CHILDREN AND NON-COMMUNICABLE DISEASE

Global Burden Report 2019
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*NCD Child is a global multi-stakeholder coalition, championing the rights and needs of children, adolescents, and young people living with or at risk of developing NCDs. We work with health professionals, NGOs, government, private donors, and most importantly, young people, to advocate for the rights of children, adolescents, and young people and promote policies to minimize preventable death and disability in young people. The American Academy of Pediatrics (AAP), a US-based membership organization of 67,000 pediatricians and pediatric medical subspecialists and surgical specialists dedicated to the health of all children, has served as NCD Child Secretariat since 2014. NCD Child continues to be a voice for the rights of children, adolescents, and young people at risk of, living with and affected by NCDs through education, raising awareness, and broader participation in the global health and development discourse.

For additional information on NCD Child, please visit [www.ncdchild.org](http://www.ncdchild.org), and follow us on Twitter at [@NCDChild](http://twitter.com/NCDChild).
Young people under the age of twenty account for more than one-third of the world’s population. In 2017, more than 2.1 billion children were affected by non-communicable diseases (NCDs). NCDs, a set of diseases resulting from the interaction of a combination of genetic, physiological, environmental and behavioral factors, present a significant burden on individuals, communities and economic resources. Children affected by NCDs often face a lifelong challenge to manage and treat their conditions. Much is written about NCDs and premature mortality, but this definition starts at 30 years of age. Indeed, children, adolescents and young people are increasingly affected by NCDs and this population remains hidden from global surveillance, targets and priorities.

For many NCDs, the best option for reducing the disease burden is prevention. Over two thirds of the antecedents to NCDs emerge during childhood and adolescence. Thus, prevention must start with children and in families, working with communities to make changes to the environment in which NCDs develop.

The key drivers of NCDs in children are unhealthy diet, obesity, physical inactivity, alcohol and tobacco use. Risk for NCDs can be established as early as life in the womb. All of these risk factors are on the rise. Three in every four adolescents are not getting enough exercise and 42 million children are considered obese. These contribute to increases in the prevalence of type 2 diabetes in youth, high blood pressure and cholesterol.

In recognition of this increasing burden, heads of government and ministers of health convened in 2011 for the United Nations General Assembly Special Session (UNGASS) for the first ever UN High Level Meeting (HLM) on non-communicable diseases (NCDs). They committed to a set of targets for reducing what was recognized as the overwhelming and rising burden of NCDs across the globe. Since then, leaders in government and health have reconvened to monitor progress on these targets and evaluate new issues. The third HLM

Burden of major NCDs in children (<20 years), 2017

<table>
<thead>
<tr>
<th>Measure</th>
<th>Prevalence Number (per 100k)</th>
<th>Incidence Number (per 100k)</th>
<th>Deaths Number (per 100k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>13.9 million (537.2)</td>
<td>1.7 million (68.2)</td>
<td>71 thousand (2.7)</td>
</tr>
<tr>
<td>Cancer</td>
<td>5.9 million (228.1)</td>
<td>392 thousand (15.1)</td>
<td>147 thousand (5.7)</td>
</tr>
<tr>
<td>Chronic respiratory disorders</td>
<td>108.9 million (4,200.6)</td>
<td>28 million (1,086.8)</td>
<td>23 thousand (0.9)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8.8 million (340.0)</td>
<td>1.7 million (65.7)</td>
<td>6.3 thousand (0.2)</td>
</tr>
<tr>
<td>Mental health disorders</td>
<td>231.3 million (8,915.4)</td>
<td>73.7 million (2,842.8)</td>
<td>51 thousand (2.0)*</td>
</tr>
<tr>
<td>Injuries and violence</td>
<td>170.4 million (6,567.9)</td>
<td>143.3 million (5,524.6)</td>
<td>766 thousand (29.5)</td>
</tr>
</tbody>
</table>

Source: GBD Study, 2017; *Deaths due to self-harm

“For goals to be met, it is crucial that NCD prevention and risk factor control starts during childhood.”
on NCDs was held in 2018 and continues the important work set out to turn the tide on NCDs. Despite progress made in monitoring and combating the rising trends of NCDs and their risk factors, many people, including children are being left behind. Children represent a vulnerable group in health as they may have limited agency to advocate for their own care, or depend on the knowledge and access to care of a parent or guardian. They are often the most vulnerable to complex issues like violence and injuries, poverty and a lack of education. As such, systems must be coordinated to ensure the health and safety of children.

Many of the risk factors increasing NCDs in children are driven by changes brought on by economic development. NCDs disproportionately affect people in low- and middle-income countries where more than three quarters of global NCD deaths. Although significant gains in child survival have been achieved over the past 25 years, most of these are the result of focused efforts on reducing under-5 mortality and especially in infectious disease. Trends in NCD burden are increasing. These shifts require a more holistic approach that includes all aspects of health across all years of life.

In 2018, the World Health Organization (WHO) set the 5 x 5 framework for tackling NCDs including five diseases (cardiovascular disease, chronic respiratory disease, cancer, diabetes, and mental and neurological conditions) and five key risk factors (unhealthy diet, tobacco use, harmful use of alcohol, physical inactivity, and air pollution). NCDs and their risk factors rarely exist in isolation and reducing the burden of even one of these elements can affect the others. Indeed, NCDs are themselves a risk factor for developing mental health disorders, whose complex determinants include: exposure to sexual violence, bullying, experiencing discrimination, living in a conflict or early pregnancy.

Early prevention of NCDs and their complications should be at the heart of health policy and management. Effective policies cannot ignore the importance of the social determinants of health including gender, socioeconomic status, age and ethnicity. These social determinants are can help highlight and understand inequalities in health. In general, developing countries tend to have a more limited capacity to respond to the rising NCD burden, leading to misdiagnosis, a lack of adequate treatment and thus higher mortality rates. NCDs disproportionately affect people in low- and middle-income countries (LMICs).

What are NCDs?

**Cardiovascular disease (CVD)** in children can be congenital or acquired. Globally, 13.9 million children are affected by CVD. Rheumatic heart disease (RHD) is the most common chronic heart disease in children.

**Cancer** is a leading cause of death for children and adolescents worldwide. Existing data suggests close to 6 million children had cancer in 2017. This may be an underestimate as many countries do not have adequate surveillance systems for childhood cancer.

**Chronic respiratory disorders (CRDs)**, including asthma, respiratory allergies and lung diseases, are a major source of disability in children. More than 108 million children in 2017 were affected by CRDs. Children with CRD often experience high rates of hospitalization.

**Diabetes** is a condition where the body cannot adequately manage blood glucose or insulin and affects more than 8.8 million children. Children who do not have access to care and essential medicines, especially insulin, may face serious complications or early death.

**Mental health disorders (MHDs)** affect as many as 231 million children and adolescents are especially vulnerable. MHDs encompass a wide range of conditions from depression and anxiety to psychosis. Mental health can have an impact throughout life, especially for people living with other NCDs.

**Injuries** affected about 131 million children in 2017. Injury can be divided into two categories: intentional or unintentional. Unintentional injuries account for almost 90% of all injuries but the Global Burden of Disease study estimates 39 million children died as a result of interpersonal violence. Sexual violence is the most prevalent type of intentional injury for both boys and girls.
where more than three quarters of global NCD deaths occur. However, inequalities can exist within countries so that the life of a child and the likelihood of adequate prevention, treatment and care for NCDs can depend greatly on their socioeconomic status.

The rising trends of NCDs require a child-centered and sustained effort to prevent disease and improve the quality of life and survival of children. This is especially true in developing countries where there is a double burden of infectious diseases and NCDs. Prevention requires a reduction of risk and the adoption of a life-course approach, starting in prenatal and neonatal care and continuing through the development of a child into adulthood. Policy efforts must be supported by a coherent and coordinated response from government across sectors including education, health, finance, labor and employment strategies. Civil society also has a role to play in the prevention, treatment, and management of NCDs, championing the needs of those at risk and affected by NCDs with strong and consistent advocacy.

NCDs must have a permanent place on the global agenda for all countries, and children must be explicitly considered within that agenda. To aid this goal the WHO has proposed a list of policy “best buys” for NCDs, many of which have a direct and important impact on the lives of children. Unfortunately, even in countries where policies for adults are in place, children are often left behind. One of the most significant gaps with regard to NCDs and children is a lack of surveillance and monitoring for these age groups. Data on NCD risk factors and prevalence along with appropriate research will enable the development of evidence based prevention and management strategies that are tailored to children.

NCD Child advocates for the unique needs of children, adolescents, and young people through its collaborations with civil society, government, youth advocates, and young people affected by NCDs.

**WHO Policy Best Buys for NCDS**

- **Tobacco** - Implement the WHO Framework Convention on Tobacco Control. Ban smoking in public places, schools, and hospitals.
- **Alcohol** - Tax alcoholic beverages. Enforce age limits. Ban promotion of alcohol to young people.
- **Unhealthy diet** - Reduce salt, fat, and sugar content in foods. Limit promotion of unhealthy foods to children.
- **Physical inactivity** - Empower schools and communities to promote physical activity in safe and convenient spaces.
- **Strengthen health systems** - Integrate NCDs into primary care. Build capacity for care professionals managing children.
- **Essential medicines and care** - Ensure equitable, affordable access to essential medicines and palliative care.
- **Monitoring and surveillance** - As with adults, regular data on the burden of NCDs and their risk factors should be routinely collected for children.
Defining children and NCDs
There is no universally agreed age range for what constitutes childhood. It is a concept that varies considerably across cultures. This report uses the definition of a child specified in the Convention on the Rights of the Child (<18 years). However, the term “children” comprises a range of sub-categories based on age: neonate, infant, adolescents, young people, youth and these are described in Table 1.1.

Noncommunicable diseases (NCDs)
NCDs are a set of diseases resulting from the interaction of genetic, physiological, environmental and behavioral factors, often associated with a long duration with a slow progression. In 2016 the World Health Organization estimated that 40.5 million adults died due to NCDs, of which 15 million occur in people under the age of 70 and thus classified as “premature.” This definition, however, starts at the age of 30 and excludes any deaths occurring in children, adolescents, and young people. While many NCDs are preventable, some like congenital heart disease and type 1 diabetes are not. All NCDs, regardless of their cause require quality and consistent access to age appropriate health care, treatment, and management to reduce the burden of complications and mortality. Seventy percent of the preventable adult deaths from NCDs are linked to risk factors that start in adolescence, providing a key opportunity for prevention.

The five most common NCDs in adults are: cardiovascular diseases, cancer, chronic respiratory disorders, mental health disorders, and diabetes.

