



# Paediatrics at a Glance

Fourth Edition

Lawrence Miall  
Mary Rudolf  
Dominic Smith



WILEY Blackwell



# **Paediatrics** **at a Glance**



# Dedication

**T**o our children: Charlie, Mollie and Rosie, Aaron and Becca, Edward and Daniel and our spouses: Domini, Michael and Kathy and all the patients who have taught us so much over the years.



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# Paediatrics at a Glance

**Fourth Edition**

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# Preface

“‘What is the use of a book,’ thought Alice, ‘without pictures or conversations?’” Lewis Carroll, *Alice in Wonderland*.

Paediatric medicine requires an understanding of developing anatomy, physiology and psychology as well as a holistic family-orientated approach. There are a wide range of professional challenges: from the technical aspects of intensive care to the ethical and sociological questions relating to issues of autonomy, independence and children’s rights. The paediatric environment is very different to the world of adult medicine. This can all be daunting to those who are new to the specialty, but developing the skills and confidence in successfully managing these challenges can enable professionals to make significant differences to the lives of children and families. This makes paediatric medicine amongst the most rewarding of all the medical specialties.

In preparing the fourth edition, we have updated the text to reflect changes in understanding of childhood illness over the last 5 years. The new edition includes advances in genetics, screening and therapy of childhood illness. Multiple choice questions to test and expand on knowledge from the text are included on the companion website. Video clips highlighting clinical signs and examination techniques are available on the companion website.

Children have complex needs that require medical staff to work together with other professionals in child health, psychology,

education and social care. There is increasing recognition of the need for all health professionals to have a good understanding of their role in safeguarding vulnerable people. New chapters have been added to expand on psychological issues and ethics in child health. There is a new chapter on Palliative Care, which is an emerging area in the specialty.

We hope that this edition will continue to educate and inspire students and trainees in taking the first steps towards an understanding of children, their illnesses, their resilience in the face of adversity and amazing capacity for recovery. It is a book with many pictures to aid the introduction and revision of the key topics. We hope this will help as students begin their all-important conversations with young patients.

Lawrence Miall  
Mary Rudolf  
Dominic Smith  
Leeds, United Kingdom  
February 2016

# Acknowledgements



**W**e would like to acknowledge Dr Tim Lee, Dr Adam Glaser, Dr Michael Harari, Dr Claire Wensley and Dr Jemma Cleminson for their contributions to chapters.



