Chapter 2
Health Trends of Communicable Diseases

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Introduction

Although the burden of communicable diseases has been steadily decreasing in past decades in industrialised countries, it is still considerable worldwide. Lower respiratory infections, diarrhoeal disease and HIV/acquired immunodeficiency syndrome (AIDS) are still among the top major killers in 2011 (Fig. 2.1, the ten leading causes of death in the world in 2011 according to the World Health Organization), and communicable diseases in general are responsible for considerable morbidity in all parts of the world [1].

There is, however, a marked difference in terms of burden of disease, morbidity and mortality between industrialized low-income countries.

In industrialized countries, chronic diseases such as cardiovascular diseases, cancer and diabetes have the highest burden. In low-income countries, infectious diseases still represent the biggest issue. Lower respiratory infections, HIV/AIDS,

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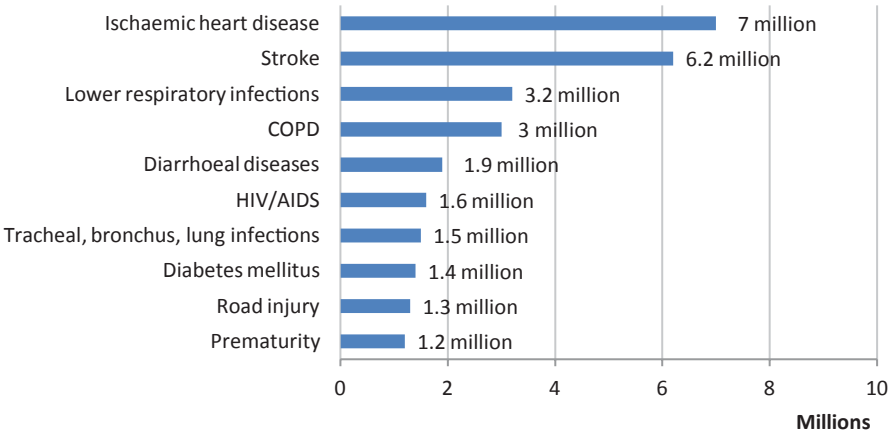

Fig. 2.1 The ten leading causes of death in the world in 2011 according to the World Health Organization [1]. *COPD* chronic obstructive pulmonary disease

diarrhoeal diseases, malaria and tuberculosis (TB) collectively account for around one third of all deaths.

Despite these differences, there is a wide range of emerging and re-emerging infectious diseases with varying potentials for spread in the world. Multidrug-resistant (MDR) TB and vancomycin-resistant *Staphylococcus aureus* are examples of emerging infections that do not immediately involve large numbers of persons but that will ultimately have a serious impact on public health throughout the world [1].

This chapter considers a selected number of infectious diseases, or of groups of diseases, which, for their burden, are of particular importance in low-income or in industrialized countries.

Tuberculosis

Mycobacterium tuberculosis is an aerogenic transmitted agent which represents the most frequent cause of TB. *Mycobacterium tuberculosis* can stay latent for years; symptoms, which can be both pulmonary and extra-pulmonary, occur when, under favourable conditions, the agent multiplies. Correct treatment of active cases is crucial to prevent the occurrence of MDR TB and extensively drug-resistant (XDR) TB. The Bacille Calmette–Guérin (BCG) vaccine is a live, weakened vaccine; hence, every sort of immunosuppression, as well as pregnancy, represents absolute contraindications. BCG vaccine protects against severe forms of TB, particularly non-pulmonary localizations. WHO recommends BCG vaccination in all newborns in high-incidence TB countries. In Europe, vaccination is recommended in all people with an increased risk of contracting TB: among them, children with parents coming from high-incidence countries and who travel regularly to their home countries [2].

Table 2.1 Economic impact of tuberculosis (TB) in European countries according to the European Centre for Disease Prevention and Control [5]

In the old EU-15 countries (+Cyprus, Malta and Slovenia), the costs per case were:	In the remaining new EU countries, the costs per case were:
€ 10,282 for drug-susceptible TB	€ 3,427 for drug-susceptible TB
€ 57,213 for multidrug-resistant (MDR) TB	€ 24,166 for M/XDR-TB
€ 170,744 for extensively drug-resistant (XDR) TB	–

Twenty-two high-burden countries account for over 80 % of the world's TB cases; in those countries, both incidence and mortality for TB are downscaling. These findings are consistent with the global data which reveal that incidence and mortality are falling down in all WHO Regions. However, within the global scenario, huge variations can be underlined: the Millennium Development Goals (MDGs) of halving the 1990 levels by 2015 are not on track to be achieved in the African and European Regions [2].