Cardiovascular disease (CVD) is a term used to describe disorders of the heart and blood vessels. In adults it is often linked to the build-up of fatty deposits inside the arteries (atherosclerosis). Within CVDs, there are four main types:

- Coronary heart disease occurs when the flow of oxygen-rich blood to the heart muscle is blocked or reduced (e.g. heart attack or angina).
- Stroke occurs when the blood supply to part of the brain is cut off. This can cause brain damage and death.
- Peripheral arterial disease is caused when there is a blockage in the arteries to the legs or arms.
- Aortic disease affects the largest blood vessel in the body and can lead to serious circulatory problems.

In children, CVD can arise as a complication of rheumatic heart disease. Similarly, although the causes may be different, stroke is also an issue.

Key Messages
- Young people under the age of twenty account for more than one-third of the world’s population.
- More than 2.1 billion children were affected by NCDs in 2017.
- NCD prevention must start during childhood and in families.
- Over two thirds of antecedents to NCDs emerge during childhood and adolescence.
- NCDs are a large and growing problem for adults and children.
- NCDs disproportionately affect people in low- and middle-income countries where more than three quarters of global NCD deaths.
for child health and is a major cause of morbidity. Cancer is a term used to describe a large group of diseases that involve the growth of abnormal cells. These abnormal cells grow beyond their usual boundaries and then invade other parts of the body. Cancer can affect almost any part of the body and there are many different types, all need specific treatment and management strategies.

Chronic respiratory disorders (CRDs) are chronic conditions affecting lungs, airways and related structures. CRDs range from rhinosinusitis, asthma, and chronic obstructive pulmonary disease (COPD) to lung cancer.

Diabetes (diabetes mellitus) is the result reduced levels of insulin production or ineffective insulin sensitivity. Increases in blood glucose resulting from problems with insulin can damage many of the body's systems. There are two main forms of diabetes:

- Type 1 diabetes occurs when the pancreas does not produce the hormone insulin. This type develops most commonly in children and adolescents.
- Type 2 diabetes is caused by the body not responding properly when insulin is released from the pancreas. Type 2 diabetes becoming more common in children. Unlike type 1 diabetes, many cases of type 2 diabetes may be preventable.

Diabetes may also develop during pregnancy in a condition known as gestational diabetes. Untreated gestational diabetes puts mothers and children at risk for complications and developing type 2 diabetes later in life.

Mental health is a term used to describe a state of well-being that allows a person to realize their own potential, cope with the normal stresses of life, work productively, and participate in the community. Mental health disorders (MHDs) comprise a broad range of problems that affect mental health (including anxiety, depression, bipolar disease, schizophrenia and other disorders). Symptoms range from any of or a combination of abnormal thoughts, emotions, behavior and relationships with others.

In addition to these five key NCDs, this report covers injuries and violence which also play an important role in determining the health of children.

Injury is defined as “the physical damage that results when a human body is suddenly subjected to energy in amounts that exceed the threshold of physiological tolerance – or else the result of a lack of one or more vital elements, such as oxygen.” They can be a result of intentional (acts of violence against others or oneself) or unintentional road traffic crashes, burns, drowning, falls, and poisonings.

### Table 1.1: Definitions of child and subcategories

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Child</td>
<td>Anyone under the age of 18.</td>
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<tr>
<td>Adolescents</td>
<td>Children between the ages 10 and 19. Used more for understanding the biological changes rather than social transitions. Recent literature suggests extending the upper limit to 24 years.</td>
</tr>
<tr>
<td>Infant and neonate</td>
<td>A child younger below one year of age.</td>
</tr>
<tr>
<td>Young people</td>
<td>Used interchangeably with “youth” the terms often are used for ages 15 to 24. Although the UN recognize that member states may use different definitions.</td>
</tr>
<tr>
<td>Youth</td>
<td>Persons between the ages 15 and 24.</td>
</tr>
</tbody>
</table>

Citations

A risk factor is any characteristic or exposure of an individual that increases their likelihood of developing a disease or injury. These include but are not limited to pollution, obesity, unsafe sex, high blood pressure, poor sanitation, tobacco and alcohol consumption and others. These risk factors often combine to increase the chances that children to develop certain NCDs. Understanding risk factors is key to the prevention and control of NCDs. Policies geared towards risk factors can have benefits for the whole population, but understanding which groups are most at risk can also provide a targeted approach to prevention.

**Tobacco use**
Globally, an estimated 24 million children aged 13 to 15 years smoke. Girls smoke at higher rates in high income countries than in middle or low income countries. Globally, boys smoke at almost twice the rate of girls (Fig. 1.1). Between 2000 and 2015, the prevalence of tobacco smoking among children decreased in all age groups and this reduction is expected to continue until 2025. However, not all tobacco use involves smoke, an estimated 13.4 million (3.6%) of the world’s population aged 13 to 15 years use smokeless tobacco products with rates almost twice as high in boys than in girls.

**Physical inactivity**
Physical activity is an important protector against a range of NCDs. Worldwide, 3 in 4 adolescents aged 11 to 17 years do not currently meet the World Health Organization global recommendations for physical activity (Fig. 1.2). Physical inactivity is higher in girls across all income groups but especially in low-

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**Key Messages**

- NCDs are driven by several risk factors, but most importantly unhealthy diet and obesity, physical inactivity, tobacco use and alcohol abuse.
- Both the prevention of risk factor development (primordial prevention) and modification of risk factors once they are established (primary prevention) are important.
- Income disparities exist in the distribution of major preventable risk factors.
and middle-income countries with the highest levels of inactivity seen in low- and upper-middle income countries. Estimates suggest that physical activity may be in decline in both sexes starting from as early as six years old.

**Unhealthy diet**
An unhealthy diet (including insufficient fruit, vegetable, legume and nut consumption and/or consumption of energy dense foods) is one of the major risk factors for a range of NCDs.\(^1\) Malnutrition in utero and in early childhood have been shown to increase a child’s vulnerability to over-nutrition later in life and into adulthood. Unhealthy diets are associated with overweight and obesity, which rank globally as the fifth leading cause of death. Children are especially high consumers of sugar-sweetened beverages including sodas, sugary juices, and other drinks which drive up rates of obesity, and independently of type 2 diabetes.\(^2\)

**Alcohol**
From conception onwards, the human body is susceptible to the harmful effects of alcohol and use during pregnancy can result in a range of lifelong conditions. Globally, 155 million 15 to 19 year olds consume alcohol. Alcohol use in adolescents is associated with negative effects on the brain, gut and circulatory system as well as increasing sexual risk-taking behavior, mental health disorders, and injuries and violence.\(^3\)

**Obesity**
The prevalence of obesity is increasing and in 2016 an estimated 42 million children under the age of 19 were overweight or obese (Fig. 1.3). The onset of obesity during childhood can lead to severe health risks; obesity is a key risk factor for orthopedic issues, diabetes and cardiovascular disease. A population-based study estimated that 70% of obese children and adolescents between the ages of 5 to 17 have at least one risk factor for CVD.\(^4\)

**High blood pressure**
High blood pressure, or hypertension, is an important risk factor for cardiovascular disease in both children and adults. Increases in childhood blood pressure have been reported by national surveys in the US and in other countries.\(^5\) These increases were observed in all ethnicities for diastolic blood pressure and in most ethnicities for systolic blood pressure (including, boys, girls, and those aged 8 to 12 years).

Increases in blood pressure are partially driven by the rising rates of obesity in children over the last three decades (Figure 1.3). Overweight in adulthood is a known risk factor for cardiovascular disease, but the effect of overweight on hypertension in children is less understood.

**High levels of fat in blood**
Atherosclerosis has been shown to begin as early as nine years of age. Amounts of triglycerides, total cholesterol, low density lipoprotein cholesterol, and high density lipoprotein cholesterol are all more likely to be abnormal in overweight children than in normal weight children. With treatment, these

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**Fig. 1.3. Trends in prevalence (%) of obesity (5-19 years) by sex**

Source: WHO, Global Health Observatory
conditions are reversible. Furthermore, left ventricular mass has been shown to be significantly raised in obese children and has been suggested to be an indicator for the need for pharmacological treatment of pediatric hypertension.6

Pollution
Exposure to pollution (indoor or outdoor) is a risk factor for chronic respiratory diseases. The WHO suggests that air pollution causes 570,000 childhood deaths annually.7 The Global Burden of Disease study puts the figure at 395,850 deaths (<20 years) in 2017. Outdoor air pollution from the environment is associated with increasing pediatric emergency hospital visits and respiratory symptoms. In addition to the direct effects of smoking, secondhand smoke (SHS) exposure causes around 890,000 deaths per year, and 28% of these are children, due to respiratory diseases.7

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Number</th>
<th>Prevalence Girls (%)</th>
<th>Prevalence Boys (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking any tobacco (13-15 years), 2014</td>
<td>24 million</td>
<td>8.3</td>
<td>18.2</td>
</tr>
<tr>
<td>Insufficient physical activity (11-17 years), 2010</td>
<td>NA</td>
<td>83.9</td>
<td>77.6</td>
</tr>
<tr>
<td>Current alcohol drinking (15-19 years), 2016</td>
<td>155 million</td>
<td>26.5 (total)</td>
<td></td>
</tr>
<tr>
<td>Obesity (5-19 years), 2014</td>
<td>42 million</td>
<td>5.6</td>
<td>7.8</td>
</tr>
<tr>
<td>Deaths due to air pollution (&lt;20 years), 2017</td>
<td>395 thousand</td>
<td>6.4</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Sources: WHO, Global Health Observatory; GBD Study, 2017

“Policies geared towards risk factors can have benefits for the whole population, but understanding which groups are most at risk can also provide a targeted approach to prevention.”

Citations
Children have made significant gains in health over the past 25 years. The rates of under-5 mortality across the globe have decreased and the gaps between the richest and poorest countries are closing. Most of these gains are the result of focused efforts on reducing under-5 mortality through the control of infectious diseases, reducing malnutrition and improving maternal care. However, trends in NCDs are increasing.

While stunting and malnutrition rates have dropped by 40%, overweight in children has increased by a third since 1990. These shifting trends require a shifting response away from a focus on just the first five years of life toward a more holistic approach that includes all aspects of health.

In 1990, the United Nations and 194 countries ratified the Convention on the Rights of the Child, enshrining the principle that children hold fundamental economic, social, cultural, civil and political rights in which they play a critical role as holders of those rights. It asserts that all children – without discrimination in any form – benefit from special protection measures and assistance; have access to services such as education and health care; can develop their personalities, abilities and talents to the fullest potential; grow up in an environment of happiness, love and understanding; and are informed about and participate in, achieving their rights in an accessible and active manner.

Article 24 of the Convention states that all children have the right to “the highest attainable standard of health and access to facilities for the treatment of illness and rehabilitation of health.” Since the adoption of the Convention, progress has been made in securing an improved prospect for children and their future. However, more work must be done, and especially in the poorest countries, to ensure that these gains are equally shared and accessible to all children.