# Abbreviations

<b>AABR</b>	automated auditory brainstem response	<b>DKA</b>	diabetic ketoacidosis
<b>ACTH</b>	adrenocorticotrophic hormone	<b>DM</b>	diabetes mellitus
<b>ADD</b>	attention deficit disorder	<b>DMD</b>	Duchenne muscular dystrophy
<b>ADH</b>	anti-diuretic hormone	<b>DMSA</b>	dimercaptosuccinic acid
<b>ADPKD</b>	autosomal dominant polycystic kidney disease	<b>DTPA</b>	diethylenetriamine penta-acetate
<b>AFP</b>	alpha-fetoprotein	<b>EBV</b>	Epstein–Barr virus
<b>AIDS</b>	acquired immunodeficiency syndrome	<b>ECG</b>	electrocardiogram
<b>ALL</b>	acute lymphoblastic leukaemia	<b>EDD</b>	expected due date
<b>ALT</b>	alanine transaminase	<b>EEG</b>	electroencephalogram
<b>ALTE</b>	acute life-threatening event	<b>ENT</b>	ear, nose and throat
<b>AML</b>	acute myeloid leukaemia	<b>ESR</b>	erythrocyte sedimentation rate
<b>ANA</b>	antinuclear antibody	<b>FBC</b>	full blood count
<b>APTT</b>	activated partial thromboplastin time	<b>FDP</b>	fibrin degradation product
<b>ARPKD</b>	autosomal recessive polycystic kidney disease	<b>FSGS</b>	focal segment glomerulosclerosis
<b>ASD</b>	atrial septal defect	<b>FTT</b>	failure to thrive
<b>ASOT</b>	antistreptolysin O titre	<b>G6PD</b>	glucose 6-phosphate dehydrogenase
<b>AVPU</b>	alert, voice, pain, unresponsive	<b>GCS</b>	Glasgow Coma Scale
<b>AVSD</b>	atrioventricular septal defect	<b>GH</b>	growth hormone
<b>AXR</b>	abdominal radiograph	<b>GI</b>	gastrointestinal
<b>AZT</b>	zidovudine (azidothymidine)	<b>GOR</b>	gastro-oesophageal reflux
<b>BCG</b>	bacille Calmette–Guérin	<b>GP</b>	general practitioner
<b>BMI</b>	body mass index	<b>GTT</b>	glucose tolerance test
<b>BP</b>	blood pressure	<b>HAART</b>	highly active antiretroviral therapy
<b>BSER</b>	brainstem evoked responses	<b>Hb</b>	haemoglobin
<b>CDH</b>	congenital dislocation of the hip	<b>HbF</b>	fetal haemoglobin
<b>CF</b>	cystic fibrosis	<b>HbS</b>	sickle-cell haemoglobin
<b>CFTR</b>	cystic fibrosis transmembrane regulator	<b>HIE</b>	hypoxic-ischaemic encephalopathy
<b>CFU</b>	colony-forming unit	<b>HIV</b>	human immunodeficiency virus
<b>CHARGE</b>	coloboma, heart defects, choanal atresia, retarded growth and development, genital hypoplasia, ear anomalies	<b>HPLC</b>	high-performance liquid chromatography
<b>CHD</b>	congenital heart disease	<b>HSP</b>	Henoch–Schönlein purpura
<b>CMV</b>	cytomegalovirus	<b>HSV</b>	herpes simplex virus
<b>CNS</b>	central nervous system	<b>HUS</b>	haemolytic uraemic syndrome
<b>CONI</b>	care of the next infant	<b>ICP</b>	intracranial pressure
<b>CPAP</b>	continuous positive airway pressure	<b>Ig</b>	immunoglobulin
<b>CPR</b>	cardiopulmonary resuscitation	<b>IM</b>	intramuscular
<b>CRP</b>	C-reactive protein	<b>INR</b>	international normalized ratio
<b>CRT</b>	capillary refill time	<b>IO</b>	intraosseous
<b>CSF</b>	cerebrospinal fluid	<b>IRT</b>	immunoreactive trypsin
<b>CSII</b>	continuous subcutaneous insulin infusion	<b>ITP</b>	idiopathic thrombocytopenic purpura
<b>CT</b>	computed tomography	<b>IUGR</b>	intrauterine growth retardation
<b>CXR</b>	chest radiograph	<b>IV</b>	intravenous
<b>DDH</b>	developmental dysplasia of the hip	<b>IVC</b>	inferior vena cava
<b>DIC</b>	disseminated intravascular coagulation	<b>IVF</b>	in vitro fertilization
<b>DIDMOAD</b>	diabetes insipidus, diabetes mellitus, optic atrophy and deafness	<b>IVH</b>	intraventricular haemorrhage
		<b>IVU</b>	intravenous urogram
		<b>JCA</b>	juvenile chronic arthritis
		<b>LFT</b>	liver function test