Although enormous progress has been done, despite regional variations, the global burden of TB is still relevant; data referring to 2011 revealed 8.7 million new cases of TB (13 % coinfected with HIV) and 1.4 million people deaths due to such disease. TB prevalence is higher in Asia and Africa. In Asia, India and China together account for almost 40 % of the worldwide TB cases while the African Region registered the 24 % of all the global cases, and the highest rates of cases and deaths per capita [2]. In the WHO European Region, the estimated TB prevalence is more than 500,000 cases; most recent data reported 44,000 victims, the vast majority in Eastern Europe and Central Asia [3, 4].

Unfortunately, steps further in responding to M/XDR-TB are still slow. India, China, the Russian Federation and South Africa have almost 60 % of the worldwide cases of M/XDR-TB. However, with over half of the world's countries with the highest percentage of M/XDR-TB cases, the WHO European Region is a gravity centre for such disease, particularly Eastern European and Central Asian countries [3, 4].

In 2004, WHO recommended the implementation of collaborative TB/HIV activities on a global scale; progress on this issue has proceeded. Around 80 % of TB cases among people living with HIV were located in Africa. In 2011, in the WHO European Region, 6 % of TB patients were coinfected with HIV [2].

With regard to TB costs, most recent data, referring to 2011, strengthened the awareness of the gigantic economic impact of TB in the WHO European Region. Table 2.1 reports the economic impact of TB [5].

Other relevant data reported that:

- The 70,340 susceptible TB cases, the 1.488 MDR-TB and the 136 XDR-TB cases notified in 2011 cost € 536.890.315 in 2012.
- The 103,104 disability adjusted life years (DALYs) caused by these cases, when stated in monetary terms, amounted to € 5.361.408.000 in 2012.

In 2006, the Global Plan to Stop TB 2006–2015 reiterated WHO pledges in halting, and beginning to reverse, the TB epidemic by 2015 and in halving TB prevalence and death rates by 2015 compared with 1990 levels. The "directly observed treatment, short course (DOTS) strategy" of the global plan points out main issues to be strengthened. They are:

- Political commitment (through long-term strategic plans) and financing (through national governments)
- Case detection through quality-assured bacteriology (by using sputum smear microscopy and then culture/drug susceptibility testing)
- Standardized treatment, with supervision and patient support (through the most effective, standardized, short-course regimens to facilitate adherence)
- Effective drug supply and management system (through a reliable system of procurement and distribution of all essential anti-TB drugs to all health facilities)
- Monitoring/evaluation of system, and measure of the impact [6]

In Cambodia, the adherence to the Stop TB Plan resulted in a downscale of the TB prevalence in 2011 by 45% compared to 2002 through the decentralization of TB control services from provincial/district hospitals to health centres [7].

At the European level, Switzerland implemented a strategic plan to fight against TB; it represents a benchmark with regard to the strict collaboration between a national government and WHO EURO. This nationwide plan aims at specifically focusing the fight against TB towards the reduction of inequalities, the access to screening and diagnosis, the strengthening of the treatment according to DOTS guidance, the improvement of the epidemiologic surveillance network, the upgrade of communication/information campaigns and the setting of new international collaborations [8].

With regard to MDR/XDR TB, in the high-prevalence Eastern European and Central Asian countries, stakeholders and decision-makers are recommended to address targeted evidence-based interventions policies. Main efforts have to be focused on:

- Identifying and addressing risk factors contributing to the spread of drug-resistant TB
- Strengthening the health system response in providing accessible, affordable and acceptable services
- Working in regional, national and international partnerships on TB prevention, control and care
- Monitoring the trends of M/XDR-TB and measuring the impact of interventions [9, 10]

HIV/AIDS

The pathogenetic mechanism of the HIV consists in attacking the immune system. The long incubation period ends with a lifelong severe disease culminating in AIDS. AIDS is defined by the presence of one or more "opportunistic" illnesses. Sexual

contacts with an infected person and sharing needles/syringes with someone who is infected represent the most common modalities of transmission. Less commonly, HIV can be contracted through transfusions of infected blood. Finally, newborns of HIV-infected women may become infected before or during birth, or through breast feeding. Since the mid-1990s, the quality of life of HIV patients has been deeply scaled up through effective combination therapies. These drugs delayed the onset of AIDS and the related death; however, the occurrence of side effects raises concerns [11].