Emergent epidemics of NCDs have yet to be explicitly named and, in practice, healthcare resources are often geared towards other priorities, especially in developing countries. This gap is contrary to rising trends discussed in this report and the high burden of some NCDs in the world.

Children represent a vulnerable group in health as they may have a decreased ability to advocate for their own care, or depend on the knowledge and access to care of a parent or guardian. They are often the most vulnerable to complex issues like violence and injuries, poverty, and a lack of education. As such, systems must be coordinated and implemented to ensure the health and safety of children.

Citations
There are many conditions that fall under the definition of NCDs, but the largest burden is made up of five in particular - cardiovascular disease, cancers, chronic respiratory disorders, mental health disorders, and diabetes (Fig 2.1). These five conditions show an increasing trend across all countries in the world, but most people with NCDs living in developing countries.

Early onset of NCDs can have serious consequences for the child both at the time of diagnosis and later in life. The effects of NCDs in children contribute 174 million years lived with disability. For many children, and especially in developing countries, surviving the first years of life with an NCD is a serious challenge and many do not reach age five (Fig 2.1). NCDs accounted for over 1 million deaths in children under 20 years in 2017. Cancers especially are a major contributor to early mortality in children as are injuries and violence. These high mortality rates are often due to a lack of capacity in healthcare systems to adequately diagnose, treat and manage children with NCDs.

Mental health disorders have the highest prevalence of any NCD in children (Fig 2.2). These disorders are often intertwined with other NCDs and children experiencing another NCD are often at a higher risk for depression and anxiety. NCDs rarely exist in isolation and represent a combined burden for many children and their families.

It is important to remember that few children experience just one NCD or risk factor and that often the challenges faced for one condition play out across the whole life of the child.

Citations
2 Hardman, C. European Association for the Study of Obesity. (2019, April 27).

Key Messages
- Mental health disorders are the most prevalent NCD in those under 20 years old.
- Cancer is the leading cause of death in those under 20 years old.
- Major NCD burdens in children also come from congenital and acquired heart disease, injuries and violence.
- Children affected by NCDs may face a lifelong risk of disability and early death.
Cardiovascular disease is a broad term encompassing a number of conditions that affect the heart and circulation. These can be congenital or acquired. While many are highly treatable, their prevention and control in children is often inadequate due to a lack of resources or awareness for early detection and management. More than 13.9 million children in 2017 had some form of CVD.

Pediatric CVD is a term used to describe several different heart conditions in children. The most common type of pediatric heart disease is congenital, which means that children are born with the defect. Globally, one million children a year are born with a heart defect and 90% of these are born in areas where appropriate medical care is limited or unavailable.¹

Rheumatic Heart Disease (RHD) is the most common chronic heart disease in children. RHD is caused by rheumatic fever, which is brought on by common infections of the throat. RHD can result in irreversible damage to the heart valves. Without surgery and life-long medical treatment RHD can be fatal. Better living conditions and access to antibiotics have meant that in developed countries, rheumatic fever has been nearly eradicated. Now it is almost exclusively a disease of poverty RHD and is estimated to affect at least 15.6 million people each year.²

Management of heart disease
Heart disease resulting from RHD is treatable: some children need heart surgery, but in many cases early intervention with a single procedure will lead to a normal or near-normal life. Basic primary healthcare services can provide primary and secondary prevention of RHD, which includes administration of basic medications like penicillin. Early identification and treatment of the infection that can cause rheumatic fever is the best form of prevention. Secondary prevention protects children who have had rheumatic fever from the recurrences that cause heart damage to progress.

Pediatric stroke
Pediatric stroke has varying mortality rates depending on the type of stroke: arterial ischemic stroke (AIS) mortality ranges from 7% to 28% and hemorrhagic stroke (HS) between 6% to 54%.³ However, mortality rates for HS are decreasing.⁴

Pediatric arterial ischemic stroke (AIS) can be divided into two main types: perinatal and childhood. Perinatal stroke occurs between 20 weeks of fetal life through the twenty-eighth postnatal day. Childhood arterial ischemic stroke defines those who have pediatric AIS beyond the first month of life. The incidence of perinatal AIS is considerably higher than that of childhood AIS; with current estimates likely to be an underestimate. Estimates of the incidence of childhood AIS are variable and highly dependent on the search strategy.

Key Figures: Cardiovascular disease

<table>
<thead>
<tr>
<th>Measure (&lt;20 years), 2017</th>
<th>Number</th>
<th>Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>13.9 million</td>
<td>537.2</td>
</tr>
<tr>
<td>Incidence</td>
<td>1.7 million</td>
<td>68.2</td>
</tr>
<tr>
<td>Deaths</td>
<td>71 thousand</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Source: GBD Study, 2017
employed as well as the study population. Incidence rates vary from 2.4 per 100,000 person-years to 7.9 per 100,000 person-years.\textsuperscript{5}

AIS varies significantly by race and sex. Boys have a higher risk of both childhood and perinatal AIS. The risk of AIS in children and neonates is highly age-dependent, with children less than one year of age at the highest risk even after accounting for perinatal AIS. After one year of age, the incidence declines considerably and stays low until mid-adolescence, when it begins to increase.

Causes of hemorrhagic stroke, other than trauma, include arteriovenous malformation, hematologic abnormalities or brain tumor with other conditions. Pediatric AIS is less understood but has been associated with diverse risk factors that vary substantially between the perinatal period and later in childhood.\textsuperscript{6}

Epilepsy is a possible outcome of childhood strokes affecting approximately 15 to 20\% of children with childhood AIS and 17\% of those with HS. For HS, specific outcomes are usually not defined, but a US study described mild to moderate neurological impairments with a lower quality of life.\textsuperscript{7} Pediatric AIS is an important cause of nerve damage in children usually due to late diagnosis.\textsuperscript{5} Consequences can include sensorimotor deficits, language impairment, intellectual disability, behavioral problems, and epilepsy. Among young adult survivors of childhood stroke, 37\% had no functional deficits, 50\% had mild or moderate deficits, and 15\% had severe deficits.\textsuperscript{6}

**Fig. 2.3. Deaths due to CVD in children (<20 years) by age and sex, 2017**

Management of pediatric stroke
Several guidelines have been published regarding the management of AIS in the pediatric population.\textsuperscript{8,9} In the acute phase of pediatric AIS, efforts are concentrated on supportive neuroprotective measures such as maintaining blood flow to the brain and aggressive treatment of fevers and seizures. At present, prevention of recurrence involves anti-clotting therapies such as warfarin or aspirin (for secondary prevention).\textsuperscript{5}

Sickle-cell disease
Sickle-cell disease (SCD) is a group of inherited conditions affecting the blood identified by the presence of hemoglobin-S (sickle shaped), which replaces a proportion of normal hemoglobin. It is the most common of all hemoglobin disorders, with 230,000 new cases per year in sub-Saharan Africa (70\% of worldwide cases).\textsuperscript{10,11}

Diagnosis of sickle-cell disease is relatively simple and neonatal diagnosis is inexpensive, allowing clinical management from birth. People living with sickle-cell disease regularly survive into adulthood, but these rates vary. SCD has a wide range of symptoms and complications. Some may people may experience few symptoms but die with a single acute event, while others skip one or more ‘phases’ in the age-related progression of the disease.

Management of sickle-cell disease
There is no one treatment for SCD and healthcare is focused on complication
management. Painful blockages in blood flow known as vasco-occlusive crises are common in SCD. These are responsible for most of the major complications as many organs of the body can be affected. In childhood, infection, stroke and acute chest syndrome (ACS) dominate as causes of morbidity and death. In adolescence, bacteraeamias, dactylitis, ACS, and stroke decrease in frequency, and gallstones, episodes of severe pain, and leg ulceration increase in frequency. Those with the disease face the physical limitations and the psychological impact of a serious chronic condition. In adulthood, complications associated with pregnancy, the eyes, and chronic organ damage become increasingly prevalent.

Policy frameworks
For the prevention and management of adult CVD, the WHO has developed the Global HEARTS Initiative, however, there is no pediatric equivalent, partly due to the fact that pediatric CVD has a broad etiology.\textsuperscript{12} In 2011, the US National Heart, Lung and Blood Institute released its Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents. The guidelines’ recommendations were controversial and not universally embraced, but they did suggested potential avenues for key research. In the same year, the WHO released the Global Atlas on Disease Prevention and Control. Although the document does not specifically address the issues of CVD in children, it does address several contributing factors, such as obesity, rheumatic fever and Chagas disease.

Citations
1 NCD Alliance. A Focus on Children and NCDs: Remembering our future at the UN Summit on NCDs, September 2011.
The term “childhood cancer” is most commonly used to designate cancers that arise before the age of 15. The most common categories of childhood cancers include leukemias, brain cancers, lymphomas and solid tumors (Table 2.1). Acute lymphoblastic leukemia is the most common type of cancer, except in sub-Saharan Africa, where children are more prone to develop non-Hodgkin’s lymphomas and Kaposi’s sarcoma (related to HIV infection).

Cancer in childhood represents between 0.5% and 4.6% of the total number of cancer cases in the world. Overall, annual incidence rates vary between 9 and 22 per 100,000 in children and around 14 per 100,000 in adolescents (Fig. 2.4). The youngest age group, 1 to 4 years, has the highest incidence relative to other groups, possibly due to genetically linked diseases, with girls having a higher prevalence of cancer in each age group than boys (Fig. 2.5).

Cancer is a leading cause of death for children and adolescents worldwide accounting for close to 150,000 deaths in 2017. However, there are few globally comparable data on cancer survival. In 2012, 82% of the new cases and 93% of the deaths from cancer occurred in the less developed countries. In high-income countries cure rates in children with cancer exceed 80% while in many low- and middle-income countries (LMICs) this rate drops to 20%. The reasons for lower survival rates in LMICs include an inability to obtain an accurate diagnosis, inaccessible therapy, abandonment of treatment, and excess relapse.

Although many studies have tried to identify the causes of childhood cancers, the vast majority have no known cause, with a minimal number of cancers in children being due to environmental or lifestyle factors. Only 10% of all children with cancer are attributable to genetic factors.

