICE guidelines. Then there are multiple 'best practice' sites, specialist society guidelines and finally the vast resource of primary literature. The advantage of a book is that we have provided a synthesis of the most important points that are relevant to our clinical practice and highlighted areas of controversy. Once you have a basic grasp of an area, exploring it online will be more rewarding.

This book, like the population, is a little fatter than its predecessors. This is the result of both more advances in medicine being offered to older people (there is a new chapter on geriatric oncology) and a decision to include more explanation in the text. For example, there is enough detail about bone metabolism to understand, rather than just memorise, the drugs for osteoporosis. Our approach to medicine that empowers patients, and values working with the multidisciplinary team is relevant to patients of any age with chronic disease. For simplicity, when describing the prevalence of disease, female sex is used when referring to those assigned female at birth.

A typical older patient is more complex than a younger patient because of the interaction between their unique long-life experience and various comorbidities. Therefore, geriatric medicine is the medicine of complexity – interesting, varied, and challenging. If you enjoy using clinical acumen, leading and working in a team, and thinking about what really matters to an individual patient rather than following guidelines, consider a career in geriatric medicine. In addition to their core inpatient and community work, geriatricians are in demand across a wide and expanding range of clinical areas, for example in orthopaedics, surgical liaison, acute assessment, falls and syncope and movement disorders.

Geriatricians provide a large proportion of the examiners for PACES, the Practical Assessment of Clinical Examination Skills examination for the Royal College of Physicians. They are often excellent teachers, successful as medical managers and there are numerous opportunities for basic, epidemiological, and clinical research. There are many options for working overseas. After retiring from full-time work, CN had an enjoyable and satisfying time working and teaching in Botswana and teaching the European geriatrics curriculum as a visiting professor at the University of Pavia in Italy.

For years, geriatricians may have felt a little overshadowed by their single-organ specialty colleagues. In a world where patients are told they must present a single problem in a consultation with their GP and guideline medicine prevails in hospitals, the value of a comprehensive but individualised approach is increasingly recognised by patients, families, and colleagues. This edition has reverted to its original name, Lecture Notes in Geriatric Medicine.

Claire G. Nicholl
K. Jane Wilson
Shaun D'Souza
Cambridge, October 2024

Note about the cover

Cover image by Francesca DB Photography.

Isabella Mastantuono with her first great-granddaughter, Sofia.

Isabella had a very prolonged hospital stay. Her medical team began to wonder if they should keep on with burdensome rounds of treatment, striving to try to get her better. Isabella and her family had a very different perspective. Four months after her discharge, they sent the team this photograph of Isabella, who was doing well and especially enjoying spending time with Sofia.

Published with permission from Isabella, Sofia's parents, and Francesca.

Note about doses

We have given doses of common drugs to help with familiarity and have tried to ensure that there are no errors, but please always check with a primary source such as the BNF or product literature before prescribing.

Acknowledgments

Thanks to Dr Matthew Butler for his input to the cardiology chapter, Prof. Liz Warburton for her contribution to the stroke chapter and Dr James Tanner for providing images.

We would also like to thank Nigel, Jo, and Hettie for their patience and support.

Abbreviations

5-HT	5 hydroxytryptamine (serotonin)
5-HT_{2A}	5-HT2A receptor
A&E	accident and emergency, usually now known as the emergency department
AA	alcoholics anonymous
AA	attendance allowance
AAA	abdominal aortic aneurysm
AADC	aromatic amino acid decarboxylase
AAFB	acid and alcohol fast bacilli
$AaPO_2$	alveolar-arterial oxygen tension difference
AAV	adeno-associated virus
Aβ	amyloid beta-peptide
ABCDE	approach for resuscitation: airway, breathing, circulation, disability, exposure
ABG	arterial blood gas
ABL-1	tyrosine protein kinase proto-oncogene
ABPI	arterial brachial pressure index
ACA	anterior cerebral artery
ACB	anticholinergic burden
ACE	angiotensin-converting enzyme
ACEi	ACE inhibitor
AChE	acetylcholinesterase
AChEi	acetylcholinesterase inhibitor
AChR	acetylcholine receptor
ACiS	anterior circulation ischaemic stroke
ACP	advanced care planning
ACR	albumin : creatinine ratio
ACS	acute coronary syndrome
ACS	anterior circulation stroke (context essential)
ACS NSQIP	American College of Surgeons national surgical quality improvement program
ACTH	adrenocorticotrophic hormone
AD	advance decision
AD	Alzheimer's disease
ADH	antidiuretic hormone
ADL	activities of daily living
ADORE	drug trial of edaravone in ALS
ADR	adverse drug reaction
ADRT	advance decision to refuse treatment
ADT	androgen deprivation therapy
AEDs	anti-epileptic drugs, now known as ASMs, see below
AF	atrial fibrillation
AFO	ankle-foot orthosis
AIDP	acute inflammatory demyelinating polyradiculoneuropathy
AIDS	acquired immune deficiency syndrome
AIHA	autoimmune haemolytic anaemia
AIP	acute interstitial pneumonia
AJGP	Australian Journal of General Practice
AKI	acute kidney injury
AKT	a serine/threonine protein kinase, also known as protein kinase B, PKB
ALD	alcoholic liver disease
ALL	acute lymphoblastic leukaemia
ALP	alkaline phosphatase
ALS	amyotrophic lateral sclerosis
AMD	age-related macular degeneration
AMHP	approved mental health practitioner
AML	acute myeloid leukaemia
AMP/ADP/ATP	adenosine mono di and triphosphate
AMPA	α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid, a receptor for glutamate
AMP-K	adenosine monophosphate activated protein kinase
AMTS	abbreviated mental test score
ANH	artificial nutrition and hydration
ANS	autonomic nervous system
anti-CCP/ACPA	anticitrullinated peptide antibody
AP	antero-posteriorly
APOE	apolipoprotein E
APP	amyloid precursor protein
ARB	angiotensin receptor blocker
ARDS	acute respiratory distress syndrome
ARIA	amyloid-related imaging abnormalities
ARNI	ARB/ neprilysin inhibitor combination e.g. valsartan/ sacubitril
AS	Alzheimer's society
AS	aortic stenosis
ASA	American Society of Anesthesiology
ASM	anti-seizure medication, previously anti-epileptic drugs
ATN	acute tubular necrosis
AV	atrioventricular
AVP	arginine vasopressin
AXR	abdominal X-ray
BACE	β-secretase enzyme that cleaves transmembrane APP
BAFTA	Birmingham atrial fibrillation treatment of the aged study
BAME	Black, Asian and ethnic minorities
BC	breast cancer
BCC	basal-cell carcinoma
BCE	before common era
BCG	bacille Calmette Guérin
BD	twice a day
BiTEs	bispecific T cell engagers
BMA	British Medical Association
BMD	bone mineral density
BMI	body mass index
BMJ	British Medical Journal
BNF	British National Formulary
BNP	brain natriuretic peptide
BOO	bladder outflow obstruction
BOOP	bronchiolitis obliterans organizing pneumonia
BP	blood pressure
BPH	benign prostatic hyperplasia
BPI	bactericidal/permeability-increasing protein fold gene
BPL	below the poverty line (households in India)
BPPV	benign paroxysmal positional vertigo
BPSD	behavioural and psychological symptoms of dementia
BRAF	a serine/threonine protein kinase proto-oncogene with a critical role in MAPK cell signalling pathway.
BRAN	questions to ask about a new drug - benefits, risks, alternatives, do nothing?
BRCA	breast cancer genes 1 and 2 (also increase risk of other cancers including ovary, pancreas, prostate)
BTS	British Thoracic Society
BZD	benzodiazepine
CAA	cerebral amyloid angiopathy
CABG	coronary artery bypass graft

CAD	coronary artery disease
CADASIL	cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy
CAG	cytosine, adenine, guanine triplet repeats found in high numbers in Huntington's
CAGE	screen for problem alcohol use
CAM	confusion assessment method
CAP	community acquired pneumonia
CAPD	continuous ambulatory peritoneal dialysis
CAR	chimeric antigen receptor
CASSR	council with adult social services responsibility
CAT	COPD assessment test
CAUTI	catheter-associated UTI
CBD	corticobasal degeneration
CBT	cognitive behavioural therapy
CBTI	cognitive behavioural therapy for insomnia
CCK	cholecystokinin
CCL5	chemokine ligand 5
CCP	cyclic citrullinated peptide
CCU	coronary care unit
CDAD	Clostridioides difficile-associated diarrhoea
CDK	cyclin dependent kinase
CFH	complement factor H
CFS	clinical frailty score (Rockwood)
CGA	comprehensive geriatric assessment
CGM	continuous glucose monitoring
CHA_2DS_2-VASc	score for risk of stroke in atrial fibrillation
CHARM	candesartan in heart failure assessment of reduction in morbidity and mortality study
CHART	continuous hyperfractionated accelerated ratdiotherapy
CHC	continuing healthcare funding
CHF	chronic heart failure
CI	confidence interval
CIDP	chronic inflammatory demyelinating polyradiculoneuropathy
CIWA	clinical institute withdrawal assessment - alcohol
CK	creatine kinase
CKD	chronic kidney disease
CKM	conservative kidney management
CK-MB	creatine kinase with muscle and brain subunits
CKS	clinical knowledge summary
CLL	chronic lymphocytic leukaemia
CMA	chaperone-mediated autophagy
CMC	carpometocarpal
CML	chronic myeloid leukaemia
CNS	central nervous system
CO	carbon monoxide
CO_2	carbon dioxide
COHb	carboxyhaemoglobin
COMT	catechol-O-methyltransferase
COP	cryptogenic organizing pneumonia
COPD	chronic obstructive pulmonary disease
COX-2	cyclo-oxygenase-2
CPAP	continuous positive airways pressure
CPN	community psychiatric nurse
CPPD	calcium pyrophosphate deposition disease
CPR	cardiopulmonary resuscitation
CQC	Care Quality Commission
CREST	acronym for calcinosis, Raynaud phenomenon, esophageal dysmotility, sclerodactyly, and telangiectasia
CRHT	crisis resolution and home treatment team
CRP	C-reactive protein
CRT	conformal radiotherapy
CRT-P	cardiac resynchronisation therapy - pacemaker
CSF	cerebrospinal fluid
CSM	carotid sinus massage
CSS	carotid sinus syndrome
CT	computerized tomography
CTPA	computerized tomography pulmonary angiogram
CTZ	chemoreceptor trigger zone
CUH	Cambridge University Hospitals (Addenbrooke's)
CVA	cerebrovascular accident
CVP	central venous pressure
CVS	cardiovascular system
CVT	central venous thrombosis
CXR	chest X-ray
DA	dopamine
DAA	direct acting antiviral
DAME	acronym for causes of falls (drugs, ageing, medical and environmental causes - female preponderance)
DAMPs	damage-associated molecular patterns
DAN	diabetic autonomic neuropathy
DAPT	dual antiplatelet therapy
DAT	dopamine transporter
DBS	deep brain stimulation
DBS	disclosure and barring service
DC	direct current
DE	dementia (elderly) - in the context of care home provision
DESH	disproportionately enlarged subarachnoid space hydrocephalus
DFLE	disability-free life expectancy
DGH	district general hospital
DHSC	Department of Health and Social Care
DI	diabetes insipidus
DIC	disseminated intravascular coagulation
DIP	distal interphalangeal
DLB	dementia with Lewy bodies
DLCO	diffusing capacity for carbon monoxide
DLUHC	Department for Levelling Up, Housing and Communities
DM	dermatomyositis
DM	diabetes mellitus
DMARD	disease-modifying anti-rheumatic drug
DMT1	divalent metal transporter1
DNA	deoxyribonucleic acid
DNACPR	do not attempt cardiopulmonary resuscitation
DOAC	direct oral anticoagulant
DOLS	deprivation of liberty safeguards
DORA	dual orexin receptor antagonists
DPLD	diffuse parenchymal lung disease
DPP	dipeptidyl peptidase
DRD	Daratumumab + Revlimid (lenalidomide) + dexamethasone, an immunotherapy regimen for myeloma
DRE	digital rectal examination, sometimes abbreviated as PR (per rectum) which is also a route for drug administration
DSPN	diabetic sensorimotor polyneuropathy
DVLA	Driver and Vehicle Licensing Authority
DVT	deep vein thrombosis
DWI	diffusion weighted imaging (MRI)
DXA	dual-energy X-ray absorptiometry
E&W	England and Wales
ECG	electrocardiogram
ECMO	extracorporeal membrane oxygenation
ECOG	Eastern Cooperative Oncology Group
ECT	electroconvulsive therapy
ED	emergency department
EEG	electroencephalogram/graphy
eGFR	estimated glomerular filtration rate
EGFR	epidermal growth factor receptor
EuGMS	European Geriatric Medicine Society
EIBC	early invasive breast cancer