<b>LIP</b>	lymphocytic interstitial pneumonitis	<b>RBC</b>	red blood cell
<b>LMN</b>	lower motor neuron	<b>RDS</b>	respiratory distress syndrome
<b>LP</b>	lumbar puncture	<b>RNIB</b>	Royal National Institute for the Blind
<b>Mag-3</b>	radioisotope technetium <sup>99m</sup> Tc mertiatide	<b>ROP</b>	retinopathy of prematurity
<b>MCAD</b>	medium-chain acyl-carnitine deficiency	<b>RSV</b>	respiratory syncytial virus
<b>MCGN</b>	minimal change glomerulonephritis	<b>SCBU</b>	special care baby unit
<b>MCH</b>	mean cell haemoglobin	<b>SCID</b>	severe combined immunodeficiency
<b>MCUG</b>	micturating cystourethrogram	<b>SGA</b>	small for gestational age
<b>MCV</b>	mean cell volume	<b>SIADH</b>	syndrome of inappropriate antidiuretic hormone secretion
<b>MDI</b>	metered dose inhaler	<b>SIDS</b>	sudden infant death syndrome
<b>MLD</b>	mild learning difficulty	<b>SLD</b>	severe learning difficulty
<b>MMR</b>	measles, mumps, rubella	<b>SSPE</b>	subacute sclerosing encephalitis
<b>MRI</b>	magnetic resonance imaging	<b>STD</b>	sexually transmitted disease
<b>MUAC</b>	mid-upper arm circumference	<b>SUDI</b>	sudden unexpected death in infancy
<b>NEC</b>	necrotizing enterocolitis	<b>T4</b>	thyroxine
<b>NF</b>	neurofibromatosis	<b>TAPVD</b>	total anomalous pulmonary venous drainage
<b>NHL</b>	non-Hodgkin's lymphoma	<b>TB</b>	tuberculosis
<b>NICU</b>	neonatal intensive care unit	<b>TGA</b>	transposition of the great arteries
<b>NPA</b>	nasopharyngeal aspirate	<b>TNF</b>	tumour necrosis factor
<b>NSAID</b>	non-steroidal anti-inflammatory drug	<b>TORCH</b>	toxoplasmosis, other (syphilis), rubella, cytomegalovirus, hepatitis, HIV
<b>OAE</b>	otoacoustic emissions	<b>TS</b>	tuberous sclerosis
<b>OFC</b>	occipitofrontal circumference	<b>TSH</b>	thyroid stimulating hormone
<b>ORS</b>	oral rehydration solution	<b>tTG</b>	tissue transglutaminase
<b>P<sub>CO<sub>2</sub></sub></b>	partial pressure of carbon dioxide	<b>U&amp;E</b>	urea and electrolytes
<b>PCP</b>	pneumocystis pneumonia	<b>UMN</b>	upper motor neuron
<b>PCR</b>	polymerase chain reaction	<b>URTI</b>	upper respiratory tract infection
<b>PCV</b>	packed cell volume	<b>UTI</b>	urinary tract infection
<b>PDA</b>	patent ductus arteriosus	<b>UV</b>	ultraviolet
<b>PEFR</b>	peak expiratory flow rate	<b>VACTERL</b>	vertebral anomalies, anal atresia, cardiac anomalies, tracheo-oesophageal fistula, renal anomalies, limb defects
<b>PKU</b>	phenylketonuria	<b>VER</b>	visual evoked response
<b>PNET</b>	primitive neuroectodermal tumour	<b>VKDB</b>	vitamin K deficiency bleeding
<b>PR</b>	per rectum	<b>VSD</b>	ventricular septal defect
<b>PT</b>	prothrombin time	<b>VUR</b>	vesicoureteric reflux
<b>PTT</b>	partial thromboplastin time	<b>WCC</b>	white cell count
<b>PUJ</b>	pelviureteric junction		
<b>PUO</b>	pyrexia of unknown origin		
<b>PVL</b>	periventricular leucomalacia		
<b>RAST</b>	radio-allergosorbent test		



# How to use your textbook



## Features contained within your textbook

Each topic is presented in a double-page spread with clear, easy-to-follow diagrams supported by succinct explanatory text.

**1 Paediatrics and child health**

**Paediatrics and child health**

According to the United Nations Committee on the Rights of the Child, every child has the right to enjoy the highest attainable standard of health and to be able to access facilities for the treatment of illness and rehabilitation of health.

**Causes of death in children**

- Pneumonia
- Congenital anomalies (WHO Case Chapter 7.5)
- Diarrhoea
- Respiratory problems
- Accidents
- Congenital anomalies
- Infectious
- Heart and circulatory
- Cancer
- Neurological
- Infections

**Paediatrics and child health**

Childhood mortality in the 21st century

Paediatric morbidity and mortality are generally decreasing worldwide. Following the elimination of measles and congenital rubella infection, infectious diseases remain the leading cause of death in children. The leading causes of death are:

- Congenital anomalies
- Accidents and injuries
- Child abuse and neglect
- Neonatal respiratory distress
- Meningitis
- Inborn errors of metabolism
- Diabetes mellitus
- Sickle cell anaemia
- Haemophilia
- Thrombocytopenia

**The social determinants of health**

Health outcomes are strongly influenced by socioeconomic circumstances. Poverty and environmental factors are particularly significant determinants. The caregiver and environment provide a key through which the various influences impacting on the health of an individual.

**Causes of death in children**

- Pneumonia
- Congenital anomalies (WHO Case Chapter 7.5)
- Diarrhoea
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- Inborn errors of metabolism
- Diabetes mellitus
- Sickle cell anaemia
- Haemophilia
- Thrombocytopenia

Key point boxes give a summary of the topics covered in a topic.

### KEY POINTS

Non-organic pain is characteristically:

- Periodic pain with intervening good health
- Periumbilical
- May be related to school hours.