Some infections are risk factors for childhood cancer, while others increase the risk of developing cancer as an adult. As a result of the limited understanding of the causes of childhood cancers, the World Health Organization (WHO) suggests that cancer prevention in children should aim to promote behaviors that will prevent the child from developing preventable cancer as an adult. In LMICs, efforts should include vaccination, screening and early diagnosis of chronic infections that lead to cancer.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Number</th>
<th>Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>5.9 million</td>
<td>228.1</td>
</tr>
<tr>
<td>Incidence</td>
<td>392 thousand</td>
<td>15.1</td>
</tr>
<tr>
<td>Deaths</td>
<td>147 thousand</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Source: GBD Study, 2017
The improved survival in high-income countries has resulted in an increasing population of childhood cancer survivors. Many survivors suffer significant later effects of their cancer and have a greater risk of death and other cancers long past their initial diagnosis. Longer term side effects of cancer treatment include neurocognitive impairment, loss of fertility in girls, cardiovascular disease, and other organ dysfunction. Additionally, there is the psychosocial impact of the disease and its treatment on patients, their family members, and their futures. Consequently, continued lifelong monitoring is important and has to consider entry into the non-specialized, primary health care system.

**Management and care**

As it is generally rare to be able to prevent cancer in children, the most effective strategy to reduce the burden is to focus on a prompt, correct diagnosis followed by effective therapy. Early diagnosis is relevant in all settings and improves survival for many cancers. Treatments for cancer vary with disease type and over the past 50 years, 5-year survival has improved in high income countries, while in low income countries, cancer is often still a fatal disease.

**Pain management and palliative care**

Palliative care relieves disease symptoms and improves the quality of life of patients and their families. It is an important aspect of cancer treatment as well as for other conditions. Although not all childhood cancers can be cured, symptom relief should be accessible to all. Palliative care should form a core component of the pediatric cancer care plan at diagnosis and continued regardless of whether or not a child receives treatment. Effective palliative care requires a multidisciplinary approach that includes the family and utilizes available community resources. Although guidelines recommend access to oral morphine for the treatment of moderate to severe cancer pain, this is not always possible as in some countries opioids are illegal. Access to pain management and palliative care is especially limited in developing countries and children with cancer may live short, painful lives.

![Fig. 2.5. Prevalence of cancer in children (<20 years), by age and sex, 2017](image)

![Fig. 2.6 Trends in prevalence of cancers in children (<20 years) by sex](image)
Policy frameworks

In 2018, the WHO launched the Global Initiative for Childhood Cancer with partners to provide leadership and technical assistance to support governments in building and sustaining high-quality childhood cancer programs.\(^3\) Within the framework of the Global Initiative, the IARC will lead efforts to identify barriers to cancer registration, and will recommend approaches to improve data quality in existing registries, specifically within the child population. The goal of the initiative is to achieve at least 60% survival for all children with cancer globally by 2030 which is estimated to save an additional one million lives over the next decade.

Palliative care, which can have an important role in the treatment of cancer and other childhood diseases, is often severely limited to children and especially in developing countries. The International Children’s Palliative Care Network has developed a suite of tools and resources to evaluate and empower countries to provide adequate palliative care to children.\(^4\)

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Table 2.1. Top cancers in children (<20 years) by prevalence, 2017

<table>
<thead>
<tr>
<th>Cause</th>
<th>Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukemia</td>
<td>34.2</td>
</tr>
<tr>
<td>Brain and nervous system cancer</td>
<td>15.9</td>
</tr>
<tr>
<td>Kidney cancer</td>
<td>8.0</td>
</tr>
<tr>
<td>Non-Hodgkin’s lymphoma</td>
<td>6.12</td>
</tr>
<tr>
<td>Hodgkin’s lymphoma</td>
<td>3.7</td>
</tr>
<tr>
<td>Thyroid cancer</td>
<td>1.8</td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td>1.0</td>
</tr>
<tr>
<td>Testicular cancer</td>
<td>0.89</td>
</tr>
<tr>
<td>Nasopharynx cancer</td>
<td>0.86</td>
</tr>
<tr>
<td>Malignant skin melanoma</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Source: GBD Study, 2017

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Citations


In children, chronic respiratory disorders (CRDs) contribute to disability and hospitalization in children (Fig 2.6). Some of these respiratory disorders are preventable including asthma and respiratory allergies. Preventable CRDs affect millions, especially the young and elderly, with more than 500 million of these people living in low- and middle-income countries (LMICs). The most common preventable CRDs are: chronic obstructive respiratory disease (COPD), sleep apnea, allergic rhinitis, and asthma. Of these, the last two greatly affect child health.

There are many risk factors for preventable CRDs but the most significant fall into three categories:

- indoor (pollution, pets, and insects),
- outdoor (pollution, pollens and molds),
- and occupational agents (platinum salts, flour and latex) that more common for working adults.

In LMICs, solid fuels are a major source of indoor pollution with children under 5 and women most likely to have a greater exposure. Preventive measures exist and have a considerable impact on morbidity as well as mortality. Not only will preventive measures improve quality of life in childhood, but they can also improve health in adulthood as exposure to risk factors and childhood asthma are major determinants of CRDs in adults.

Children with CRD often experience high rates of hospitalization with delayed presentation of acute episodes, particularly in those under 5 years, which can result in death (Fig. 2.7). Although effective management plans have been shown to reduce the morbidity and mortality caused by CRDs, there are many barriers to optimal treatment. These barriers range from reduced availability of medications to more societal factors such as poverty and literacy. In LMICs, this reduced access to treatment is compounded by the lack of resources to enable diagnosis of CRDs.

Allergic rhinitis (AR) and asthma are the most common preventable CRDs in children. AR is characterized by one or more symptoms, such as sneezing, itching, nasal congestion and runny nose. If treatment is not adequate, children can experience chronic inflammation which can induce a range of medical complications, learning and behavioral issues, as well as aggravate conditions such as sinusitis and asthma.

Children and adolescents are the most commonly affected by AR with a prevalence up to 40% of the population. AR is a multifactorial disease with genetic as well as environmental
factors influencing disease development. Sensitization to allergens at an early age along with a range of maternal and in utero factors contribute to the risk of developing AR. Not surprisingly, outdoor allergens appear to constitute a greater risk for seasonal rhinitis while indoor allergens pose a greater risk for perennial rhinitis.

Asthma
Another common cause of CRDs in children, asthma is described as a heterogeneous disease usually characterized by chronic airway inflammation. Symptoms include wheeze, shortness of breath, chest tightness, cough and expiratory airflow limitation that vary over time and in intensity.³

The prevalence of asthma in children is rising and is highest among children under 9 years. The International Study of Asthma and Allergies in Childhood highlighted the wide variability in the prevalence and severity of asthma between regions and countries as well as within countries.⁴

Asthma is rarely a cause of death in children, but it can be an important source of disability and hospitalization. Childhood asthma can result in many lost school days and may deprive the affected children of both academic achievement and social interaction.

There are genetic and non-genetic factors contributing to asthma with the disease often running in families. Although a number of factors that can cause exacerbations in symptoms have been identified, there is no recognized cause. Environmental factors, particularly indoor allergens (including smoking in the household) are more likely to be responsible for a large portion of the numbers of people with asthma. In addition to this focus on environmental factors, it is now understood that allergic mechanisms are only responsible

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**Fig. 2.7 Prevalence of asthma in children (<20 years) by age and sex, 2017**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 4</td>
<td>5K</td>
<td>3K</td>
</tr>
<tr>
<td>5 to 9</td>
<td>6K</td>
<td>4K</td>
</tr>
<tr>
<td>10 to 14</td>
<td>4K</td>
<td>2K</td>
</tr>
<tr>
<td>15 to 19</td>
<td>3K</td>
<td>1K</td>
</tr>
</tbody>
</table>

Source: GBD Study, 2017
for no more than 50% of asthma cases. However, the non-allergic mechanisms are not fully understood.

Management and care

The most common diagnostic tests for AR are the percutaneous skin test and allergen specific IgE antibody test. Treatment of AR includes the avoidance of allergens, use of antihistamine tablets or nasal sprays and in some cases desensitization.

Asthma treatment comprises “relievers” (bronchodilators that reverse airway narrowing) and “controllers” (inhaled corticosteroids) that reduce the underlying airway inflammation. Diagnosis and treatment for CRDs are more widely available in high income countries. With rising air pollution in many developing countries, rates of asthma and AR are expected to rise in the coming decades.

Policy frameworks

In 2002, the WHO launched its strategy on CRDs; the strategy has three key objectives:

- Improved surveillance to enable mapping of the magnitude of CRDs and analyze their determinants;
- Reductions in the level of exposure of individuals and populations to common risk factors, particularly tobacco, poor nutrition, frequent lower respiratory infections during childhood, and environmental air pollution (primary prevention);
- Secondary and tertiary prevention to strengthen health care for people with CRDs by identifying cost-effective interventions, upgrading standards and accessibility of care at different levels of the health care system.³

This was followed by the launch of the Global Alliance Against Respiratory Diseases (GARD) which in 2006 brought together a range of international and national organizations with the aim of improving the lives of those affected by respiratory diseases. It initiated the implementation of the CRD strategy. Consequently, the main objective of GARD is to apply a comprehensive approach to combat CRDs by:

1. Developing standardized methods for surveillance of the burden of chronic respiratory diseases and their risk factors;
2. Advocating for action on chronic respiratory diseases;
3. Encouraging the implementation of health promotion and CRD prevention policies;
4. Developing simple and affordable strategies for the control of CRDs.

In addition to these objectives, GARD also has 6 areas of focus, one of which is pediatric asthma.

In 2017, the Forum of International Respiratory Societies (FIRS) called for eight essential actions to reduce the burden of respiratory disease. These actions supported the WHO strategy goals and included improved early diagnosis of respiratory diseases, ultimate elimination of tobacco products and increased education of health professionals.⁵ Their first essential action specifically mentioned children:

“Increase public and policy makers’ awareness that respiratory health is essential to global health and that childhood respiratory disease may have long-term negative consequences on adult health by advocating at world health meetings and through publications and media postings.”

Formed in 2001 FIRS comprises the leading international respiratory societies with the goal of promoting worldwide respiratory health.

Citations

2 Mims JW. Epidemiology of allergic rhinitis. Int Forum Allergy Rhinol 2014;4 Suppl 2:S18-20
More than 8 million children in 2017 were affected by diabetes. There are three main types of diabetes which affect children. Type 1 diabetes, representing up to 25% of cases of diabetes, is characterized by an inability to produce the hormone insulin due to inactive beta cells in the pancreas, leading to an uncontrolled rise in blood glucose. People with type 2 diabetes produce insulin, but their cells and tissues become insensitive to the hormone, leading to high blood glucose. The prevalence for both types of diabetes is highest in adolescents (Fig. 2.8). A third kind of diabetes, gestational diabetes, arises during pregnancy and can pose risks to both mother and child. More detail is given on gestational diabetes in the chapter discussing early life development.

Type 1 and type 2 diabetes require lifelong careful self-management and care. People with type 1 diabetes require insulin to survive and some people with type 2 diabetes will also require management with insulin at some point. Unmanaged diabetes, regardless of type, can lead to serious and debilitating complications including nerve damage (neuropathy), cardiovascular and cerebrovascular disease, amputation of extremities, kidney disease (nephropathy), and blindness.