ELISA	enzyme-linked immunosorbent assay
EMA	endomysial antibodies
EMG	electromyogram/electromyography
ENT	ear, nose and throat
EOFAD	early-onset familial Alzheimer's disease
EPO	erythropoietin
ER	(o)estrogen receptor
ER	endoplasmic reticulum
ERAD	endoplasmic reticulum-associated degradation
ERCP	endoscopic retrograde cholangiopancreatography
ESC	European Society of Cardiology
ESKD	end stage kidney disease
ESR	erythrocyte sedimentation rate
ET	essential tremor
ET	essential thrombocythaemia
EU	European Union
EVAR	endovascular aneurysm repair
EWGSOP2	European Working Group on Sarcopenia in Older People 2
FaME programme	fitness and mobility exercise programme
FAST	face, arms, speech, time, score for stroke
FBC	full blood count
FDA	Food and Drug Administration (US)
FDG	fluorodeoxyglucose
FEV1	forced expiratory volume in 1 s
FGFR	fibroblast growth factor receptor
FIMDT	feeding issues multidisciplinary team
FIT	faecal immunochemical test
FLAIR	fluid-attenuated inversion recovery, MRI sequence that shows grey matter as bright and CSF as dark
FNC	NHS funded nursing care
FOCUS	fluoxetine on functional outcomes after acute stroke trial
FOXO	forkhead box O: transcription factors with key roles in insulin signalling and ageing
FRAX	fracture risk tool advocated by NOGG and NICE
FRIDS	falls-risk increasing drugs
FRS	family research survey
FSH	follicle stimulating hormone
FTD	frontotemporal dementia
FTLD	frontotemporal lobar degeneration
FUS	focused ultrasound
FVC	forced vital capacity
GABA	gamma-aminobutyric acid
GARS	glycyl-tRNA synthetase
GBS	Guillain–Barré syndrome
GCA	giant-cell arteritis
GCS	Glasgow coma score
G-CSF	granulocyte colony stimulating factor
GDNF	glial cell-line derived nerve growth factor
GDP	gross domestic product
GDS	geriatric depression score
GFR	glomerular filtration rate
GH	growth hormone
GI	gastrointestinal
GIP	glucose-dependent insulinotropic polypeptide
GLP-1	glucagon-like peptide 1
GLUT4	glucose transporter - a rate-limiting step in insulin-stimulated glucose uptake in muscle and adipocytes
GMC	General Medical Council
GnRH	gonadotrophin releasing hormone
GORD	gastro-oesophageal reflux disease
GP	general practitioner
GPCOG	general practice cognitive screening test for dementia
GRACE	global registry of acute coronary events
GSF	gold standards framework
GSK	a pharma company, previously GlaxoSmith Kline
GSM	genitourinary syndrome of menopause (new term for vulvovaginal atrophy)
GTN	glyceryl trinitrate
GU	genitourinary tract
GWAS	genome-wide association study
h	hour
HALE	health-adjusted life expectancy
HASBLED	score for predicting bleeding risk of anticoagulation for AF, superseded by ORBIT
HCM	hypertrophic cardiomyopathy
HDU	high dependency unit
HPC	haemoprogenitor cell
HSC	haemopoietic stem cell
HER2	human epidermal growth factor receptor 2
HERMES	outcomes of thrombectomy : highly effective reperfusion evaluated in multiple endovascular stroke trials
HFE	high iron (Fe)/ human homeostatic iron regulator protein/ gene (mutations cause haemochromatosis)
HFmrEF	heart failure with mildly reduced ejection fraction
HFpEF	heart failure with preserved ejection fraction
HFrEF	heart failure with reduced ejection fraction
HHS	hyperosmolar hyperglycaemic syndrome
HINTS test	head impulse, nystagmus, test of skew test in vertigo
HIV	human immunodeficiency virus
HL	Hodgkin's lymphoma
HLA	human leucocyte antigen
HLE	healthy life expectancy
HLY	health-adjusted life expectancy
HMRN	Haematological Malignancy Research Network
HOOF	home oxygen order form
HPC	haematoprogenitor cell
HPV	human papilloma virus
HRCT	high resolution computerized tomography scan
HRT	hormone replacement therapy
HSC	haematopoietic stem cells
HSMN	hereditary motor and sensory neuropathy
HSV	Herpes simplex virus
HUT	head-up tilt
HWB	health and wellbeing board
I131	iodine-131
IA	intraarticular
IADL	instrumental activities of daily living
IBD	inflammatory bowel disease
IBM	inclusion body myositis
IBS	irritable bowel syndrome
IC	intermediate care
ICA	internal carotid artery
ICB	integrated care board
ICD	implantable cardioverter-defibrillator
ICH	intracerebral haemorrhage
ICP	intracranial pressure
ICP	integrated care partnership
ICS	inhaled corticosteroids
ICS	integrated care system
ICU	intensive care unit
IDA	iron deficiency anaemia
IE	infective endocarditis
Ig G, M, A, D and E	immunoglobulin classes
IGF-1	insulin-like growth factor 1
IHD	ischaemic heart disease
IL	interleukin
ILD	interstitial lung disease
IM	intramuscular
IMCA	independent mental capacity advocate
INR	international normalized ratio
IOP	intraocular pressure

IPF	idiopathic pulmonary fibrosis
IS	ischaemic stroke
ISC	intermittent self-catheterisation
IU	international units
IV	intravenous
IVT	intravenous thrombolysis
IVU	intravenous urogram
JAK	Janus kinases, cytoplasmic tyrosine kinases and their genes
JVP	jugular venous pressure
KRT	kidney replacement therapy
LA	local authority
LAA	left atrial appendage
LABA	long-acting beta$_2$ agonist
LACI	lacunar infarct
LAMA	long-acting muscarinic antagonist
LASI	longitudinal aging study in India
LBBB	left bundle branch block
LBD	Lewy body disease, an umbrella term including DLB and PDD
LCP	Liverpool care pathway for the dying patient
LDH	lactate dehydrogenase
LDL-C	low density lipoprotein cholesterol
LE	life expectancy
LED	levodopa equivalent dose
LFT	liver function test
LGBTQ+	lesbian, gay, bisexual, transgender, queer plus other emerging gender and sexual identities
LH	luteinizing hormone
LHRH	luteinizing hormone-releasing hormone
LMIC	low or middle income country
LMN	lower motor neuron
LMWH	low molecular weight heparin
LOAD	late-onset Alzheimer's disease
LOC	loss of consciousness
LP	lumbar puncture
LPA	lasting power of attorney
LPL	lymphoplasmacytic lymphoma
LPS	liberty protection safeguards
LTOT	long-term oxygen therapy
LUTS	lower urinary tract symptoms
LV	left ventricular
LVEF	left ventricular ejection fraction
LVF	left ventricular failure
LVH	left ventricular hypertrophy
LVO	large vessel occlusion
M_{1-5}	muscarinic receptors
M band	monoclonal band
Mab	monoclonal antibody
MAO-A or B	monoamine oxidase A or B
MAP	mean arterial pressure
MAP-K	mitogen-activated protein kinases: serine/threonine-specific protein kinases that relay signals from the cell surface to the nucleus
MAR	medicines administration record
MASD	moisture-associated skin damage
MASLD	metabolic dysfunction-associated steatotic liver disease (replacing the term NAFLD)
MBBS	Bachelor of Medicine, Bachelor of Surgery (UK professional medical qualification)
MCA	Mental Capacity Act
MCA	middle cerebral artery
MCCD	Medical Certificate of Cause of Death
MCI	mild cognitive impairment
MCV	mean corpuscular volume
MDRD	modification of diet in renal disease
MDS	myelodysplastic syndrome
MDT	multidisciplinary team
MEK	mitogen-activated protein kinase, also known as MAP2K
MFRA	multifactorial falls risk assessment
MG	myasthenia gravis
MGUS	monoclonal gammopathy of unknown significance
MHA	Mental Health Act
MHC	major histocompatibility complex
MHRA	Medicines and Healthcare Products Regulatory Agency (UK)
MI	myocardial infarction
min	minute
MIND	a mental health charity in England and Wales
MMSE	mini-mental state examination
MNA	mini-nutritional assessment
MND	motor neuron disease
MoCA	Montreal cognitive assessment
MOVES	Trial of chondroitin and glucosamine for knee pain in osteoarthritis
MPTP	1-methyl-4-phenyl-1,2,3,4-tetrahydropyridine
MRA	magnetic resonance angiography
MRC	Medical Research Council
MRCP	magnetic resonance cholangiopancreatography
MRCP	Membership of the Royal College of Physicians
MRgFUS	MRI-guided focused ultrasound
MRI	magnetic resonance imaging
mRNA	messenger RNA
MRSA	methicillin-resistant Staphylococcus aureus
MS	multiple sclerosis
MSA	multiple system atrophy
MSU	midstream urine
MT	mechanical thrombectomy
mtDNA	mitochondrial DNA
mTOR	mammalian target of rapamycin: a serine/threonine protein kinase regulating cell growth and proliferation
MTP	metatarso-phalangeal
MuSK	muscle specific tyrosine kinase
MUST	malnutrition universal screening tool
NA	noradrenaline
NABCOP	national audit of breast cancer in older patients
NAD +	nicotinamide adenine dinucleotide
NAFLD	non-alcoholic fatty liver disease, now known as MASLD
NAIF	national audit of inpatient falls
NaSSa	serotonin noradrenaline reuptake inhibitor
NBM	nil by mouth
NCEPOD	National Confidential Enquiry into Patient Outcomes and Death
NCS	nerve conduction studies
NCSE	non-convulsive status epilepticus
NELA	national emergency laparotomy audit
NF-kB	nuclear factor kappa light chain enhancer of activated B cells
NG	nasogastric
NGO	non-governmental organisation
NHS	National Health Service
NHS CC	NHS continuing care
NIA-AA	National Institute on Aging and the Alzheimer's Association (new criteria for diagnosis of AD)
NICE	National Institute for Health and Care Excellence
NICs	national insurance contributions
NIH	National Institutes of Health (Agency of the US Dept. of Health)
NIHSS	National Institutes of Health stroke scale
NIV	non-invasive ventilation
NKT	natural killer T cells
NMDA	N-methyl-D-aspartate, a receptor for glutamate
NMJ	neuromuscular-junction