In 2011, the global prevalence of HIV accounted for 34 million people; 69% of them lived in Sub-Saharan Africa. Around five million people are living with HIV in South, South-East and East Asia combined. Other high-prevalence regions include the Caribbean, Eastern Europe and Central Asia [11].

Worldwide, HIV incidence is in downturn. In 2011, 2.5 million people acquired HIV infection; this number was 20% lower than in 2001. Sharpest declines in the incidence have been recorded in the Caribbean (42%) and Sub-Saharan Africa (25%). However, variation among regions gives rise to concerns; since 2001, a 35% increase of HIV incidence has been reported in the Middle East and North Africa. The number of newly infected people in Eastern Europe and Central Asia has been scaling up since 2001, as well [11].

As for HIV mortality rates, the number of people dying from AIDS-related causes has been reducing since the mid-2000s, because of the improved antiretroviral therapy [12, 13]. In 2011, the Joint United Nations Programme on HIV and AIDS (UNAIDS) estimated that 1.7 million people died from AIDS-related causes worldwide, thus recording a 24% decline compared with 2005 statistics. However, huge variations between regions have been reported, as well. Although Sub-Saharan Africa still accounts for 70% of all AIDS-related deaths, a 32% downturn was underlined in this region, in 2011. Consistent findings have been reported in the Caribbean, (reduction achieved was 48%), in Oceania (41%) and in Latin America (10%). According to data referring to incidence rates, increased AIDS-related mortality has been highlighted in Eastern Europe/Central Asia (21%) and in the Middle East/North Africa (17%) [11].

The steady scaling up of HIV incidence in the WHO European Region raises many concerns and underpinned further investigations to point out high-risk groups. The highest number of HIV cases in Europe was reported among men who have sex with men (MSM, 38%), individuals infected by heterosexual contact (24%) and injecting drug use (4%). Noteworthy, transmission patterns are widely different across Europe: MSM route of transmission accounted for a disproportionate amount cases in the UK and in the Netherlands, heterosexual contacts in Western/Central Europe and injection drug users in Eastern Europe [14, 15].

Although evidence of cost-effective interventions is not clear and straightforward neither for Western countries nor for developing ones, some analysis outlined interesting results. In developing countries, mass media campaigns and interventions for sex workers, preventative measures to interrupt mother-to-child transmission, voluntary counselling and school-based education have been shown to be cost-effective [16].

In Europe, interesting findings have been reported with regard to structural interventions (as mass media campaigns and large-scale condom distributions), and individually focused interventions to change risk behaviour, respectively in low- and high-prevalence populations [17]. However, with regard to behavioural interventions in high-prevalence settings, a UK study pointed out the effectiveness of group- and community-level interventions but unclear findings were recorded in terms of individual-level interventions [18].

Globally, others evaluations reported the cost-effectiveness of:

- Community empowerment approach to HIV prevention and treatment across sex workers, with projected impact beyond the sex worker community
- Needle/syringe programmes among drug users' groups
- Behavioural interventions for MSM to reduce the rate of unprotected anal intercourse (27% downturn vs. no HIV-preventive interventions) [19, 20, 21].

In Europe, most successful HIV control programmes emerge from the awareness that HIV transmission is higher among injecting drug users; in turn, people who inject drugs are at greater risk of contracting TB. Hence, in order to foster people to seek and maintain treatment, the city of Porto has brought services for opioid substitution therapy (OST), HIV and TB together, focusing services on people's needs instead than on diseases. The WHO assessment of the Porto's model showed that integrating services for HIV, TB and drug-dependence treatments improve the accessibility and quality of care for people who inject drugs [22].