**Type 1 diabetes**

Type 1 diabetes usually begins between the ages of 6 and 14, although it can occur at other ages. It is an autoimmune condition brought on by an attack of the body’s own immune system on the pancreas’ beta cells. Without insulin, the body struggles to take up glucose in the blood, leading to a life threatening condition called diabetic ketoacidosis (DKA). While DKA is also found in type 2 diabetes, it is more common and more severe in people with type 1 diabetes and is often the first sign of the disease.

Type 1 diabetes is more common in high income countries which is largely due to high mortality rates in developing countries. Still, the incidence of type 1 diabetes is increasing globally for reasons that are not clear (Fig. 2.9). Mortality rates in developing countries, where access to insulin is limited are higher, leading to fewer children overall living with the disease. Indeed, many deaths due to diabetes occur in children under 14 often at the point of diagnosis (Fig. 2.10).

### Key Figures: Diabetes

<table>
<thead>
<tr>
<th>Measure (&lt;20 years), 2017</th>
<th>Number</th>
<th>Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>8.8 million</td>
<td>340.0</td>
</tr>
<tr>
<td>Incidence</td>
<td>1.7 million</td>
<td>65.7</td>
</tr>
<tr>
<td>Deaths</td>
<td>6.2 thousand</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Source: GBD Study, 2017
Type 2 diabetes
Type 2 diabetes, traditionally seen as a disease of adulthood, is on the rise in children. Unlike type 1 diabetes, a large portion of type 2 diabetes may be preventable. Its most important risk factor is obesity and rising rates of obesity across the world are driving increases in the prevalence of type 2 diabetes. Children affected by type 2 diabetes progress more quickly to cardiovascular disease and complications than adults. Rates of complications in children can be surprisingly high leading to a lifelong battle with the disease.

Management and care
Both type 1 and type 2 diabetes require careful self-management and follow-up. In type 1 diabetes, children must have daily access to insulin, often through injections, in order to survive. Both conditions benefit from a healthy lifestyle and physical activity, as well as access to essential medicines. This is not a guarantee in many parts of the world and insulin, especially, can be difficult to access due to costs, the necessity for refrigeration, and inadequate administration of doses. Both conditions suffer from stigma and parents and children can often find it difficult to confront the daily needs of children with diabetes.

Mental health and diabetes into adulthood
Children with diabetes have higher rates of anxiety and depression, often brought on by the stresses of an intensive care routine. This added mental health burden can lead to problems in the management and care of the condition driving to a vicious cycle in children's lives. There is evidence that type 1 diabetes can also cause difficulty in fertility and pregnancy later in life. Healthcare providers are not always trained to recognize the symptoms of type 1 or type 2 diabetes in children and misdiagnosis can occur, leading to delays in treatment and risks to the child. This lack of training is further damaging once a regular management protocol must be implemented. Healthcare providers, parents, and caregivers must be given adequate resources and support to help children faced with diabetes. Under the right conditions, children with diabetes can live long and healthy lives.

Policy frameworks
The WHO lists insulin among the essential medicines that every country must provide. However, access to insulin is usually a major problem for children living with type 1 diabetes in resource-poor settings. Even in some high income countries, like the United States, the price of insulin may be prohibitively high leading to serious consequences for those with diabetes. Limited access can be compounded by the fact that health facilities do not have the appropriate equipment and few health professions know how to manage diabetes in children. These factors all contribute to poor diabetes management which results in the premature development of often preventable complications and early death.

Citations
Mental health disorders are the most prevalent NCD in children under 20 years affecting more than 231 million children. They encompass a wide range of conditions from depression and anxiety to psychosis and others. Mental health can have a large role to play throughout life, especially for people living with NCDs. In children, undiagnosed or misdiagnosed mental health issues can lead to years of debilitating symptoms and even result in self-harm or suicide. The prevalence of mental health disorders in children is highest among adolescents 15 to 19 years with rates slightly higher in boys than in girls (Fig. 2.11).

According to the World Health Organization, half of all mental health disorders globally begin by 14 years of age, but most cases are undetected and untreated.1 Thus mental health disorders are one of the largest contributors to disability. Suicide is the third leading cause of death in 15 to 19 year olds and is especially high among young men 20 to 24 years (Fig. 2.12). Adolescence is a critical time for development, especially with regard to social skills, interpersonal development, problem solving, and managing emotions.1 Mental health disorders can have a serious and lasting impact on normal development if left untreated.

Risk factors
A number of risk factors are associated with mental disorders in youth including exposure to sexual violence, bullying, experiencing discrimination, living in a conflict or disaster zone, early pregnancy, young parents, and having another NCD. The more risk factors,
the greater the chance an adolescent will develop a mental health disorder. Mental health disorders can have their roots in the earliest years of development. Children born to mothers who experience stress during pregnancy have a higher risk of developing depression and anxiety. Those who experience stress in the first years of development can experience difficulties in learning, brain development, and will be more prone to MHDs later in life, setting up a vicious cycle from one generation to the next.\textsuperscript{2}

Due to stigma and a lack of awareness, mental health disorders often go unrecognized and untreated. This is especially true in youth who may not be able to identify symptoms themselves.\textsuperscript{3} While many symptoms can be psychological, younger adolescents may also develop physical symptoms such as stomach ache, headache or nausea.

**Risky behaviors and substance and alcohol abuse**

Children often begin engaging in risky behavior starting in adolescence, including sexual risk-taking, substance abuse and alcohol use. Exposure to poverty and violence can increase these behaviors and adolescents may also use them as a coping mechanism for underlying mental health issues.

The prevalence of episodic heavy drinking in adolescents 15 to 19 years old was 13.6\% in 2016 and highest among boys.\textsuperscript{1} Drinking and other substance abuse can also lead to high rates of unsafe sex, sexually transmitted disease and early pregnancy in girls - a leading contributor of mortality in adolescent girls. Trends in alcohol use and substance abuse disorders show the rate has been largely steady over the past 30 years and is almost 1.5 times higher in boys than in girls (Fig. 2.13).

**Management and care**

Treatment of mental health disorders is still hampered by stigma and a lack of awareness of the prevalence of these conditions in children.\textsuperscript{4} However, some success has been shown in helping children cope with mental health issues, especially through school-based and community-based interventions. These interventions rely on engaging everyone involved in the community, not just a relationship between the child and a healthcare provider. Parents, peers, care providers and community groups all work together to create a change from the grassroots to improve mental health by following specific guidelines. These types of interventions can have a major impact
Policy frameworks

Healthcare providers and caregivers must be made aware of the warning signs and risk factors of mental health disorders and risky behavior. The WHO, respecting the United Nations Convention on the Rights of the Child, recommends targeting multiple mental health problems at diagnosis, using supervised staff trained in managing adolescents’ specific needs, engaging and empowering caregivers, guided self-help methods, and cautions against the overuse of psychotropic medication as only appropriate for those with moderate-severe mental health conditions.

Nevertheless, developing countries and low-resource areas struggle to provide adequate mental health support and adolescents may remain in a precarious position if their needs are not met.

“Treatment of mental health disorders is still hampered by stigma and a lack of awareness of the prevalence of these conditions in children.”

References


3 Hawkes, N. (2018). Barriers for mental health services for children and adolescents are too high, finds regulator. BMJ, k1093. doi:10.1136/bmj.k1093


In 2017, injury was responsible for more than 707,000 deaths in children and young people under 20 years. Injury can be divided into two categories: intentional (including sexual violence, homicide, and suicide) or unintentional (including drowning, falls, poisoning and road traffic accidents).\(^1\)

Intentional injury to self or by others (violence) against children occurs regardless of geography, race, class, religion and culture. Perpetrators can be from inside or outside the family and it occurs in a range of settings. Of these child victims, most were between 15 and 19 years of age; 75% of these deaths occurred in boys (Table 2.2).\(^2\)

For infants the risk of death is about three times greater for children under one year old than for those aged 1 to 4. The younger the child, the more likely their death will be caused by a close family member. There are many factors associated with the risk of lethal violence including: economic development, status, age, sex and gender. The rate of intentional injury in children is higher in upper-middle income countries (2,086 per 100,000) than the global average (1,512 per 100,000).

The GBD Study estimates that in 2017, 27.1 million girls and 8.6 million boys experienced sexual violence. The majority of this sexual violence is committed by family members or other people staying or visiting a child’s family home. A review of epidemiological surveys from 21 countries, mainly high- and middle-income countries, found that at least 7 to 36% of females and 3 to 29% of males reported sexual victimization during their childhood.\(^3\)

**Unintentional injuries**

Unintentional injuries (Table 2.3) account for almost 90% of all injuries and they are the leading cause of death for children aged 10 to 19 years. These include falls, the most common

<table>
<thead>
<tr>
<th>Cause</th>
<th>Girls (per 100,000)</th>
<th>Boys (per 100,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual Violence</td>
<td>2,159</td>
<td>642</td>
</tr>
<tr>
<td>Conflict and terrorism</td>
<td>162</td>
<td>150</td>
</tr>
<tr>
<td>Physical violence (other)</td>
<td>76</td>
<td>112</td>
</tr>
<tr>
<td>Physical violence - sharp object</td>
<td>21</td>
<td>53</td>
</tr>
<tr>
<td>Executions and policy conflict</td>
<td>5.6</td>
<td>10</td>
</tr>
<tr>
<td>Physical violence - firearm</td>
<td>2.3</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Source: GBD Study

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**Key Messages**

- Sexual violence is three times more prevalent in girls than in boys.
- Boys are twice as likely to experience physical violence, executions, and police violence than girls.
- Road traffic accidents are the most common type of unintentional injury in children.
type of injury for both sexes, exposure to mechanical forces including accidental discharge of a firearm, fire, animal contact, poisonings and drownings. Males experience a higher rate of unintentional injuries than females, although the distribution of the causes varies (Table 2.3).

Road traffic injuries in 2017 caused 125,000 deaths in boys and 60,000 deaths in girls. They are the leading cause of deaths among 15 to 19 year olds. Road traffic injuries are also a major contributor to disability (14.8 million DALYs in children <20 years) and especially in low- and middle-income countries (LMICs). Ninety-three percent of child road fatalities occur in LMICs, with approximately 33% of these attributed to pedestrians, while 65% are car occupants or bicycle or motorcycle riders.

Drowning is a major cause of death for children, although this has decreased dramatically over the past thirty years. In 2017, there were 128,000 deaths due to drowning in children under 20 years compared to more than 350,000 in 1990. The majority of these deaths occur in LMICs and is more common in boys than girls (Table 2.3).