Consider organic pain if there is

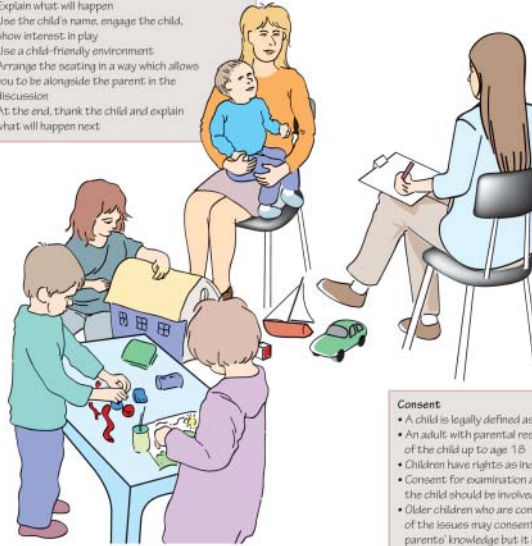
- Pain occurring at night
- Weight loss, reduced appetite, lack of energy or recurrent fever
- Organ-specific symptoms, e.g. change in bowel habit, polyuria, menstrual problems, vomiting, occult or frank bleeding
- Ill appearance, growth failure or swollen joints.

Your textbook is full of photographs, illustrations and tables.

## The doctor-patient relationship

### The consultation

- Introduce yourself to the child and parent
- Use emotional warmth and humour, and be patient
- Explain what will happen
- Use the child's name, engage the child, show interest in play
- Use a child-friendly environment
- Arrange the seating in a way which allows you to be alongside the parent in the discussion
- At the end, thank the child and explain what will happen next



### Observations

- While taking the history start to observe the child and parent
- What is the interaction like?
- Consider child's development of movement, play and communication
- Are there any immediate signs of illness?
- Move on to measure height, weight and head circumference. Plot these on centile charts
- Examine for signs of acute illness
  - pulse
  - temperature
  - capillary refill time
  - blood pressure
  - respiratory rate
  - conscious level
- Assess for signs of pain
- Examine each system

### Consent

- A child is legally defined as any individual below age 18 years
- An adult with parental responsibility can make a decision on behalf of the child up to age 18
- Children have rights as individuals
- Consent for examination and treatment is agreed with parent but the child should be involved in the discussion
- Older children who are competent to understand the significance of the issues may consent to examination and treatment without parents' knowledge but it is best practice to encourage the young person to involve their parents for support if possible

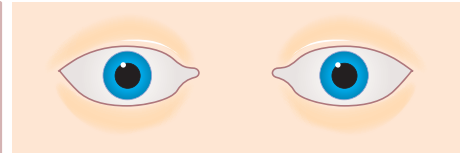
The 'play icon' indicates related videos which can be found on the companion website.



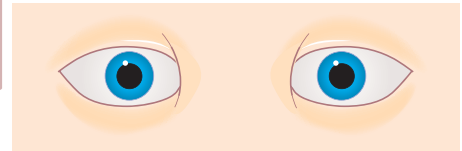
## The visual system

### Observation of eyes

- Look at the iris, sclera and pupil
- Check pupils are equal and react to light, both directly and indirectly
- Look for red reflex to exclude cataract, especially in the newborn
- Look at reflection of light on the cornea—is it symmetrical or is one eye squinting? (see box opposite)
- Look at the inner epicanthic folds—if very prominent they may cause a pseudosquint



Normal symmetrical light reflex



Pseudosquint due to prominent inner epicanthic folds



# About the companion website



Don't forget to visit the companion website for this book:

[www.ataglanceseries.com/paediatrics](http://www.ataglanceseries.com/paediatrics)

There you will find valuable material designed to enhance your learning, including:

- Interactive self-assessment case studies
- Multiple-choice questions
- Videos on various procedures and concepts covered in the book
- Links to online resources

Scan this QR code to visit the companion website.



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# Evaluation of the child

## Part 1

### Chapters

- 1 Paediatrics and child health 2
- 2 The paediatric consultation 4
- 3 Systems examination 6
- 4 Development and developmental assessment 12
- 5 Growth and puberty 16
- 6 Understanding investigations 20

# 1

# Paediatrics and child health

## Paediatrics and child health

According to the United Nations Convention on the Rights of the Child, every child has the right to enjoy the highest attainable standard of health and to be able to access facilities for the treatment of illness and the rehabilitation of health.