Crucial tools to drive decisions of stakeholders and policymakers should rely on scientific evidence and on the burden of disease. As for the latter, statistics show that in Europe high-risk groups are MSM (36 and 22% in Western and Central Europe, respectively), injecting drug users (33% in Eastern Europe) and male and transgender sex workers [19, 23]. Policymakers and HIV programme implementers should target their policies to high-prevalence groups, in order to streamline efforts. According to most recent evidence-based recommendations, stakeholders and policymakers should take into account that most successful HIV campaigns should be addressed to social change as decriminalization of sex workers, de-stigmatisation of sex between men and of drug use. In this framework, policies should be focused on HIV testing and distribution of condoms (at individual level), and on policy efforts to decriminalize MSM behaviour and anti-homophobia programmes (at community level) [23].

Other Sexually Transmitted Infections

Sexually transmitted infections (STIs) are a heterogeneous group of infections which recognize a common transmission pathway. They include:

- Chlamydia, caused by the *Chlamydia trachomatis* bacteria
- Gonorrhoea, caused by *Neisseria gonorrhoeae* bacteria

- Syphilis caused by *Treponema pallidum* bacteria (syphilis may also be transmitted from mother to child, thus resulting in congenital syphilis)
- Blood-borne viruses which could be sexually transmitted, as well (HIV, hepatitis B and hepatitis C viruses are the most common ones) [24]

STIs are contracted through vaginal, oral and anal sexual intercourse.

STIs raise public health concerns because of the profound consequences of these infections on sexual and reproductive health. During pregnancy, syphilis leads to foetal/neonatal deaths, prematurity, low birth weight or congenital disease. As for gonorrhoea and chlamydia, they represent an important cause of infertility. Noteworthy, contracting an STI increases the chances of acquiring HIV infection by threefold or more.

In recent years, HIV addressed all the public health efforts and the strong association between STIs and HIV acquisition has been underestimated [24].

Worldwide, an estimated 499 million new cases of curable STIs (as gonorrhoea, chlamydia and syphilis) occurred in 2008; these findings suggested no improvement compared to the 448 million cases occurring in 2005. However, wide variations in the incidence of STIs are reported among different regions; the burden of STIs mainly occurs in low-income countries [24].

In the European Union (EU), chlamydia is the most frequently reported STI; more than 340,000 new cases have been reported in 2010. However, the true incidence of chlamydia is likely to be higher than the officially reported one; underreporting and asymptomatic disease are common when referring to chlamydia infection. On the other hand, the scaling up of the reported cases of chlamydia infection (incidence rates have more than doubled over the past 10 years) represents a straightforward attempt of Member States to tackle the problem of STIs by improving the diagnosis of the infection. In Europe, three quarters of all new cases of chlamydia were contracted by young people (particularly women). Furthermore, almost 95% of cases are reported from six Western/Northern Europe countries reflecting the considerable variation in screening, diagnostic and surveillance programmes across EU countries [15].

With regard to gonorrhoea, more than 25% of cases are reported among MSM. Furthermore, almost 40% of the overall incidence occurs in people below 25 years of age. Main public health concerns on gonorrhoea arose after 2009; indeed, the European Gonococcal Antimicrobial Surveillance Programme (EuroGASP) reported decreased susceptibility to cefixime. As ceftriaxone, cefixime represents the recommended therapy for gonorrhoea across Europe; decreased susceptibility to this orally administered antibiotic may have major health and economic implications in the case of parenterally administered ceftriaxone becomes the only viable option [25].

As for syphilis, in 2010 the overall incidence rate was around 4.4 per 100,000 people within the EU. Around 83% of all cases were reported among people older than 25 years of age. The highest incidence occurred in MSM. However, the 2010 incidence of 4.4 represents a huge achievement compared to the 8.4 per 100,000 people, recorded in 2000 [15].

Table 2.2 Implementation steps for control of chlamydia infections according to the European Centre for Disease Prevention and Control [27]

Level A	Primary prevention: health promotion, sex education, school programmes and condom distribution
Level B	Case management: Level A + chlamydia diagnostic and clinical services, and patient/partner management services, supported by clear evidence-based guidance
Level C	Opportunistic testing: Level B + testing with the aim of case finding of asymptomatic cases
Level D	Screening programme: Level C + as it is difficult to identify asymptomatic cases, a more systematic screening programme
Level C/D	The evidence for the impact of Level C/D programmes is limited; therefore, whether implemented, they need to be evaluated to guide future policies

HIV discussion has been developed separately, in a dedicated section.