NMS	neurally-mediated syncope
NNT	number needed to treat
NOF	neck of femur
NOGG	National Osteoporosis Guidelines Group
NPH	normal pressure hydrocephalus
NSAID	non-steroidal anti-inflammatory drug
NSCLC	non-small-cell lung cancer
NSIP	non-specific interstitial pneumonia
NSTE-ACS	non-ST elevation acute coronary syndromes
NSTEMI	non-ST elevation myocardial infarction
NT-proBNP	N-terminal pro-B-type natriuretic peptide
NVH	non-visible haematuria
NYHA	New York Heart Association
O2	oxygen
OA	osteoarthritis
OADR	old age dependency ratio
OD	once a day
OECD	Organization for Economic Cooperation and Development
OGD	oesophago gastro duodenoscopy
ONS	Office of National Statistics
OPG	osteoprotegerin
ORBIT	acronym for a risk score for bleeding on anticoagulants for AF (older, renal impairment, bled before, iron low, taking antiplatelet drugs)
OSA/HS	obstructive sleep apnoea/hyponoea syndrome
OT	occupational therapy/ therapist
OTC	over-the-counter (medicines)
P2Y12	purinergic receptors on platelets (bind clopidogrel family)
PA	pernicious anaemia
PACG	primary angle closure glaucoma
PACI	partial anterior circulation infarct
PAF	paroxysmal atrial fibrillation
PaO2	partial pressure of oxygen
PARP	poly ADP-ribose polymerase
PBC	primary biliary cirrhosis
PCI	percutaneous coronary intervention
PCiS	posterior circulation ischaemic stroke
PCR	polymerase chain reaction
PCS	posterior circulation stroke
PCT	primary care trust
PD	Parkinson's disease
PD-1 inhibitor	programmed cell death protein 1 inhibitor (an immune checkpoint inhibitor)
PDB	Paget's disease of the bone
PDD	Parkinson's disease dementia
PDE	phosphodiesterase
PDK1	phosphoinositide-dependent kinase 1
PD-LI inhibitor	programmed cell death ligand inhibitor
PE	pulmonary embolism
PEC	percutaneous endoscopic colopexy
PEFR	peak expiratory flow rate
PEG	percutaneous endoscopic gastrostomy
PEG-J	percutaneous endoscopic gastrostomy with a jejunal extension
PEJ	percutaneous endoscopic jejunostomy
PET	positron-emission tomography
PHC	primary health centre (India)
PICC	peripherally inserted central catheter
PICH	primary intracranial haemorrhage
PIM	potentially inappropriate medication
PIP	proximal interphalangeal
PIP2/3	phosphatidylinositol 4,5-bisphosphate and 3,4,5-trisphosphate (cell membrane phospholipids)
PJ	slang for pyjama, as in pj paralysis
PLMS	periodic limb movements in sleep
PM	polymyositis
PMF	primary myelofibrosis
PMR	polymyalgia rheumatica
POADR	prospective old age dependency ratio
POAG	primary open angle glaucoma
POCI	posterior circulation infarct
POP	plaster of Paris
POPS	perioperative medicine for older people having surgery
PP	pulse pressure
PPARγ	peroxisome-proliferator-activated receptor gamma
PPCs	postoperative pulmonary complications
PPI	proton pump inhibitor
PPI	patient and public involvement
PPO	potential prescribing omissions
PPS	post-polio syndrome
PRISMA	a self-reported questionnaire for frailty
PRISMS	potential of rtPA for ischemic strokes with mild symptoms trial
PSA	prostate specific antigen
PSP	progressive supranuclear palsy
PSR	potential support ratio
PT (or physio.)	physiotherapy/ physiotherapist
PTCA	percutaneous transluminal coronary angioplasty
PTH	parathyroid hormone
PTHrP	parathyroid hormone-related protein
PUVA	psoralen + UVA treatment
PV	polycythaemia vera
PVD	peripheral vascular disease
PVS	persistent vegetative state
QDS	four times a day
Qfracture	fracture risk tool advocated by SIGN and NICE
QOF	quality and outcomes framework
QRISK3	UK cardiovascular risk calculator
QT	the time between the start of the Q wave and end of the T wave on an ECG
RA	rheumatoid arthritis
RA	right atrium
RAAS	renin angiotensin aldosterone system
RAGE/AGE	receptor for advanced glycation endproducts
RANKL	receptor activator of nuclear factor kappa-B ligand
RAS	renal artery stenosis
Ras	ras proto-oncogenes: GTPases that act as molecular switches in pathways for cell proliferation and survival
RBBB	right bundle branch block
RBC	red blood cell
RCC	renal cell cancer
RCGP	Royal College of General Practitioners
RCP	Royal College of Physicians
RCT	randomized controlled trial
RDW	red cell distribution width
Rehab.	rehabilitation
REM	rapid eye movement
RGSC	Registrar General's socio-economic class
RLS	restless legs syndrome
RNA	ribonucleic acid
RNIB	Royal National Institute for Blind people
ROS	reactive oxygen species
ROSIER	recognition of stroke in the emergency room scale
RoSPA	Royal Society for the Prevention of Accidents
RPE	retinal pigment epithelium
RS3PE	remitting seronegative symmetrical synovitis with pitting (o)edema
RSPCA	Royal Society for Prevention of Cruelty to Animals
RTA	road traffic accident
rt-PA	recombinant tissue-type plasminogen activator
RUQ	right upper quadrant
SA	sino-atrial

SABA	short-acting beta$_2$ agonist
SABR	stereotactic ablative radiotherapy
SAE	serious adverse event (with a medical product)
SAH	subarachnoid haemorrhage
SAMA	short-acting muscarinic antagonist
SaO2	arterial oxygen saturation
SARI	serotonin antagonist-reuptake inhibitor
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
SASP	senescence-associated secretory phenotype
SBOT	short-burst oxygen therapy
SBP	systolic blood pressure
SC	subcutaneous
SCC	squamous-cell carcinoma
SCLC	small-cell lung cancer
SCN	suprachiasmatic nucleus
SD	standard deviation
SDH	subdural haematoma
SE	status epilepticus
sec	second
SERM	selective estrogen modulator
Sestamibi or 'mibi' scan	technetium 99m methoxy isobutyl isonitrile scan
sFLC	serum free light chain
SGLT2i	sodium-glucose co-transporter-2 inhibitor
SIADH	syndrome of inappropriate antidiuretic hormone
SIGN	Scottish intercollegiate guidelines network
SIRT	sirtuins: nicotine adenine dinucleotide-dependent histone deacetylases regulating critical signalling pathways
SITS-MOST	safe implementation of treatments in stroke monitoring study
SIVD	subcortical ischaemic vascular disease
SLE	systemic lupus erythematosus
SLT	selective laser trabeculoplasty
SLT	speech and language therapist/ therapy
SN	substantia nigra
SNP	single nucleotide polymorphism (pronounced snip)
SNRI	serotonin and norepinephrine reuptake inhibitor
SNS	sympathetic nervous system
SOD	superoxide dismutase, an enzymatic antioxidant, which catalyses the dismutation of superoxide ions into oxygen and hydrogen peroxide
SOL	space-occupying lesion
SPA	state pension age
SPECT	single-photon emission computerized tomography
SPF	sun protection factor
SPLATT	acronym for falls assessment (symptoms, previous falls, location, activity, time, and trauma)
SSNAP	sentinel stroke national audit programme
SSRI	selective serotonin reuptake inhibitor
Stat.	usually a one-off dose, given immediately, from the Latin statim
STEMI	ST-elevation myocardial infarction
STOPP/START	screening tool of older persons prescriptions and screening tool to alert doctors to right treatment
SVC	superior vena cava
T1/T2 DM	type 1/type 2 diabetes mellitus
T3	triiodothyronine
T4	thyroxine
TACI	total anterior circulation infarct
TAVI	transcatheter aortic valve insertion
TB	tuberculosis
TCC	transitional cell carcinoma
tDCS	transcranial direct current stimulation
TDP	transactive response DNA-binding protein
TDS	three times a day
TEDS	thromboembolic deterrent stockings
TENS	transcutaneous electrical nerve stimulation
T_{FH}	T follicular helper cells
TFTs	thyroid function tests
TGA	transient global amnesia
TH	tyrosine hydroxylase
T_H	subset of T helper cells
TIA	transient ischaemic attack
TIBC	total iron binding capacity
TLOC	transient loss of consciousness
TMJ	temporomandibular joint
Tn	troponin
TNFα	tumour necrosis factor alpha
TOE	transoesophageal echocardiography
tPA	tissue plasminogen activator
TPN	total parenteral nutrition
T_{reg}	regulatory T cells, a T helper subset with role in immune tolerance
TSH	thyroid stimulating hormone
tTG-IgA	tissue transglutaminase antibodies
TTT	tilt-table testing
TUG	timed up and go test
TUIP	transurethral incision of the prostate
TUMT	transurethral microwave therapy
TUNA	transurethral needle ablation
TURBT	transurethral resection of bladder tumour
TURP	transurethral resection of the prostate
TVN	tissue viability nurse
TVT	tension-free vaginal tape
U&Es	urea and electrolytes
UA	unstable angina
UC	ulcerative colitis
UCL	University College, London
UI	urinary incontinence
UIP	usual interstitial pneumonia
UK	United Kingdom
UKHSA	UK Health Security Agency
UKPDS	UK prospective diabetes study
UMN	upper motor neuron
UN	United Nations
UNHCR	UN High Commissioner for refugees
UPR	unfolded protein response
URTI	upper respiratory tract infection
US	United States
US$	US dollar
UTI	urinary-tract infection
UV A and B	ultra violet light: A - longer wavelength associated with tanning and ageing, B - causes more sunburn
V/Q	ventilation/perfusion
VA	visual acuity
VAC	vacuum-assisted wound closure
VaD	vascular dementia
VAT	value added tax
VATS	video-assisted thoracoscopic surgery
VCSE	voluntary, community and social enterprise sector
VE	vaginal examination
VEGF	vascular endothelial growth factor
VGCC	voltage-gated calcium channels
VO_2max	the maximum rate of oxygen the body can use during exercise
VTE	venous thromboembolism
WBC	white blood cell
WCC	white cell count
WHO	World Health Organisation
YAG	yttrium aluminium garnet laser
Z drugs	hypnotics in the zopiclone family
ZIO	tradename of a biosensor to detect cardiac arrythmias

About the companion website

This book is accompanied by a companion website:

www.wiley.com/go/lecturenotesgeriatricmedicine9e

The website includes:

- Key revision points for each chapter
- Appendix
- Extended content for specialty trainees
- Further reading

1

Global ageing

Introduction

The Western world turned grey in the 20th century, and the rest of the world is following this century at a more rapid pace.

In response to population ageing, the United Nations General Assembly declared 2021–2030 the Decade of Healthy Ageing and asked the WHO to lead on implementation, but the Coronavirus disease 2019 (COVID-19) pandemic has diverted attention.

The common afflictions of old age are now accepted, not as a cause for shame but as serious diseases. Films and novels portray various aspects of ageing. There is increasing discussion in mainstream media about dementia and its effects on individuals from all levels of society, including former heads of state, sporting, and literary figures. However, ageism is still an issue. In the developed world, experience of death is often limited to the deaths of very elderly parents, and there is a loss of familiarity with death as a natural process.

Changes in the global population

The world is affected by the four global demographic 'megatrends', all of which have implications for older people:

1 Population **growth**
2 Population **ageing**
3 International **migration**
4 **Urbanisation** (local migration)

Population growth

From antiquity, the world population increased gradually, with fluctuations due to factors including famine and pandemics, reaching one billion around 1800. Since then, the growth rate has been remarkable (see Figure 1.1).