Burns are the only type of unintentional injury where females have a higher rate of injury than males. The difference is particularly pronounced in infants and in adolescents, while those aged 10 to 14 years have the lowest rates. The death rate in LMICs was eleven times higher than that in high income countries.

Falls are a major cause of death and disability for children. Up to 95% of the 40,000 deaths in children under 20 years in 2017 due to falls occurred in LMICs. Infants less than one year of age have the highest mortality rates.

Poisoning related fatality rates are generally higher in low income and middle income countries than in high income countries. Except in the high income countries of the Americas, where rates of death are high, particularly among those 15 to 19 years.

Management and policy frameworks
Injuries are not inevitable; many can be prevented or controlled. Although awareness for the need for prevention of injury and violence is growing, attention and funding to address this issue remains low. As more governments around the world come to recognize that injuries and violence can and must be prevented, many are trying to get a better understanding of the problem in their countries as a basis for designing, implementing and monitoring effective prevention strategies. A number of strategies have helped lower the rates of injuries and their consequences in many settings and these are outlined in “Injuries & violence: the facts.” Since the report’s publication in 2014, there have been concerted efforts centered on reducing violence against children with the need to end this burden recognized within the Sustainable Development Goals (SDGs). For intentional injuries a technical package has been developed to prevent violence against children.4

Table 2.3. Prevalence and deaths due to unintentional injuries in children (<20 years), 2017

<table>
<thead>
<tr>
<th>Cause</th>
<th>Prevalence per 100,000</th>
<th>Deaths per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Falls</td>
<td>950.85</td>
<td>1,257.0</td>
</tr>
<tr>
<td>Exposure to mechanical forces incl. accidental firearm discharge</td>
<td>398.5</td>
<td>696.3</td>
</tr>
<tr>
<td>Fire, heath, and hot substances</td>
<td>340.9</td>
<td>293.8</td>
</tr>
<tr>
<td>Animal contact</td>
<td>165.4</td>
<td>173.2</td>
</tr>
<tr>
<td>Foreign body</td>
<td>91.9</td>
<td>120.4</td>
</tr>
<tr>
<td>Poisonings</td>
<td>29.8</td>
<td>28.7</td>
</tr>
<tr>
<td>Drowning</td>
<td>7.2</td>
<td>8.6</td>
</tr>
</tbody>
</table>

Source: GBD Study

Citations
The health of a child and the future risk for developing disease is influenced by more than just biology. The environment the child lives in, the care available to him or her and interactions with peers and society all have a powerful influence on health. That environment starts in the earliest development in the womb, through early life through to young childhood and adolescents. At each stage the environment a child is exposed to will influence his or her chances of developing an NCD. Factors such as air pollution, nutrition, social norms around physical activity and other behaviors, the influence of peers, exposure to violence, access to education, and household income all play a role.

The requirements for care for children then become important to be tailored not just to the individual, but to the circumstances of the community in which the child lives and the stage of development. This chapter examines the social determinants of health that have a strong influence on the development and management of NCDs, the influence of the earliest life experience on the future risk of NCDs, and how treatment and care can respond for the prevention and control of NCDs. It discusses the earliest ages of development through to the impact of communities, environment, health care, and government policies.

Key Messages
- The health of a child is determined not only by biological factors, but also by their social and economic realities.
- A lifetime risk for NCDs can start in the womb.
- Managing NCDs in children requires a tailored approach with training and education for the workforce and community engagement.
In 2003, the World Health Organization recognized that health is influenced by the conditions in which people are "born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life." These forces are influenced by policy, economics, development, social norms and political systems, all of which play a role in the health and development of a child. Together these elements are known as the "social determinants of health" and are often used to discover and understand inequalities in health among and between groups. Identifying inequalities can help to target aid and treatment to specific groups who may be more vulnerable to disease or its effects. In general, children are considered a vulnerable group when compared to adults because they are less able to advocate for themselves, are socially and economically dependent on others and often suffer the worst effects from inequalities.

**Socioeconomic status**

The socioeconomic status of a household can have a profound influence on health. The most obvious way in which this may happen is the ability to purchase food, access healthcare, or provide for the basic needs of survival. However, social factors may also play a role. As countries and economies have developed, issues related to poverty such as malnutrition have decreased. However, access to cheap and unhealthy foods is on the rise and especially in developing countries, leading to an increase in prevalence of obesity in children (Fig 3.1).

Within countries, those at lower socioeconomic levels are more likely to be obese, have an increase risk of NCDs, and less likely to have access to care. These inequalities extend to several NCDs. Mental health issues, in particular, tend to be higher in children of lower socioeconomic status because of complex drivers such as more exposure to violence and bullying, less family support, and discrimination.

**Gender and ethnicity**

Gender and ethnicity can also play a role in driving inequalities. For example, girls are more likely than boys to be physically inactive which can have effects on obesity, cardiovascular health, mental health, and other risk factors for NCDs. Girls are also at risk of early pregnancy and NCD-related complications such as preeclampsia and maternal mortality. On the other hand, boys are more likely to engage in risky behaviors leading to injuries and violence, more likely to smoke, and more likely to consume harmful amounts of alcohol.

Some ethnic groups are more likely to develop NCDs. Diabetes is high among Pacific Islanders, Southeast Asians, and native populations around the world and gestational diabetes in these populations means that children born of mothers with high blood glucose during pregnancy carry a greater risk for type 2 diabetes later in life. Sickle cell disease, a condition where hemoglobin is produced abnormally in red blood cells, is more prevalent in people of African descent and can lead to lifelong risks for pain, infection, organ...

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**Key Messages**

- Several factors can contribute to the health and development of a child including: gender, access to education, household income, ethnicity, and socioeconomic status.
- With economic development, NCDs in children has also increased.
- Adequate care and resources for health are lacking in developing countries, contributing to a higher mortality for children there with NCDs.
damage and stroke.\(^5\) A study of cancers in the United States found that Black and Native American children had a higher risk of aggressive neuroblastoma than other ethnicities, although the reasons for this were not clear.\(^6\) Similarly, a study in the UK found children of Black and South Asian families to be at a greater risk of any type of cancer than other ethnic groups.\(^7\)

### Inequalities in treatment and care

The social determinants of health can also have an impact on access to treatment and care for NCDs. Children in lower socioeconomic households within developing countries may be less likely to receive the care that they need to prevent and manage NCDs. Discrimination based on race can also be a problem for children in need of care in both high income and developing countries. Children living in remote rural settings may also have less access to physicians and care often having to travel to cities and especially for any issues requiring hospitalization.\(^8\)

Developing countries, despite having the highest burden of NCDs, have the least resources available to manage them.\(^9\) Children with cancer were much less likely to survive if they lived in developing countries than those in developed countries due directly to a lack of resources for care.\(^10\) A review of scientific publications found that even research for children and pediatric health was disproportionately lacking in lower-middle-income countries.\(^11\) While some efforts have been made to reduce the gaps in the availability of trained health professionals for children using community health workers, they have only been applied to acute care and not for NCDs.\(^12\)

Disparities can often be clear between countries but inequalities also exist within borders and communities that can often affect the life of a child with or at risk for NCDs. Understanding those specific needs is essential to providing the care and environment necessary for a healthy life.

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Citations
9 Saxena A. (2019). Status of Pediatric Cardiac Care in Developing Countries. Children (Basel, Switzerland), 6(2), 34.
A person’s lifelong risk for NCDs can start as early as development in the womb, where the intrauterine environment can play a significant role in the later development of NCDs and obesity. For example, mothers with untreated high blood glucose during pregnancy can experience greater risks of complications including macrosomia, obstructed labor, and other immediate issues but also will have babies who have a higher lifelong risk of developing type 2 diabetes.\(^1\) As the epidemic of type 2 diabetes increases, and more women of reproductive age experience high blood glucose, more babies will be born with an added future risk for obesity and type 2 diabetes (Fig 3.2).\(^2\)

These increases are expected especially in developing countries where the rate of new cases of type 2 diabetes is highest.\(^3\) The mechanisms for these changes are being described in research which indicates that the nutrition and health status of the mother can have permanent effects on the growth and structure of the child in a phenomenon known as ‘fetal programming.’\(^4\) Growing evidence suggests that the presence of NCDs or obesity, in particular, can have a detrimental effect on the development of the child leading to the development of metabolic and other problems later in life.\(^4\) These changes can lead to a generational transmission of NCDs from mother to child, especially in the absence of adequate treatment and prevention.

**Mental health disorders and early life**
One of the most prevalent NCDs in children, the risk for mental health disorders (MHDs) can develop as early as in the womb. Mothers who experience extreme stress or trauma during pregnancy can lead to a uterine environment for a developing fetus that will affect their genetic propensity to develop mental health problems later in life.\(^5\) Even after birth, the life experience of children in their earliest years can have a great impact on their risk for developing MHDs. Left untreated or unmanaged, this pattern can set up a cycle of MHDs generations.\(^5\)

**Infant feeding and early life experience**
After birth, what mother and child eat and the environment in which they live can also have a profound impact on a child’s future risk for NCDs. The World Health Organization recommends an early introduction to breastfeeding - within the first hour after birth - and exclusive breastfeeding for at least 6 months. A child who follows these recommendations is less likely to develop obesity and type 2 diabetes later in life and more likely to have greater educational achievement.\(^6\) The benefits of breastfeeding have shown to reduce a mother’s risk of ovarian and breast cancer, type 2 diabetes, and cardiovascular disease and hypertension.\(^7\)\(^-\)\(^9\)

**Early pregnancy and NCDs**
Adolescent pregnancy carries a number of risks related to NCDs for mother and child. An adolescent pregnancy is more likely to experience complications such as low birth weight, preeclampsia (high blood pressure during pregnancy), anemia, and preterm delivery and is a leading cause of death for girls.\(^9\) While some of these are related to biological factors, there is evidence that pregnant adolescents do not access antenatal care regularly.

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**Key Messages**

- Risk for NCDs can be established as early as the womb.
- Early life experiences and exposures can strongly affect a child’s risk for NCDs and their outcomes.
- Mothers experiencing NCDs or their risk factors during pregnancy are at future risk for illness.
care at the same rates as older women putting themselves and their babies at risk.\textsuperscript{10} Other factors, such as poor dietary habits, tend to be higher in adolescents and can affect both mother and child.\textsuperscript{11} In many parts of the world, adolescent pregnancy can result from a lack of agency for girls, early marriage influenced by social and family pressures, lack of awareness on sexual education, and sexual violence.\textsuperscript{12} Girls who become pregnant earlier are also less likely to achieve education goals, thus setting them up for a higher risk of poverty and lower socioeconomic status which is increasingly linked to obesity (see chapter on Social Determinants of Health).