### Childhood morbidity in the 21st century

Paediatric morbidity until this century was dominated by infections. Following the introduction of immunisations and antibiotics new morbidities have emerged:

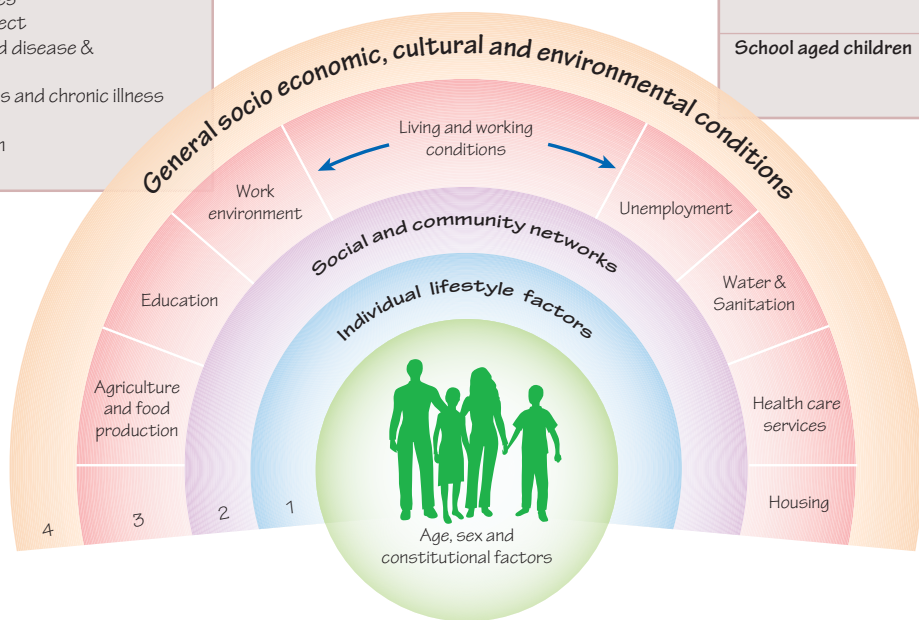
- Emotional and behavioural problems
- Childhood obesity
- Accidents and injuries
- Child abuse and neglect
- Sexually transmitted disease & teenage pregnancy
- Increase in disabilities and chronic illness
- Substance misuse, suicide and self harm
- Poor vaccine uptake

### The social determinants of health

Health is determined as much by psychosocial circumstances as by genetics. Poverty and socioeconomic status are particularly significant determinants. The Dahlgren and Whitehead model provides a way to help you consider the various influences impacting on the health of an individual

### Causes of death in childhood

<b>Infancy</b>	Prematurity Congenital anomalies SIDS (see Chapter 70) Infection Respiratory problems
<b>Preschool children</b>	Accidents Congenital anomalies Infections
<b>School aged children</b>	Cancer Accidents Infections

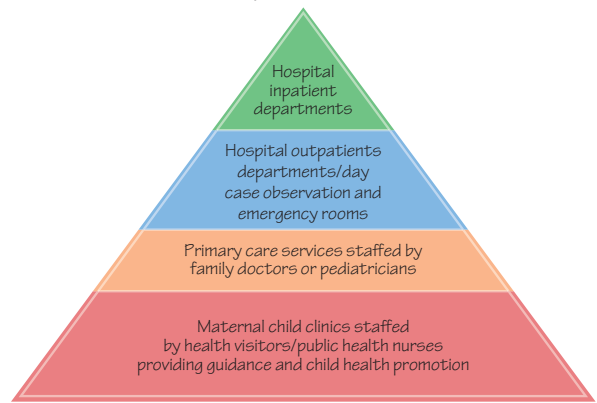


### The early years are a particularly vulnerable period

Factor	Long term outcomes
Sustained poverty	Unemployment, low income, low working hours
Abuse and neglect	Depression, anxiety, drug abuse, suicidal behaviour, STIs, health issues, trust problems
Early mental health problems	Emotional problems, leaving school early, criminal justice system contact, poor physical health
Conduct problems	Anti-social and criminal behaviour
Poor health and nutrition	More health problems; poor academic achievement, not graduating on time

Encouragingly the evidence shows that intervention in the early years can bring long term improvements in outcomes

### The pyramid of care



### Who's who in services for children?

- Parents have the central role
  - Child care providers and minders
  - Teachers
  - Social workers and care workers
- Nurses**
- Health visitors/public health nurses
  - School nurses
  - Practice/community nurses
  - Specialist nurses
- Therapists**
- Speech therapists
  - Physiotherapists
  - Occupational therapists
- Doctors**
- General practitioners (Family doctors)
  - Paediatricians

**P**aediatrics is not just about the recognition and treatment of children's illness. It also encompasses child health, covering all aspects of growth and development, promotion of children's health and the prevention of disease. It includes every aspect of life from birth through adulthood. In many countries, such as the UK, paediatric care extends up to the age of 18 and covers all children from the very premature infant to teenagers in the workforce.