Population growth is determined by the balance of birth and death rates.

In outline:

- Once childhood death rates start to fall, life expectancy (LE) increases.
- More people reach reproductive age, high birth rates continue, the median age of the population stays low, and the population grows rapidly.
- Birth rates then start to fall; the population continues to increase, but ages.
- Eventually, older people outnumber the young, and the population begins to fall.

This process is called demographic transition (see Figure 1.2).

Major drivers of the transition include improvements in food security, nutrition, housing, clean water and sanitation, income, education (especially for women), and public health measures such as immunisation and contraception. Medical interventions such as the management of cardiovascular risk factors and earlier detection and management of cancer have extended LE in later life.

World stages of transition in 2019 (Wang, Lancet 2020)

1 **Pre-transition:** no countries
2 **Early transition:** no countries (1970, 17 countries)
3 **Intermediate:** 35 countries
4 **Late transition:** 131 countries
5 **Post-demographic:** 38 countries, 18 with net emigration, and 20 with net immigration.

Population pyramids usually show the population divided into males and females in 5-year age bands. The shape shows the stage of transition, moving from expansive, a wide-based triangle where young children predominate, to a more rectangular shape as the population ages, constrictive as the base shrinks, and finally a rocket shape as there is little death until old age. The changing shape can be seen in the world population pyramids 70 years apart (see Figure 1.3).

The world population reached eight billion in 2022. The rate of world population growth has been slowing since the 1960s. Until recently, the UN estimated that the world population would peak at 11 billion in 2100, but the rapidity of the decline in fertility has exceeded predictions.

- Many women wish or need to work.
- Widespread television, mobile phones, and internet access have brought a quantum leap in access to information, education, and awareness of how others live.
- Aspirations for a higher standard of living and better opportunities for children may be factors driving the rapidity of change.

The latest modelling suggests that peak world population will occur sooner and will be falling by 2100 to 10.4 billion (UN 2022), a peak of 9.7 billion in 2065 with a fall to 8.8 billion by 2100 (Lancet 2020), or more optimistically, a peak of 8.6 billion in 2050 with a fall to 7 billion by 2100 (New Scientist 2023). See Figure 1.4.

Geriatric Medicine and Elderly Care: Lecture Notes, Ninth Edition. Claire G. Nicholl, K. Jane Wilson, and Shaun D'Souza.

Companion website: www.wiley.com/go/lecturenotesgeriatricmedicine9e

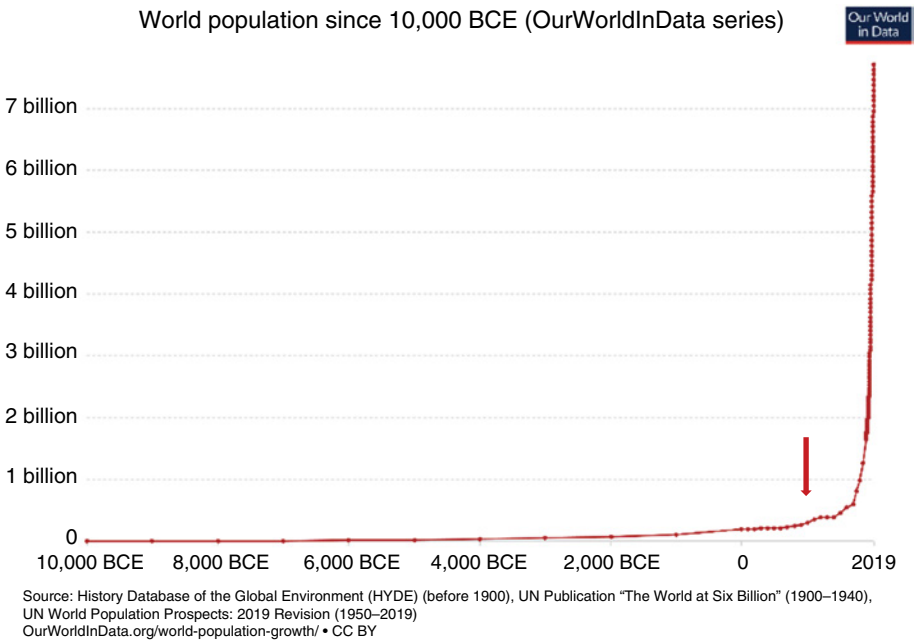


Figure 1.1 World population from 10,000 BCE to 2019 (BCE is before the common era, CE is the common era, previously AD or anno domini). The arrow shows the impact of the Black Death. *Source*: Adapted from Our World in Data.

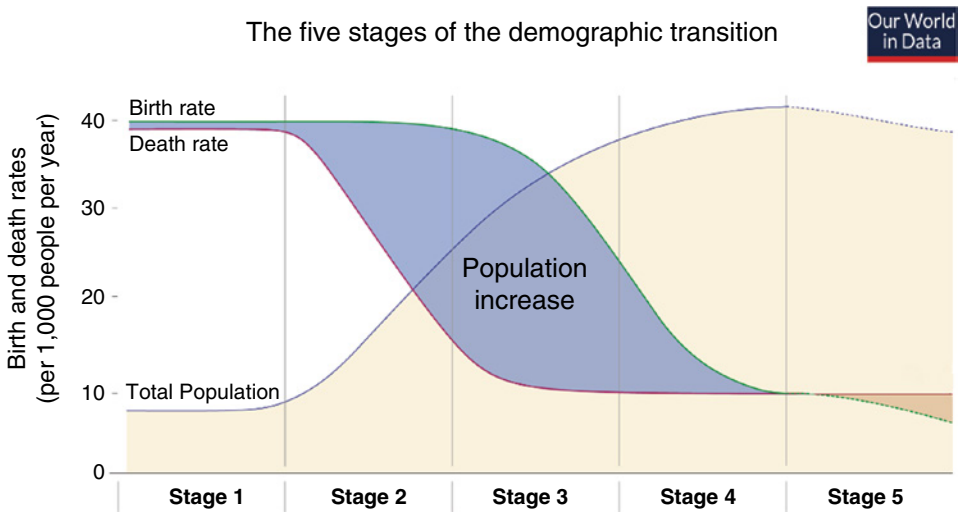


Figure 1.2 Demographic transition. *Source*: Our World in Data / CC BY - 4.0.

Population ageing

As discussed earlier, populations tend to age as they grow.

Population ageing has four key characteristics (UN 2009). It is:

1 **Unprecedented**, without parallel in the history of humanity.
2 **Pervasive,** affecting nearly all the countries in the world. Better treatment for HIV has enabled LE in sub-Saharan Africa to increase following a dip. Civil wars still have an impact on affected areas. It is too early to assess the overall effect of the COVID pandemic, but LE dipped for the first time in decades in many countries.
3 **Profound**, with major consequences and implications for all aspects of life.
4 **Enduring**, as short of a worldwide disaster, the trend will not be reversed.

Ways of expressing the age of a population

Median age

- Age at which half of the population is older and half is younger.
- It enables a single figure to compare countries and measure change.

World median age: 22.6 years in 1960, 30.9 in 2020, projected 36.2 in 2050.

Population over a specified age

- The age at which populations are considered 'elderly' is over 65 years in many statistics.
- Some data sets categorise people of 60+ as older and people of 80+ as the 'oldest old'.

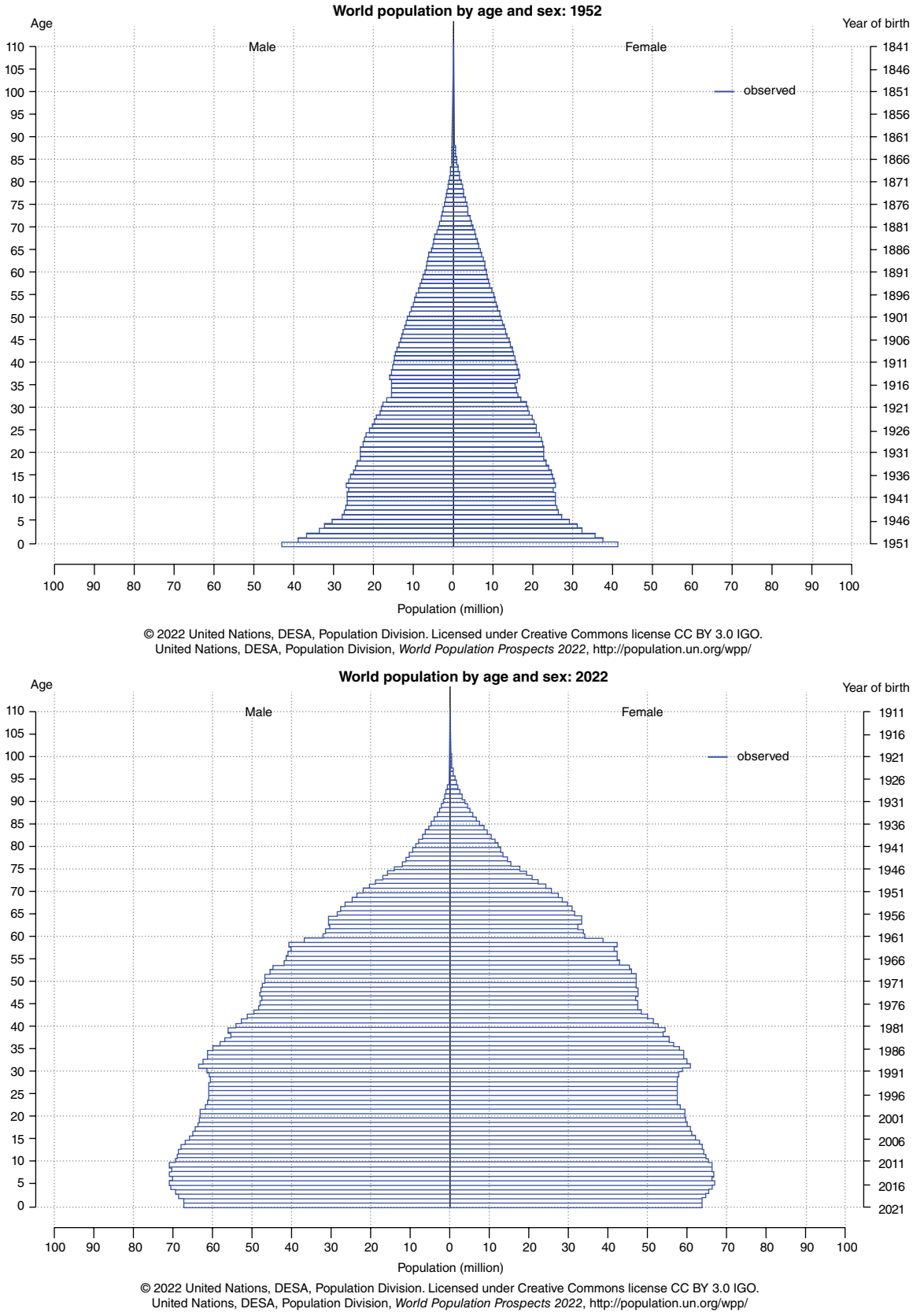


Figure 1.3 World population pyramids for 1952 and 2022. *Source*: United Nations (UN) World population prospects 2024 / CC BY 3.0.