Early screening for NCDs in pregnancy, comprehensive antenatal care, and family planning can all help improve outcomes for mothers and children - preventing future cases of NCDs. Special attention and care should be given to delaying pregnancy in girls and promoting their education achievement. The early life experience of the child can also have a great impact on future NCD risks thus making it important for mothers to receive care and support for nutrition and breastfeeding, even after the birth of a child.

Policy frameworks
The World Health Organization has produced a comprehensive guide for essential practice in pregnancy, childbirth, postpartum and newborn care.\textsuperscript{13} The guideline stresses the importance of antenatal care, an attended birth, and continued monitoring in the first few weeks and months of life for both mother child. These guidelines have contributed greatly to the overall global reduction in maternal and child mortality. They also include recommendations on tobacco use and postpartum depression but do not address NCDs during pregnancy in any specific way.

But awareness is growing. In 2013, the WHO produced guidelines on the screening and management of women with high blood glucose in pregnancy.\textsuperscript{14} In addition, guidelines on breastfeeding also reinforce the links to obesity and NCD risk reduction for children and mother.\textsuperscript{15}

Citations
The management of NCDs includes the screening and treating of these diseases, as well as providing access to supportive treatment and palliative care. Investing in better management of NCDs is critical. In developed countries, launching NCD specific responses within health systems has contributed considerably to improvements in NCD trends. However, it should be noted that countries with insufficient healthcare coverage will struggle to provide universal access to essential NCD interventions. Efforts are needed across all countries to limit the rising NCD epidemic.

To address this need, the World Health Organization (WHO) have developed the Package of Essential Noncommunicable Disease Interventions (PEN) with a view to improving management and care. It is a prioritized set of cost-effective interventions that can be delivered to an acceptable quality of care, even in resource-poor settings.

NCDs management in children
When a child is diagnosed with a chronic health condition, the goal of the healthcare system is to help that child enjoy the highest quality of life possible. Children with chronic health conditions have needs that are multifaceted and involve families, schools as well as the wider community. From a purely economic standpoint, children who receive appropriate treatment for their chronic health conditions can go on and make major contributions to society, and return far more than their treatment costs.

Cancer
Palliative care should start at diagnosis and continue irrespective of whether or not a child receives disease directed therapy. Symptom control is critical because there is always uncertainty about outcome in life threatening conditions. However, in addition to the limited access to treatment drugs, there are also access issues around analgesics, compounded by the fact that the use of opioids is illegal in many countries (see ‘Pain management’ below).

Heart disease
Lack of access to skilled medical professionals and appropriate treatment increases the burden of congenital and acquired heart disease in low- and middle-income countries. The bulk of the acquired heart disease could be avoided by the implementation of proven, cost effective interventions. However, as this is not always possible, many children suffer from debilitating and often fatal heart damage that requires complex surgery and life long medical follow-up.

Essential medicines
Many of the medicines needed to treat major NCDs are very low cost and could be funded if purchased efficiently and the WHO have created a list of these Essential Medicines. The two key exceptions to this general statement are insulin and asthma inhalants which are on the list but not low cost. The implementation of essential medicines provision is not a one-stop solution, it needs to be accompanied by public health initiatives to reduce risk factors and prevent disease.

Key Messages
- NCD management interventions are essential for achieving the global target of a relative reduction in premature deaths due to NCDs by 2025 and the SDG target of a one third reduction in premature deaths by 2030.
- Countries must improve coherence across all sectors to support an adequate and responsive health workforce.
- Essential medicines including insulin, salbutamol, and opioids for pain management are often unavailable or inaccessible.
promote early screening as well as measures to strengthen the healthcare system.

**Pain management**
In many parts of the world, pain in children is a significant public health concern. Although the means and knowledge to manage or relieve pain exist, children’s pain is often not recognized or even denied. In 2012, the WHO released guidelines for the pharmacological management of persisting pain in children. The guidelines recommended a two-step approach of pharmacological treatment and highlight the necessary policy changes required and suggest future priority areas of research.²

For the two-step approach, paracetamol or ibuprofen are the medicines of first choice and are used for treatment of mild pain. For the second step, for moderate to severe pain morphine is recommended as the medicine of choice. However, access to strong analgesics are often restricted, especially in developing countries. Regardless, the guidelines suggest that both strong opioids and non-opioid analgesics should always be available at all levels of healthcare. The report also noted that the clinical recommendations were unlikely to be effective unless they were accompanied by the necessary policy changes.²

**Human resources for health (HRH)**
Health systems can only function with health workers. Improving health service coverage and health outcomes depends on a fit-for-purpose and fit-to-practice health workforce.³ The need for health workers is anticipated to rise as a result of a range of factors from population growth, aging and an increase in NCDs.

However, current trends of health worker training and employment will not have sufficient impact on reducing the needs-based shortage of healthcare workers by 2030. To enable alignment of population health needs and HRH demand, greater investments will be required in both supply and demand of HRH.

In the most recent estimates, 53 of the 68 priority countries have a national density of doctors, nurses and midwives that falls below the minimum threshold of 23 per 10,000 population established by the World Health Organization. However, this threshold population has its limitations post Millennium Development Goals (MDGs). Now with the Sustainable Development Goals (SDGs) there is interest in a wider array of services including the management of NCDs and the International Labor Organization have increased the threshold to 41.1, while Scheffer et al suggest an “SDG index threshold” of 44.5 per 10,000 population.⁴

**Screening of newborns**
Newborn screening for certain disorders since the early 1960s. A simple heel prick blood test allows early screening and diagnosis of a variety of conditions, so that the impact of the disease can be minimized with early effective treatment. As it is cost-effective and successful, newborn screening is a mainstay of child health care in developed countries. This is not the case in developing countries, with only 30% of all newborns globally having access to any newborn screening.⁵

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**Citations**


5 NCD Alliance. A Focus on Children and NCDs: Remembering our future at the UN Summit on NCDs, September 2011.
NCDs extend well beyond the sphere of health. The physical and social environment has a strong impact on exposure to risk factors for NCDs and the ability to respond to a growing burden. NCDs can be affected by agricultural, environmental, industrial, trade, and other policies that are not traditionally considered in the realm of health. Leaders in global health have called for a systems approach to public health and planning. The hallmarks of systems thinking look beyond a simple cause and effect at multiple interacting factors, feedback loops, and interconnected pathways that may affect health in unexpected ways. Policies that do not take these complexities into account are at a risk to fail or even lead to undesired outcomes. These principles can be applied to any policy for NCDs as the drivers of these disease are complex and interlinked.

Systems thinking and obesity prevention

One area that has gained momentum for the application of systems thinking and planning is obesity prevention. The Institute of Medicine in the United States requires a systems approach to obesity prevention. This type of response expects coordination from food production and standards, urban planning for spaces promoting physical activity, limitation of advertising of unhealthy foods - especially to children - and a responsive health system that meets the needs for screening and management. The systems thinking and planning must exist across all these sectors and coordinate with each other. In developing countries, especially, these mechanisms are often not in place and low resources mean building that capacity is limited. However, systems thinking for obesity prevention in developing countries can provide an opportunity to apply limited resources in the most effective way.

NCDs and the SDGs

The Millennium Development Goals (MDGs) set the stage for universal targets to reduce inequities in health and development. Countries were held to specific targets and tracked over time to ensure progress, leading to sweeping improvements in sanitation, access to clean water, a reduction in poverty and other development goals. While the MDGs were groundbreaking in holding governments to account across a wide breadth of sectors, NCDs were absent. The adopted Sustainable Development Goals (SDGs), adopted in 2015, recognize health as a development issue and NCDs in particular as a threat to development.

“Policies that do not take ... complexities into account are at a risk to fail or even lead to undesired outcomes.”

Key Messages

- NCDs are affected by policies across all sectors, not just health, and require a multi-sector response.
- Without considering and including NCDs, sustainable development will not be as effective.
- Planning for the future in a changing environment requires the engagement and involvement of children.
The SDGs call for governments to:

- Reduce by one third premature mortality from NCDs.
- Strengthen responses to reduce the harmful use of alcohol.
- Achieve universal health coverage.
- Strengthen the implementation of the WHO Framework Convention on Tobacco Control (FCTC).
- Support the research and development of vaccines and medicines for NCDs that primarily affect developing countries.
- Provide access to affordable essential medicines and vaccines for NCDs.

All of these goals have strong implications for NCDs and for children who are affected by many of these dimensions. Planning and implementation to achieve these goals must take into account a multi-sectoral, all-of-society approach to health.

Citations
NCDs in children are gaining attention on the public health agenda. Rising trends in childhood cancers, obesity, diabetes, cardiovascular disease and a number of other conditions will need a child-centered and sustained effort to shift trends and improve the quality of life and survival of children. This is especially true in developing countries where the double burden of infectious diseases and NCDs often means the focus of public health interventions are only in the first five years of life.

Managing NCDs in children presents a unique challenge. The same approach used for adults cannot be applied to children in the same way where social and physiological differences can lead to different outcomes. As children develop, so too can their NCD risk profile change. The response to this evolution must also be adaptable and consider the whole health of the child as well as their rights to a healthy future. This chapter will present some of the work of civil society in addressing the needs of children with NCDs, suggestions for best buys in policy and interventions, and where gaps in the research must be filled in order to improve the prevention and care of NCDs in children.

Key Messages

• Managing NCDs in children presents a unique challenge.
• As children develop, their NCD risk profiles change.
• The rights of the child must be considered to ensure a healthy future.
Much progress in the fight against NCDs has been made since the first United Nations High Level Meeting on NCDs in 2011. However, while the global health agenda has shifted towards NCDs, it remains highly focused on adults. Global surveillance, monitoring, and targets often start at 18 years.

Monitoring, surveillance and estimation
Any data being gathered on children and adolescents does not follow a universal, standardized protocol making comparisons difficult and trends hard to assess. Furthermore, there are serious gaps in surveillance in particular in developing countries which may have fewer resources to gather, analyze and present results. The figures reported here are based on extrapolation and “best guess” data that has clear gaps and may represent an underestimate of the true burden of NCDs in children. Trends and monitoring are particularly lacking and many surveys are conducted only once, making it impossible to assess progress or understand any changes in the NCD landscape.

Surveys of children often take a limited approach, being conducted only in schools or participating communities. This leads to a bias in the results that would represent only those children who have access to the place or community being surveyed. Understanding the burden of NCDs in children needs a comprehensive and clear-eyed approach similar to the rigorous methods that have been used for monitoring and surveillance of adults.