All aspects of paediatrics are coloured by the fact that the child is growing and developing both physically and emotionally. Anyone involved in the medical care of children needs to have an understanding of children's normal development and a realization that children must not be considered as mini adults. In paediatrics, more than in any other branch of medicine, the needs of the family and carers must also be taken into consideration. At the end of childhood, a smooth transition of care to adult services is needed, especially for those with chronic conditions.

## The changing face of paediatrics and child health

One hundred years ago, infection was the major cause of morbidity and mortality in childhood. Improvements in the environment, sanitation and housing began the trend for advancement in population health, and this was accelerated by the introduction of immunizations and antibiotics. Changes have occurred in society too, many of which are beneficial to children and their health and well-being. Children are better and more widely protected than was the case a century ago. Educational standards, social support, medical care and knowledge about child development have all improved, and child abuse has become unacceptable.

However, inequalities in both wealth and health are increasing, and the 'gap' between the richest and poorest has a profound impact on children's lives. Referrals for emotional and behavioural problems are rising dramatically, and childhood obesity is seen as the major public health problem of our time. A relatively new aspect of paediatrics is the understanding that many determinants of adult health have their origins antenatally, in infancy and in the early years of childhood.

Health care has also changed in paediatrics. Over the last 40 years, we have seen more children admitted to hospital, but the experience of hospitalization has changed. Once visiting hours for parents were limited to 30 minutes per day, but now the normal expectation is that parents will stay with their child. Where possible every effort is made to keep children out of hospital, and many aspects of specialized complex care have become available in the community. Even for the acutely ill child, short-stay observation wards now allow serious causes of illness to be excluded and children to be discharged to recover at home. A significant proportion of admissions are for social reasons, for example, if there are concerns that the family is unable to cope or they live too far away to safely send the child home.

## The determinants of health

The way health is considered has also changed over the decades. In the early part of the 20th century, health was considered to be the absence of disease. However, in 1948, the World Health Organization changed the way we look at health when it declared that 'health is a state of complete physical, mental, and social well-being,

and not merely the absence of disease and infirmity'. In paediatrics, this has been accompanied by a more holistic approach to children, with greater emphasis on well-being especially for those coping with chronic conditions and disabilities.

Two major factors have changed priorities in the care of children and their services. The first is the understanding that socioeconomic status has a powerful influence over many aspects of children's health. Poverty is now known to be a significant predictor of a number of major measures of health, including:

- Birth weight
- Perinatal morbidity
- Sudden infant death syndrome (SIDS)
- Admission to hospital
- Obesity.

The other factor that has changed the way we view disease arises from the 'Barker hypothesis'. Barker and his colleagues brought to light how events in pregnancy and infancy can have a long-term effect on health. Exploring infant growth records from the last century, they showed that babies born small for gestational age were at significantly increased risk for hypertension, cardiovascular disease, diabetes and obesity in adult life, particularly if they showed rapid catch-up growth in the first year of life. Their findings demonstrated how critical the early years are in programming later health outcomes.

Rather reassuringly, economists have shown that although the preschool years are a vulnerable period, they are also a critical period amenable to intervention. The evidence clearly shows that when society invests in the early childhood years and provide support, community programmes, guidance for parents and education, there are profound benefits on many later outcomes such as physical health, academic achievement, mental health, antisocial behaviour and substance abuse.

## Types of paediatric problems

With the changing face of childhood disease, health professionals need to be competent at managing a broad variety of conditions. These conditions include the following broad categories:

- Acute illnesses such as bronchiolitis, respiratory infections and anaphylaxis
- Chronic illnesses such as asthma, epilepsy, diabetes and cancer
- Disabilities—both physical and intellectual
- Injury: accidental and non-accidental
- Disorders of eating and nutrition, including weight faltering, obesity and anorexia
- Mental health disorders such as attention deficit disorder, challenging behaviour, depression and anxiety.

Some of the particular challenges we need to face are emotional and behavioural problems, childhood obesity, child abuse and neglect, accidents and injuries, sexually transmitted disease and teenage pregnancy, increase in disabilities and chronic illness, substance misuse, suicide and self-harm and poor vaccine uptake.

By directly treating childhood conditions, by ensuring effective screening and prevention programmes and by advocating for better public health interventions, paediatricians and all those working in child health have a fantastic opportunity to influence the long-term outcome of their patients. Paediatrics is a challenging specialty but a very rewarding one.