Global population size: estimates, 1950–2022, and medium scenario with 95 per cent prediction intervals and high- and low-fertility scenarios, 2022–2100

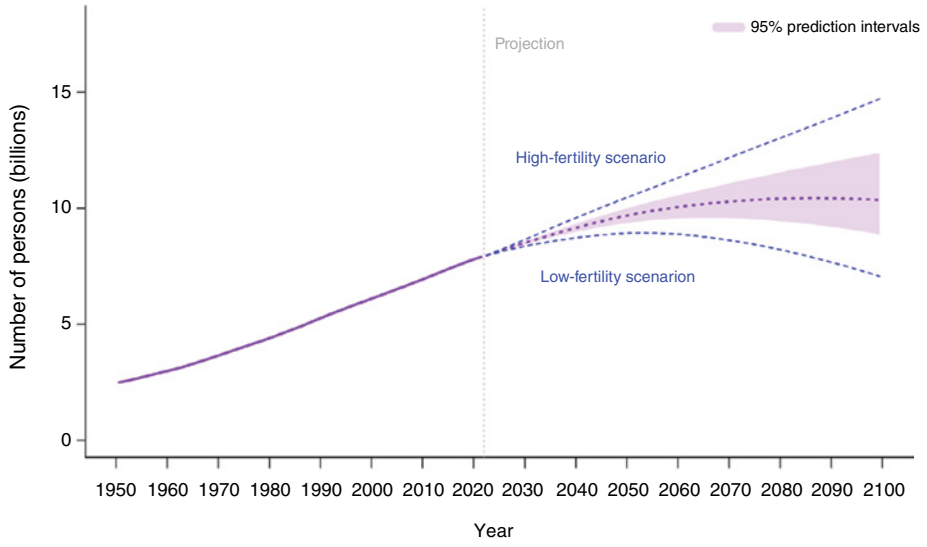


Figure 1.4 Global population and projections *Source*: UN World population prospects summary, 2022 / CC BY 3.0.

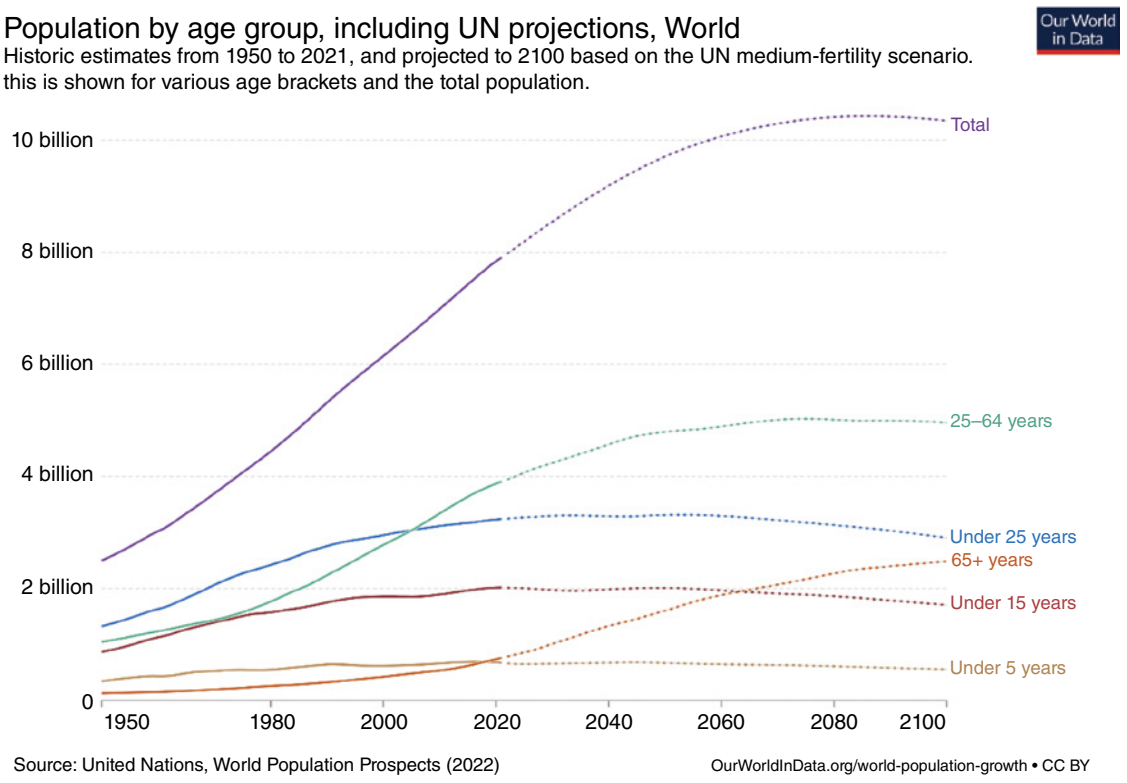


Figure 1.5 The changing proportions of different age bands within the global population. *Source*: Modified from Our World in Data / CC BY 4.0.

The proportion of the world population aged 65+ was 5% in 1960, 10% in 2022, and predicted to rise to 16% in 2050. For the first time in world history, in 2018, people aged 65+ outnumbered children under 5 (see Figure 1.5).

Within the older population, the number of people aged 80+ will increase markedly (see Figure 1.6). This has implications for health and social services, as this age group has more needs. This will occur in middle-income countries as well as high-income countries.

Life expectancy at birth

Prior to 1800, global LE at birth is estimated to have been between 20 and 30. Extremely high infant and child mortality was the major factor, but people have always lived into middle and older age, just a much smaller proportion than today. In the absence of data, inferences about ageing can be made from artistic artefacts, e.g. figurines, drawings, and contemporary texts. In the 7th century BCE, the Greek poet Hesiod wrote

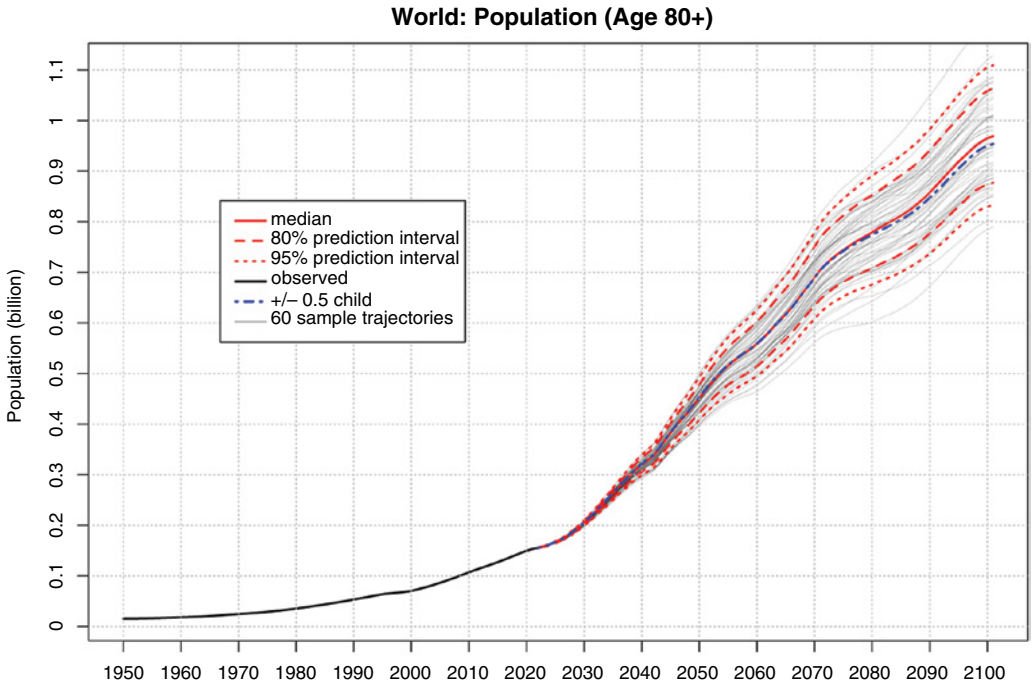


Figure 1.6 Projected world population aged 80 and over. *Source*: UN World population prospects 2024 / CC BY 3.0.

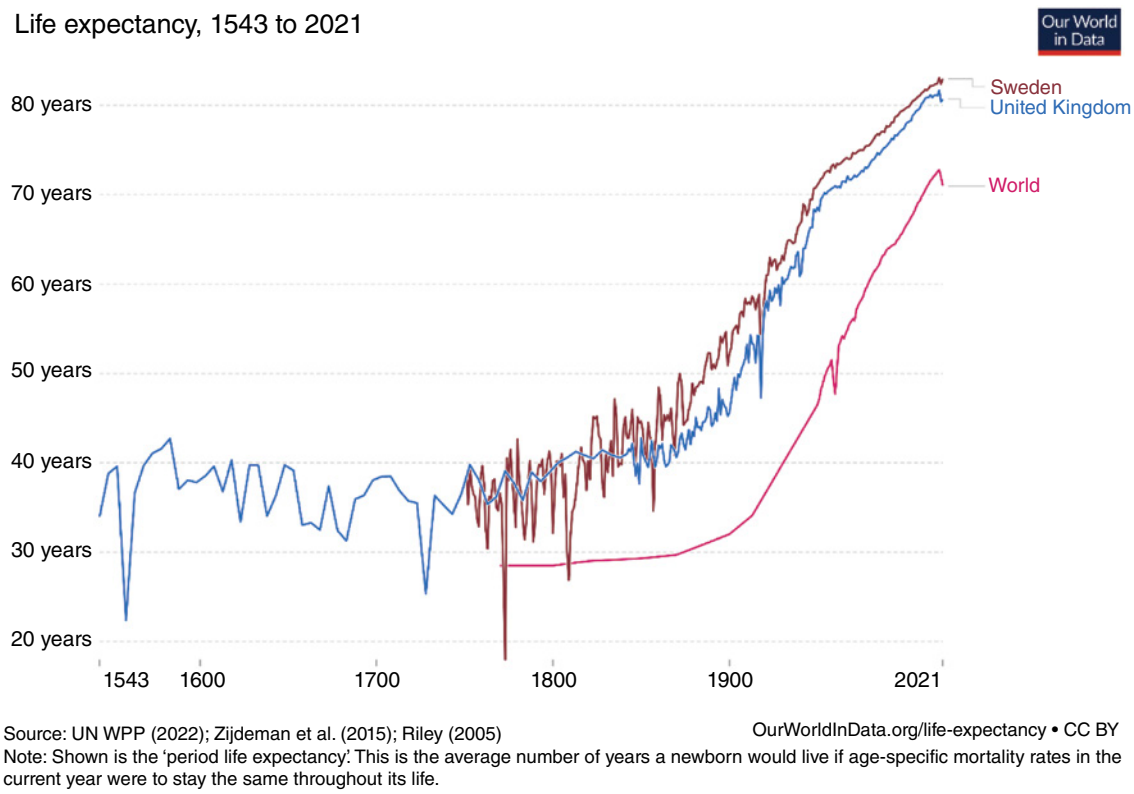


Figure 1.7 The changing life expectancy at birth in the UK and Sweden over several centuries. *Source*: Modified from Our World in Data / CC BY 4.0.

that a man should marry at 'not much less than 30, and not much more'. To be a consul in ancient Rome, you had to be 43 – 8 years older than the minimum age of 35 to hold the presidency of the US. In the 1st century, Pliny records a few individuals with well-documented life spans of over 100 years, including Cicero's wife Terentia (103 years).

- Data about LE in populations is available for the UK from 1543 and Sweden from 1750.
- In 1800, more countries began collecting data, but global data, compiled by the UN, has only been available since 1948 (see Figure 1.7).
- Before 1800, no country had a sustained LE at birth over 40 years.
- Global inequality increased after 1850 as LE began to increase in parts of Europe and widened in 1900 as LE also increased in Australia and the US. By 1950, Norway had a LE of 72 years; the mean across Africa was 36 years, and in Mali, only 26 years.