Setting global targets
The World Health Organization has proposed a series of global targets for tackling NCDs in the Global Action Plan for the Prevention and Control of NCDs. The plan puts forth a series of targets for countries to curb the rising burden of NCDs with recommendations on how to achieve those targets. Many of the suggestions and targets proposed will have benefits for whole populations, meaning children will also benefit. However, none of the monitoring measures proposed are for children and only a few of the targets specifically address the needs of children. This gap may lead to children being left behind. As is evidenced in this report, the roots of many NCDs and their risk factors start early in life. Not including younger age groups in monitoring processes and target setting is a missed opportunity for prevention and early treatment.

Engaging governments, civil society and communities
Countries must take an integrated approach to NCDs which also includes children, adolescents, and young people. Country level governments should coordinate across sectors to involve health, development, finance, trade, education, and youth ministers. These systemic, coordinated approaches have been

Key Messages
• Monitoring, surveillance, and evaluation for the measurement and tracking of NCDs must include children and follow through the life course.
• Global targets for prevention, treatment, and management of NCDs must include children and the rights of children.
• Governments, civil society, and communities must work together to include children in the NCD global health agenda.
shown to lead to better policy-making for NCDs and have been promoted for obesity prevention, and NCD management. They must also include children as a key stakeholder.

Civil society also has an important role in advocating for children with NCDs. Many associations and groups exist that champion the rights of children or people with NCDs, but these organizations should work together to enshrine the intersection of children and NCDs into the priorities of each group. Umbrella organizations like NCD Child, the NCD Alliance, and other disease-specific groups can provide a platform for coordination build resources.

Finally, working with communities for the prevention and management of NCDs is critical. A community-based approach engages all members, creating a supportive environment for change which empowers children, their peers, and their caregivers to prevent and manage NCDs. Children must be at the center of their own advocacy for a better and healthier future.

The life course approach

- NCD prevention is most effective when it targets the root of the problem.
- Early life factors can influence NCD development as early as in the womb.
- Transitions across the life course must be met with a coordinated and supported health system.
- It is important to address the upstream determinants of NCDs to improve the health and wellbeing of people at all stages in life.
- The life course approach will support the SDG 3.4 to reduce premature mortality due to NCDs by 30% by 2030.

Citations


The World Health Organization put forth a list of policy “best buys” for NCDs, many of which have overlap with the health of children or affect children directly. Many countries still lag behind in implementing these recommendations. Where the situation is lacking for adults, the same is true for children. Even in countries where policies for adults are in place, children are often left behind. However, many of these policies have a direct and important impact on the lives of children. One area of particular interest is the rising influence of digital and social marketing, which does not have clear regulations in place. These are areas that highly affect children and require special attention to ensure the same strict guidelines that have been used in the past are extended to these new media.\footnote{1}

**Risk factor “best buys”**

Risk factors and behaviors such as tobacco and alcohol use, unhealthy diet and physical activity often begin during adolescence. Attention and investment is needed during children to prevent and change these behaviors.

**Tobacco use**

The WHO recommends reducing tobacco use through the implementation of taxes to raise their price, the use of plain packaging or graphic warnings, and bans on advertising. All of these directly affect children who may have limited sources of money to purchase tobacco and are often targeted by tobacco companies in advertising.\footnote{2} Furthermore, the WHO recommends the elimination of secondhand smoke through bans on smoking in public areas and certain environments such as hospitals and schools. This can have a positive impact on the youngest children who may have no other way of escaping exposure to smoke.

**Harmful alcohol use**

Taxes should also be placed on alcoholic beverages to raise their prices. Alcohol should also be restricted in terms of when and where they can be purchased with strict enforcement of age limits. In addition, alcohol should not be promoted to young people. The WHO also recommends providing psychosocial help to those who use alcohol in a harmful way, which as stated earlier in this report can have strong ties to mental health issues.

**Unhealthy diet**

Children are often the target audience for foods high in sugars, salts, and fats, setting them up for habits that will carry on into adulthood.\footnote{3} The WHO recommends limitations on the salt and fat content of foods, and reducing sugar consumption through the taxation of sugar sweetened beverages. They further recommend the provision of nutrition education and healthy meals in schools and the promotion of exclusive breastfeeding in the first six months of life as effect ways to curb childhood obesity.

**Physical inactivity**

Another increasing problem, physical inactivity contributes to obesity and complications for other NCDs. The WHO recommends community wide public education campaigns with physical activity counseling to those in need. For this, an education health workforce must be able to recognize physical inactivity in a child. School programs with quality education are also recommended as well as safe and convenient spaces to engage in physical activity.

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**Key Messages**

- The challenge of NCDs remains a serious public health concern.
- Countries must do more to ensure the prevention and care of NCDs.
- A life-course approach to prevention and care starting at the earliest stages of life can help curb the rising burden of NCDs.
The health system, care and treatment
Addressing NCD risks and management in children, adolescents, and young people is a human right, as well as a priority for health and sustainable human development. Childhood and adolescence represent an “age of opportunity” for prevention and control, early detection, treatment, and care of NCDs.

Strengthening health systems
NCDs must be integrated into basic primary care with referral to all levels of care. This is grounded in a need for universal healthcare coverage. Often children, especially in developing countries, do not have access to a health care professional that understand the needs of children as well as integrating NCDs. Special attention must be paid to training and capacity building for NCDs. In addition, the WHO recommends a scale up of early detection and coverage, which must extend to children, and access to the basic technologies and medicines essential for NCDs.

Managing NCDs
The WHO recommends therapy be given to those at high risk of CVD, monitoring and treatment for those with diabetes, and preconception care for women with diabetes. With regards to cancer, vaccination of girls 9 to 13 years old for HPV can prevent future cases of cervical cancer, and hepatitis B immunization can prevent some cases of liver cancer. In addition, palliative care must be offered to all those with cancer. Asthma is a major cause of disability and death in children. Symptom relief and a reduction of home air pollution through the improvement of stoves are important recommendations that directly affect children with NCDs.

Investments for health
NCD Child recommends therapy be given to those at high risk of CVD, monitoring and treatment for those with diabetes, and preconception care for women with diabetes. With regards to cancer, vaccination of girls 9 to 13 years old for HPV can prevent future cases of cervical cancer, and hepatitis B immunization can prevent some cases of liver cancer. In addition, palliative care must be offered to all those with cancer. Asthma is a major cause of disability and death in children. Symptom relief and a reduction of home air pollution through the improvement of stoves are important recommendations that directly affect children with NCDs.

Children can also play an important role in NCD policy and program development, and should be active members in programs to increase their participation.

Gaps and needs for the future
One of the most significant gaps with regards to NCDs and children is a lack of surveillance and monitoring for these age groups. Traditionally, NCDs were assumed to affect adults almost exclusively so that many surveys, epidemiological studies, and surveillance mechanisms only tracked people from 20 years and more. For children, the health and development agenda have traditionally focused on the first few years of life. The Millennium Development Goals set several targets at reducing disease and mortality in children 5 years and under who were most affected by infectious disease and poor sanitation. With progress in those areas, children older than 5 years old or those affected by NCDs are left behind.

Monitoring and surveillance, as well as research into the needs of children with or at risk for NCDs is crucial. Often treatment guidelines for NCDs have been developed for adults and adapted with difficulty for children. These evidence-based guidelines for care are essential in the necessary training of health care workers and staff, already limited in developing countries, for the life-course approach advocated by NCD Child. Research must also focus on the interplay of different risk factors and diseases in children as there is mounting evidence that NCDs may affect children differently than adults. These gaps hinder progress on preventing and managing NCDs in children and advocating for their needs at every level.

Citations
Currently, 42% of the world’s population is under the age of 25, and half of NCD-related deaths can be attributed to behaviors that often begin in adolescence. All trends indicate that NCDs are on the rise not only in adults, but increasingly in children. Addressing the early life factors and development of children including their risk and burden of NCDs is essential to managing outcomes and NCDs in the future.

Laying the groundwork
NCD Child was founded in advance of the first UN High-Level Meeting (UNHLM) on NCDs in September of 2011. It began as a child-focused working group under the NCD Alliance and evolved into its own coalition, championing the rights and needs of children, adolescents, and young people who are living with or at risk of developing NCDs. The founding members of NCD Child include American Youth Understanding Diabetes Abroad (AYUDA), Caring and Living as Neighbors (CLAN), the Harvard Global Equity Initiative (HGEI), the International Pediatric Association (IPA), the American Academy of Pediatrics (AAP), the Johns Hopkins Bloomberg School of Public Health (JHSPH), the International Association for Adolescent Health (IAAH), the Medtronic Foundation, the Public Health Institute (PHI), Save the Children, the Geddes Group, and UNICEF.

In 2012, NCD Child published the Oakland Statement, advocating for the health needs of children and adolescents across the global health and NCD agenda. It provides guidance and context to the NCD Child agenda. It recognizes the unique and vulnerable state of children with NCDs, the disparities in care for children in developing countries compared to

Key Messages
• Civil society has an important role in championing the rights and needs of children and NCDs.
• NCDs must have a place on the global agenda for all countries, and children must be explicitly considered within that agenda.
high income countries, the need to explicitly address children in the NCD health agenda, and to redress inequities.

**Building alliances**
A number of NCD advocacy groups, active for many years in the global health agenda and at the community level, have been working together through the NCD Alliance to make sure the NCDs remain at the top of the health agenda. With a growing disease burden across the world, countries and governments cannot afford to disregard NCDs. However, bringing children as a specific group into this discussion is developing. NCD Child is actively working with those organizations to provide materials and guidelines on ensuring that children are given special consideration in the NCD agenda. NCD Child advocates for a life-course approach to NCDs, beginning in early childhood and carrying through to adulthood, meeting the needs and risks at every step of the way.

Citations
Acknowledgements

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List of Abbreviations
ACS - acute chest syndrome
AIS - arterial ischemic stroke
AR - allergic rhinitis
COPD - chronic obstructive pulmonary disease
CRD - chronic respiratory disorder
CVD - cardiovascular disease
DALYs - Disability Adjusted Life Years
DKA - diabetic ketoacidosis
FIRS - Forum of International Respiratory Societies
GARD - Global Alliance Against Respiratory Disease
GBD - Global Burden of Disease
HIV - human immunodeficiency virus
HPV - human papilloma virus
HRH - human resources for health
HS - hemorrhagic stroke
IARC - International Agency for Research on Cancer
ILO - International Labor Organization
LMICs - low- and middle-income countries
MDGs - Millennium Development Goals
MHD - mental health disorder
NCD - non-communicable disease
RHD - rheumatic heart disease
SDGs - Sustainable Development Goals
SHS - secondhand smoke
UN - United Nations
UNGASS - United Nations General Assembly Special Session
UNHLM - United Nations High-Level Meeting
US - United States
UK - United Kingdom
WHO - World Health Organization
WHO PEN - World Health Organization Package of Essential Noncommunicable Disease Interventions
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Additional referenced reports and publications


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