As for the cost-effectiveness of STIs interventions, further investigation is required. However, evidence-based cost-saving interventions include: widespread condom provision, school education programmes, safe sex training for high-risk groups, wide choice of contraceptive services and high-quality rapid access to STI services [26].

According to the crucial burden of chlamydia infection in Europe, we decided to focus our further discussion around this disease. The economic impact of chlamydia infection has been deeply investigated; in the UK, the cost of chlamydia complications has been estimated to a minimum of € 110 million, annually [26]. Each year, in the USA, direct costs of chlamydia and its complications range between € 1 and 3 billion.

To tackle the burden of chlamydia in Europe, in 2009, the European Centre for Disease Control in Stockholm (ECDC) released a guidance to develop an effective chlamydia national control programme which, as a prerequisite, requires the involvement of national authorities, key stakeholders and policymakers. Implementations steps are reported in Table 2.2 [27].

In 2008, the ECDC evaluated in depth the availability of national chlamydia control programmes across EU Member States. Results of the assessment showed a wide variability among countries; main findings are reported in Table 2.3 [28].

Table 2.3 Availability of national chlamydia control programmes across EU Member States. (Source: Review of chlamydia control activities in EU countries. ECDC Technical Report, 2008)

No organized activities *No guidelines for effective diagnosis and management of diagnosed chlamydia cases*	Case management *Guidelines covering minimum of diagnostic tests and antibiotic treatment, for at least one group of health care professionals*	Case finding *Case management + either guidelines covering partner notification or guidelines including offer of chlamydia testing for sexual contacts of people with chlamydia*	Opportunistic testing *Case finding + either guidelines stating that at least one specified group of asymptomatic people is offered chlamydia tests or guidelines include a list of asymptomatic people to whom chlamydia testing should be offered*	Organized screening *Opportunistic testing + organised chlamydia screening available to a substantial part of the population within the public health system*
Bulgaria	Austria	Belgium	Denmark	The Netherlands
Finland	Czech Republic	France	Estonia	The UK
Greece	Germany	Hungary	Latvia	–
Ireland	Italy	–	Sweden	–
Luxembourg	Lithuania	–	–	–
Malta	–	–	–	–
Portugal	–	–	–	–
Romania	–	–	–	–
Slovenia	–	–	–	–
Spain	–	–	–	–

At the EU level, the reduction of countries reporting no organised activity should be set as the minimal target [27, 29]

Influenza

Seasonal influenza viruses are classified into three groups according to the specific variety of the haemagglutinin (or "H" protein) and the neuraminidase (or "N" protein). Specific combinations of these two proteins label A, B and C seasonal influenza viruses; furthermore, type A influenza viruses are further divided into subtypes [30].

In temperate climates, seasonal influenza tends to spread in winter months, following a person-to-person transmission pattern. The continuous evolution of seasonal influenza viruses explains why people can contract the disease multiple times, throughout life [30].

The currently circulating seasonal influenza A virus subtypes are the influenza A(H1N1) and A(H3N2). Influenza A(H1N1) virus is the same virus that caused pandemic influenza in 2009, which is currently circulating seasonally. In addition, there are two type B viruses that are circulating as seasonal influenza viruses, as

well. A and B influenza viruses are included in the seasonal influenza vaccine, which represents the most effective way to prevent the disease and its potential severe outcomes. Influenza C virus is excluded from the vaccine, according to the lower burden of disease [30].

A pandemic influenza occurs when an influenza virus, which was not previously circulating among humans and to which most people do not have immunity, emerges and transmits among humans; whether this happens, these viruses may result in large influenza outbreaks outside seasonal patterns. Pandemic influenza outbreaks can occur when humans are infected with influenza viruses that are routinely circulating in animals, such as avian influenza virus and swine influenza virus. Indeed, animal viruses neither easily transmit to humans nor, if it happens, transmit among them. Occasionally, some animal viruses infect humans but human infections of zoonotic influenza do not spread far among humans. If such a virus acquires the capacity to spread easily among people, either through adaptation or through acquisition of certain genes from human viruses, a pandemic could start. Currently, there are no pandemic viruses circulating in the world [30].