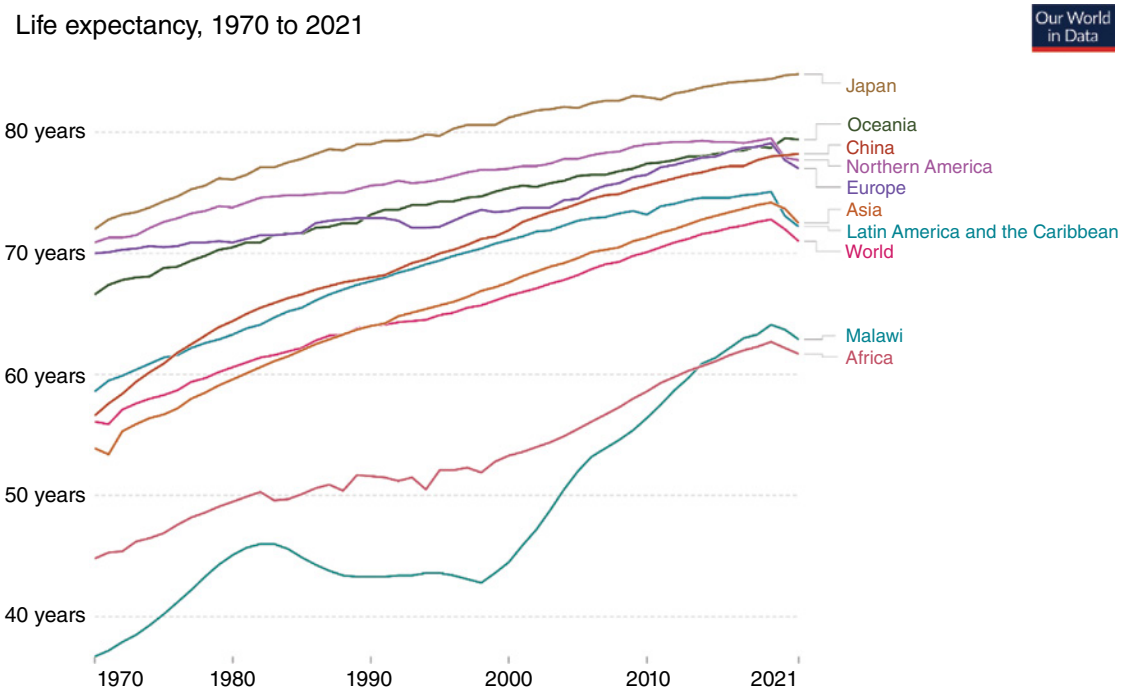


Figure 1.8 Life expectancy in a wider range of countries showing convergence. *Source*: Modified from Our World in Data / CC BY 4.0.

- From the 1950s, LE in most regions increased at a comparable rate until the HIV epidemic, which peaked in sub-Saharan Africa in the 1980s–1990s, caused a marked fall there.
- Since 2000, LE has again increased in all regions, with a faster trajectory in Africa, so the global gap is narrowing (see Figure 1.8).
- The average world citizen born in 1950 could expect to live to 46 years, to 66 by 2000, and to 73 in 2019, with a projection of 77 years by 2050.
- Since 2020, COVID has caused LE to fall. Data on the extent is incomplete, but there has been a fall of almost 3 years in the US, and the dip is now visible in world data.

To visualise the increase in LE since records became available, look at the interactive site in Our World in Data: life expectancy-increased-in-all-countries-of-the-world.

Life expectancy at age 65

Life expectancy at age 65 is the average number of additional years of life a 65-year-old person would live if subjected to the age-specific mortality risks of a given period for the rest of their life.

- Worldwide, a person reaching 65 years old in 2020 can expect to live an additional 17 years, increasing to 19 years by 2050.
- Australia and New Zealand currently have the highest LE at age 65 (21 years), followed by Europe and Northern America (19 years).
- Life expectancy at age 65 is projected to increase in all regions, but with the smallest gain in sub-Saharan Africa.

Estimating years spent in health

There is now more focus on whether the extra years of life are spent in health. There are several similar metrics with different definitions, so to compare data, e.g. across countries, use the same metric.

Health-adjusted life expectancy (HALE), used by the WHO, is the expected number of remaining years of life spent in good health, i.e. without irreversible limitations in activities of daily living, from birth or age 65, assuming current rates of mortality and morbidity. Health status is derived from health statistics. In the EU, the Healthy Life Years indicator (HLY) is also known as disability-free life expectancy (DFLE) and uses self-reported data on disability. The UK metric of Healthy Life Expectancy (HLE) is not synonymous with DFLE, as it asks about the perception of health rather than disability.

Across the world, people live longer and live more years in good health. Between 2000 and 2019:

- LE at birth increased from 66.8 to 73.3 years.
- HALE increased from 58.3 to 63.7 years.
- LE and HALE are consistently higher for females.

Within individual countries, there are socio-economic gradients for LE and HALE.

Old-age dependency ratio

The old-age dependency ratio (OADR), the number of old-age dependents (people aged 65+) per 100 persons of working age (aged 20 to 64 years), is used to compare the economic prospects of countries related to their ageing population (see Figure 1.9).

In 2020:

- Japan tops the list and will continue to do so in 2050.
- Most countries with high OADRs are European; more Asian countries will be among this group by 2050.

Some data still uses 15–64 as 'working age', but the age of 20 reflects longer education and later entry into the work force. The use of 'age 64' will also become outdated as older people choose or need to defer retirement.

Whatever age bands are used, a more intuitive way of expressing the number of working people available to support older people is the Potential Support Ratio (PSR), i.e. the inverse of OADR. Using data for people aged 25–64 per person aged 65+; in 2019, Japan had a ratio of 1.8,

Economic old-age dependency ratios, world and regions, estimates for 1990–2021 and projections for 2022–2050

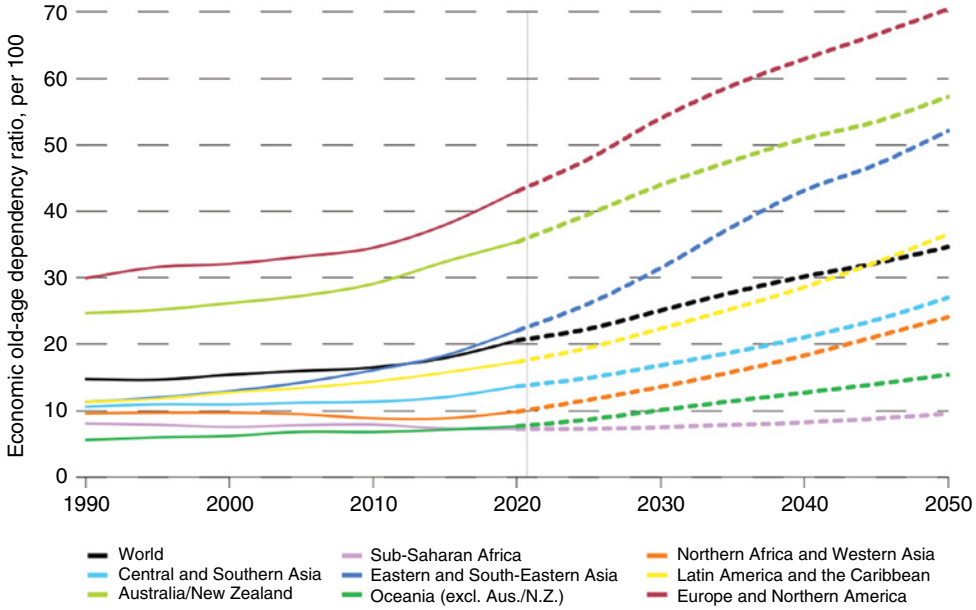


Figure 1.9 OADRs calculated from numbers of people aged 65+ per 100 persons aged 20–64. *Source*: UN World social report 2023 / CC BY 3.0.

the lowest in the world. A further 29 countries, mostly in Europe and the Caribbean, already have PSRs below 3.

Prospective old-age dependency ratio

As LE increases and older people stay economically active, rather than defining people as 'old' at an arbitrary age, newer metrics are being used. The prospective old-age dependency ratio (POADR) is calculated as the number of persons above the age closest to a remaining LE of 15 years compared to the number of persons between age 20 and that age.

Sex ratios and the age-sex gap

Unless there is intervention, more male infants are born than females in all populations (105:100). However, boy babies have higher perinatal and infant mortality. For data and discussion on sex ratios in different countries, see Our World in Data.

In antiquity, men were said to outlive women. This may have been true, but it may be a reporting phenomenon as most cultures recorded more information about men. Once comprehensive data became available, it was clear that, on average, women outlived men. The difference results from a complex interaction between biological, behavioural, and socio-economic factors that is uneven throughout the lifespan (e.g. due to the risks of childbirth, attitude to risk, military service and dangerous jobs, and cardiovascular disease). The size of the difference has varied historically.

- By 2020, it was universal that women live longer than men, although the difference ranges from less than a year in Nigeria to over 10 years in Russia (the global average is 4.8 years).
- 90% of supercentenarians (people reaching 110 years of age or older) are women.
- Thus, in many countries, particularly those with older populations, women outnumber men.

Countries where most older people live

India overtook China as the world's most populous country in April 2023. It is likely that between 2060 and 2070, sub-Saharan Africa will become the most populous region in the world.

The proportion of older people varies greatly from country to country, but as countries undergo demographic transition, the differences are diminishing. Globally, there were 703 million people aged 65+ in 2019. The region of Eastern and South-Eastern Asia was home to the largest number of older people (261 million), followed by Europe and Northern America (over 200 million).

Data from a range of countries are shown in Table 1.1.

Japan's population is the oldest in the world; most European countries have median ages around 43 years, but population ageing is not restricted to the developed world. In 2019:

- Nearly one in four people aged 65+ lived in China.
- Five countries (China, India, the US, Japan, and the Russian Federation) accounted for half of the world's population aged 65+.
- Five countries (China, the US, India, Japan, and Germany) were home to half of people aged 80+.

Table 1.1 Percentage of people aged 65+ and median age in 2019 (Our World in Data).

	% aged 65+	Median age years	World population ranking	Number of people aged 65+ (million)
Japan	28	46.7	11	35.6
Italy	23	45.7	23	14.0
UK	19	40.1	21	12.5
US	16	37.7	3	53.3
Russian Fed	15	39.4	9	22.0
China	12	37.0	1 (2 from 2023)	164.5
Brazil	9	33.5	6	19.3
Mexico	7	29.2	10	9.5
India	6	28.4	2 (1 from 2023)	87.1
Indonesia	6	29.7	4	16.3
Nigeria	3	18.1	7	5.5
WORLD	9	30.7	7.7 billion	702.9

Over the next three decades, the number of people aged 65+ is projected to more than double, reaching more than 1.6 billion people in 2050.

All regions will see an increase in the 65+ population between 2019 and 2050.

- The largest increase (312 million) is projected to occur in Eastern and South-Eastern Asia.
- The fastest increase (226%) is expected in Northern Africa and Western Asia.
- The second fastest increase (218%) is projected for sub-Saharan Africa.
- The increase is expected to be relatively small in Australia and New Zealand (84%) and in Europe and Northern America (48%), where the population is already older.

An excellent resource to look at demographic changes in individual countries is Our World in Data – the trends with time, effects of war (e.g. France 1918, 1944; Japan 1945), earlier flu pandemics, and HIV (e.g. Eswatini) are readily seen.

The pace of population ageing

The pace of population ageing is accelerating. It took 115 years (1865–1980) for the proportion of older people to double in France (from 7 to 14%), whilst in China the proportion will have doubled between 2000 and 2026. This gives countries very little time to adjust.

International migration

International migration is increasingly important.

- The number of people living outside their country of birth or citizenship reached 281 million in 2020, up from 173 million in 2000.
- The rate is continuing to increase due to economic migration and people fleeing war and persecution.

Most economic migrants are of working age and move to developed countries with older populations, so the countries they leave 'age' and the age in the destination country falls (e.g. Sweden). Immigration has an immediate impact on population age and growth in countries where natural population growth has fallen; in half of these 38 countries, immigration has ensured stable or rising populations.

However, emigration may worsen natural population decline, such as in Romania, where waves of immigration and emigration have caused marked fluctuations (see Figure 1.10).

The effect on populations of rapid, massive migration due to war depends on the situation, but typically more women and children are displaced. It is too early to evaluate the effect of the Russian invasion of Ukraine in 2022, but over 2 million refugees fled the fighting in the first 2 weeks. For context, United Nations High Commissioner for Refugees (UNHCR) estimates that there were 43.4 million refugees globally in 2023.

Urbanisation

The other major change affecting populations is urbanisation. The UN estimates that in 2007, for the first time in human history, the number of people in urban areas overtook the number in rural settings (see Figure 1.11). As with international migration, it is mainly younger people who leave the countryside, fragmenting families and altering the age distribution of areas within a country. Conflicts also cause massive internal displacements in countries.

Typical patterns of health and social care

More developed countries

Demographic changes

- Death, which was common in infancy and usual before 65 years, is now rare in infancy and unusual before 65 years.
- Life expectancy has generally continued to rise, but the rate of increase has flattened since 2010 in the US, Canada, Australia, the UK, and several European countries. By contrast, in Japan, a period of low gains in LE was followed by a return to faster improvement.
- Life expectancies have dipped because of the direct and indirect effects of COVID, but it is still too soon to be sure of the size and duration of this effect.
- The dramatic rise in the older population over the past 100 years is now slowing.
- The number of 'very old', i.e. those ≥80 years of age, is still increasing rapidly.
- Ageing populations are associated with slower economic growth due to lower productivity, less innovation and a risk of 'ageing recessions' due to labour shortages plus increased demands for care. In 2010, China overtook Japan as the world's second-largest economy, due in part to the ageing and shrinking population of Japan.

Medical services

- Sophisticated health systems are set up with specialised services for elderly people.
- An older person costs health services nine times as much as a young person.
- Population ageing requires increased health funding, estimated in the EU at 0.6% per year between 2015 and 2050, so price growth and technological advancements will be the main contributors to future growth in health care expenditure.
- Most deaths are due to cardiovascular disease, dementia, and cancer (see Figure 1.12).
- Time-to-death, particularly the final year of life, rather than age, is a stronger driver of healthcare expenditure, and there is an inverse relationship between age and the cost of end-of-life care.
- Rising expectations of older people and their carers also fuel rising health costs.
- Ethical dilemmas will become more pressing, e.g. the prolongation of death by technological intervention and the debate about access to euthanasia.
- Medical training continues to value increasing specialisation, so practitioners struggle to deal with complex aetiologies (sociological, psychological, and medical), multiple pathology and the frailty and atypical presentations common in older patients. This can result in a mismatch between the aspirations of young medics and the needs of their older patients.

Community services

- The provision of community care is more varied than for acute care. Inter-country comparisons are complex because of political, socio-economic, and demographic differences. The most straightforward comparison is the proportion of people in care homes; there used to be marked variation, but figures are converging to 4–7% of those aged 65+.

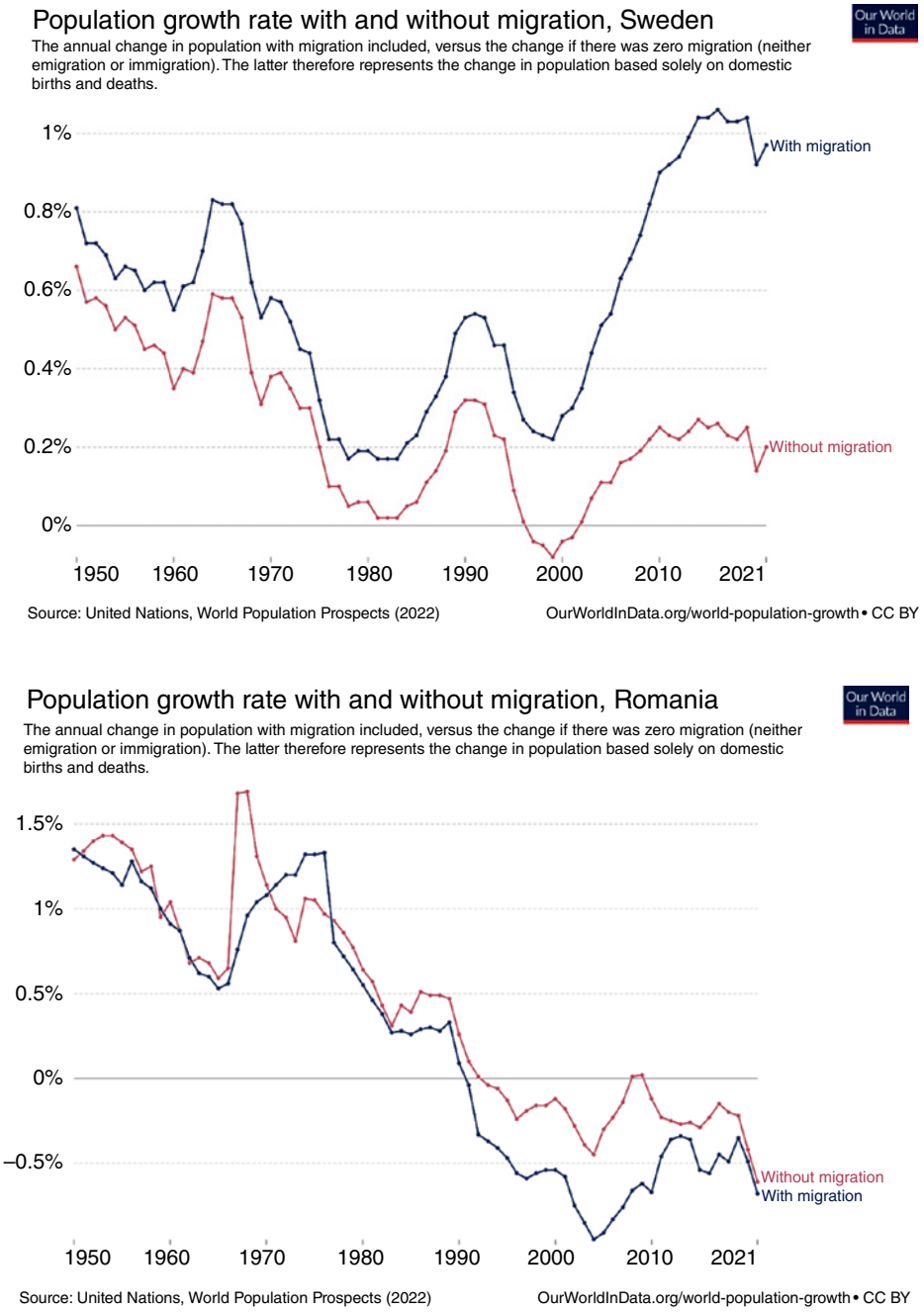


Figure 1.10 Population growth with and without migration: in Sweden, where migration is increasing the population, and in Romania, where it has decreased the population. *Source*: Our World in Data / CC BY 4.0.

- The development of patterns of care is similar. Historically, there was a heavy reliance on self-sufficiency and family care. The healthy and wealthy elderly have always fared the best. The more disadvantaged have always needed support from others.
- In the 'Old World', non-family support was provided by the church or by occupationally related charities or guilds. In England, the state began to take a more active role after the dissolution of the monasteries with the first Poor Law Act of 1601, which provided workhouse care and 'outdoor relief'. This continued until the end of the 19th century. The 20th century saw the beginning of the welfare state – gradually growing in the first half of the century, reaching a peak mid-century, and then declining towards the end of the 1980s. State provision of services was replaced by state regulation of services provided by other organisations. This regulation was gradually devolved and often weakened.
- From the 1980s on, nursing homes in the US, Europe, and Australia were increasingly run for profit, now mainly by multinational companies.
- Detailed case studies (2021) describe the provision and financing of long-term care (facility-based health care, home-based care, residential care, and personal care) in Australia, several European countries, Japan, the Republic of Korea, and the US. Common themes are issues with eligibility, equity, quality, affordability, and funding streams.
- Care for people with dementia is a major issue.

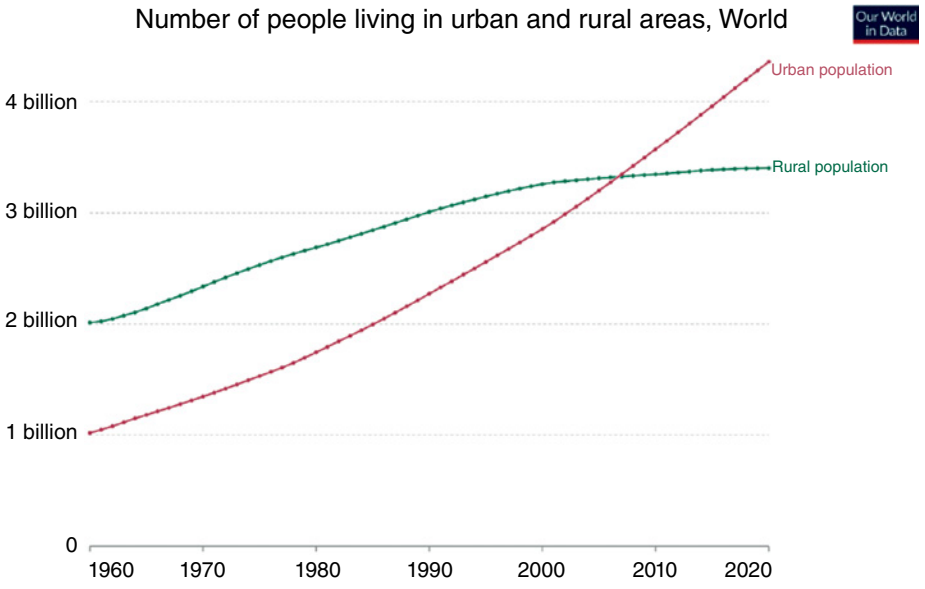
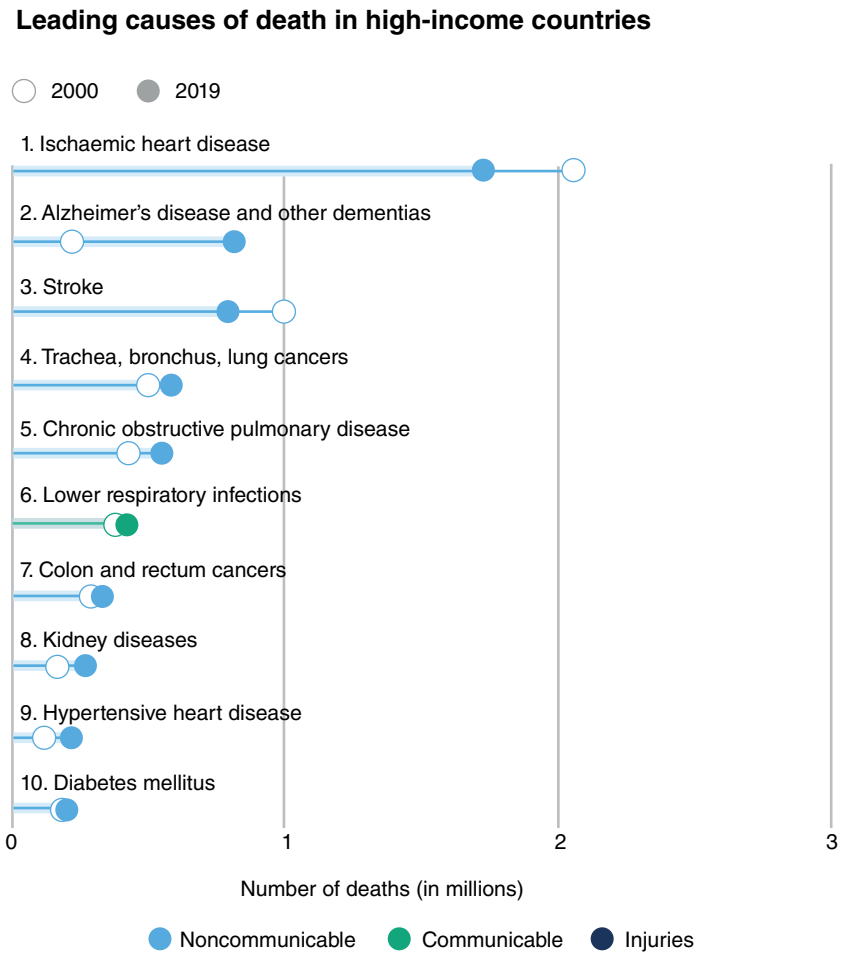


Figure 1.11 Most people now live in urban areas. *Source*: Our World in Data / CC BY 4.0.



Source: WHO Global Health Estimates. Note: World Bank 2020 income classification.

Figure 1.12 Top ten causes of death in high-income countries. *Source*: WHO Global Health Estimates.

Less developed countries

Demographic changes

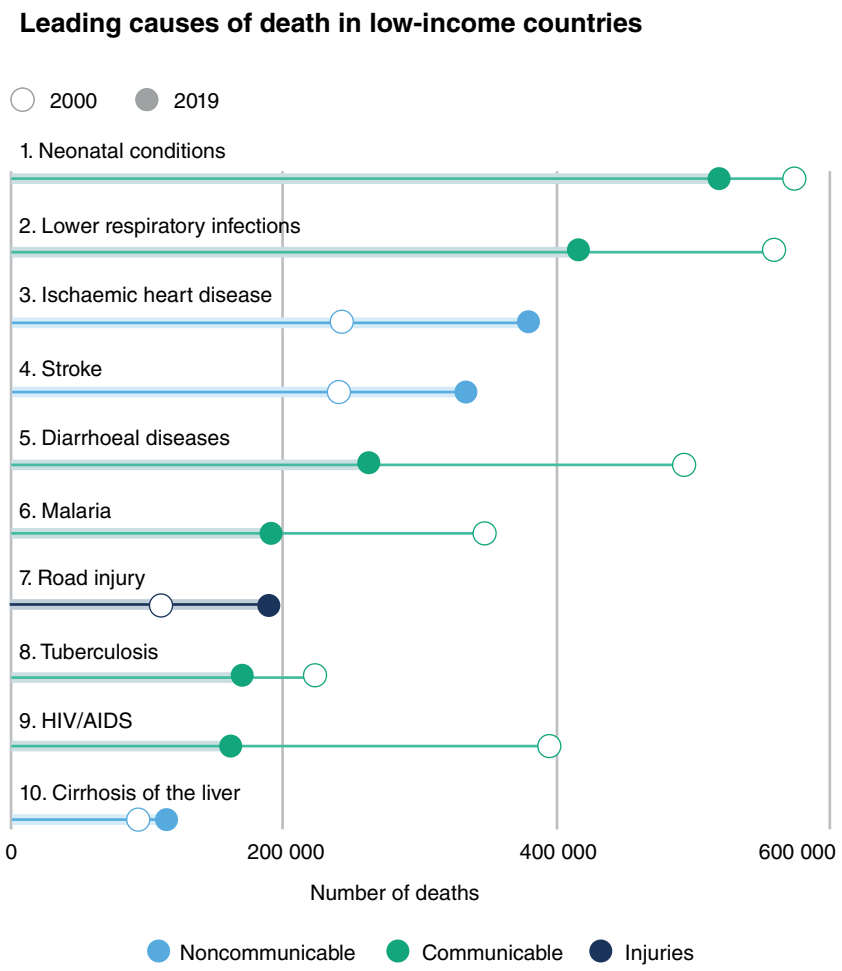
- Once people reach old age in developing countries, their LE is not much lower than in the developed world (Table 1.2).
- Until recently, the proportion of older people was low, but as countries such as China and India are so populous, over 60% of the world's elderly population already lives in these countries.
- These countries' population structures are changing rapidly with falling birth rates as contraceptive policies become effective (or are imposed), infant mortality is reduced, and survival in adult life improves.
- European studies show that babies with low birth weight and reduced growth in the first year have poor adult health, e.g. with hypertension and hyperglycaemia. This is likely to have significant consequences in India and Southeast Asia.
- Potentially preventable congenital and childhood disabilities will complicate old age.
- Poor people will be unable to get sufficient wealth to provide for themselves in old age, so the total burden will either fall on the state or older people will be neglected.
- Governments have many competing financial demands, e.g. education, housing, and the development of infrastructure.
- Many countries struggle with debt, and political instability is common.
- Population patterns are at risk of distortion by epidemics, e.g. HIV/AIDS, civil war, and migration, e.g. sub-Saharan Africa.

Table 1.2 Mean life expectancy at different ages (UN 2019).

Country	At birth	At 60 years	At 80 years
World	73.3	21.1	8.2
Low-income	65.1	17.4	5.9
Lower-middle income	69.4	18.6	6.8
Higher-middle income	76.3	21.2	7.7
High income	80.9	24.3	9.8

Medical services

- Communicable diseases still claim most lives, but cardiovascular disease is increasing (see Figure 1.13).
- Health services are often primitive, patchy, and inappropriate for needs with huge urban/rural divides.
- There may be conflict between traditional healers and scientific approaches.
- The state may pursue 'high-tech' for the few over public health measures that would help many.
- Private health care clinics grow rapidly in cities, regulation may be limited, and people may shop around until they get an opinion that they like.



Source: WHO Global Health Estimates. Note: World Bank 2020 income classification.

Figure 1.13 Top ten causes of death in low-income countries. *Source*: WHO Global Health Estimates.

- There is often limited access to therapies and equipment for rehabilitation.
- Doctors and nurses need training in geriatrics because of worldwide demographic change.
- Development may be restricted by the tight macro-economic practices enforced by the International Monetary Fund, which encourage privatisation and limit a government's ability to invest in public health.
- Globalisation via the World Trade Organisation has resulted in conflict over the cost of drugs. Unaffordable prices for patented drugs ensure financial profits for Pharma, enabling the development of new drugs, but developing countries need access to cheap generic drugs, e.g. for hypertension, diabetes, and HIV. Efforts to distribute COVID vaccines worldwide and limited countries of manufacture highlighted the difficulties.
- World trade tends to promote bad health habits, e.g. smoking, high sugar intake, excess alcohol, and recreational drug abuse.

Community services

- Most of the population continues to work for as long as they are able, and when they cannot, they must rely on family support; retirement, at least for most people, is a concept of the developed world.

Ageing in India in 2023

Demographic changes

India is in a rapid phase of transition. Life expectancy at birth has been increasing since the 1950s, with a recent dip due to COVID (see Figure 1.14). Of note, male LE was longer than that of females until 1980. As the birth rate is higher in India than in China, India became the most populous country in 2023.

- The population of India is around 1.5 billion people (UN data).
- India has 17.8% of the world's population.
- The median age in India is 28.7 years.
- Fertility has fallen from 5.9 children per woman in 1965 to 2.1 in 2020.
- The number of children under the age of five peaked in 2007.
- The population growth rate has been falling since 1983.
- Urbanisation has increased from 20% in 1970 to 35% in 2020.
- About half a million people emigrate every year.

The fall in the numbers of children means that the base of the population pyramid is becoming progressively constricted (see Figure 1.15) and young adults are the largest group.

Life expectancy at the age of 65 and older in India has also increased for both men and women since 1955, and as a result, India's elderly population is growing rapidly (Table 1.3).

Between 1970 and 2020, the number of children aged 0–14 increased, plateaued and has been falling since 2010. The population age 15–64 has increased steadily by threefold; the over-65s have gone up over fourfold; and the over-80s, sevenfold, although they still make up only 7% and 1% of the population, respectively (see Figure 1.16).

Causes of death and disability

Indian states are in different phases of epidemiological transition, and there are large variations in disease burden across the states. People are living longer, but in 2019, only a fifth of registered deaths in India had a medically certified cause of death, so causes of death are based on extrapolation.

India generates considerable data on health aspects, but the data are fragmented and non-standardised, and there is little quality control. The Ayushman Bharat Digital Mission developed a system to generate a unique health identification number for every individual for use across a range of healthcare providers (to document cases of COVID and vaccinations), but the use of this number is still optional.

- Communicable diseases have fallen.
  - Polio has been eliminated, but malaria, tuberculosis, leprosy, AIDS, and a swathe of 'neglected tropical diseases' are still significant (see Figure 1.17).
  - Mortality from TB has halved since 1990 to 23 per 100,000, but India still has a quarter of the world's cases, an estimated 28 million new cases in 2018.
  - 1.47 million of these are drug-resistant TB, a situation local sources believe has arisen because of 'unregulated treatment by private providers'.
- The prevalence of noncommunicable diseases is rising steadily as the population ages.
  - Tobacco and alcohol use, a lack of exercise, and a poor diet have resulted in a high prevalence of metabolic syndrome and hypertension. Death rates from ischaemic heart disease (IHD), stroke, diabetes, and cancer are increasing.
  - Although domestic air pollution has fallen with cleaner cooking, poor air quality contributes to chronic obstructive pulmonary disease (COPD).
  - Malnutrition is still widespread. The 2019 Global Hunger Index ranks India at 102 out of 117 countries assessed and accounts for over two-thirds of deaths under 5 years old. The sequelae in the survivors will include poor health in middle and older age.
  - Injuries are another significant cause of mortality and morbidity.

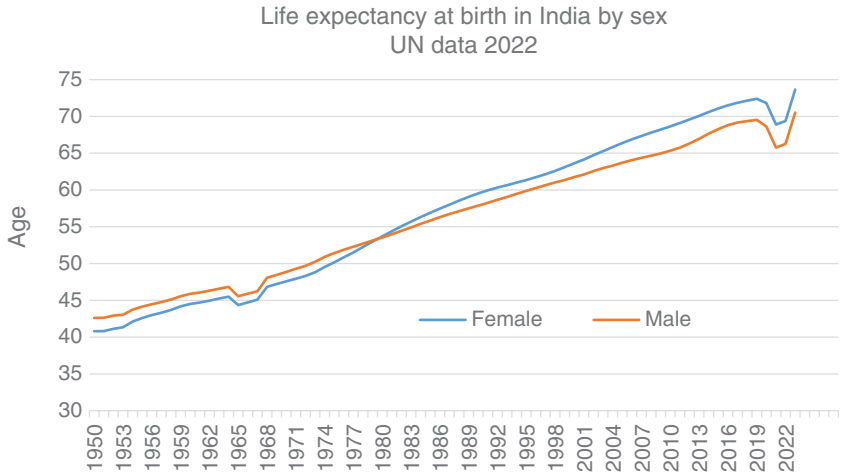


Figure 1.14 Life expectancy in India is now higher in women than men. The dip after 2019 was due to COVID. *Source*: UN World population prospects 2024 / CC BY 3.0.