The burden of seasonal influenza varies, globally, in different regions. The 2012–2013 influenza season was characterized by crucial differences, reported below:

- Influenza A(H3N2) was the most common virus in North America and in temperate Asia
- A(H1N1)pdm09 (pandemic 2009) affected Europe, North Africa and the Middle East
- Influenza type B was reported in North America and Europe, by the end of the season [31]

With regard to costs of influenza, results of a 2007 study, referring to 2003 data, highlighted the huge economic brunt of the burden of influenza in the USA, accounting for US$ 87.1 billion across all age groups [32].

As reported above, vaccination is the most effective modality to prevent the occurrence of influenza and of its potential severe outcomes. Two types of influenza vaccines are available: trivalent inactivated influenza vaccine (TIV) and live attenuated influenza vaccine (LAIV). Both TIV and LAIV contain three strains of influenza viruses and are administered annually.

The selection of strains to be included in the vaccine is taken according to the information gathered from the Global Influenza Surveillance Network (GISN), a partnership which encompasses 5 WHO Collaborating Centres, 136 National Influenza Centres in 106 countries and several laboratories. Apart from the crucial role of obtaining reliable virus information to update influenza vaccines, other GISN functions are to:

- Monitor the burden of human influenza
- Detect and obtain isolates of pandemic potential viruses [33]

The influenza vaccine is made up of strains of influenza A(H3N2) viruses, A(H1N1) and B. Each year, one or more virus strains might be changed according to results provided by GISN in order to reflect the most recent circulating influenza A(H3N2),

A(H1N1) and B viruses. In the large majority of countries, TIV remains the cornerstone of influenza vaccination [33].

Although influenza vaccination rates are scaling up globally, particularly in Central/Eastern Europe and in Latin America, no country has fully implemented WHO vaccine recommendations, so far. Consistent findings also encompass industrialized countries where significant proportions of the groups at risk of complications from influenza are not vaccinated. In high-risk groups, influenza is a serious public health problem, potentially leading to severe illness and death. For these reasons, WHO specifically recommends vaccination to the following categories:

- Pregnant women (even to extend protection to infants under 6 months who are not eligible for immunization)
- Children 6–59 months of age (particularly in children 6–23 months)
- Elderly individuals who are above a nationally defined age limit (often >65 years)
- Persons >6 months with specific chronic diseases (pulmonary, cardiovascular, metabolic, renal dysfunction, immunosuppression as AIDS and transplant recipients)
- Health care workers (even to protect vulnerable patients) [34]

Hence, policymakers and stakeholders should address their efforts towards the implementation and the strengthening of influenza vaccination programmes, taking into account the potential health impacts of influenza in high-risk groups as well as its huge economic brunt.

Malaria

Malaria is caused by the parasite *Plasmodium,* which is borne by mosquitoes of the species *Anopheles*. In the human body, the parasites multiply in the liver, and then infect red blood cells [35].

Symptoms of malaria include fever, headache and vomiting, and usually appear between 10 and 15 days after contact with the mosquito. If not treated, malaria is potentially lethal as it can disrupt the blood supply to vital organs. In many parts of the world, the parasites have developed resistance to a number of malaria medicines [36].

It is estimated that in 2010 alone, malaria caused 216 million clinical episodes and 655,000 deaths. An estimated 91 % of deaths in 2010 were in the African Region, followed by 6 % in the South-East Asian Region and 3 % in the Eastern Mediterranean Region (3 %). About 86 % of deaths globally were in children. A total of 3.3 billion people (half the world's population) live in areas at risk of malaria transmission in 106 countries and territories [35, 36].

Malaria imposes substantial costs to both individuals and governments. Direct costs for malaria have been estimated to be at least US$ 12 billion per year worldwide [35, 36].

Key interventions to control malaria include: prompt and effective treatment with artemisinin-based combination therapies, use of insecticidal nets by people at risk, and indoor residual spraying with insecticide to control the vector mosquitoes. Success in malaria control, however, requires strong, sustained political and budgetary commitment at national and international levels.

Zambia and Ethiopia, which achieved substantial progress in malaria control, are examples of strong political support behind malaria control programmes. The Zambian government has supported the establishment and implementation of a 6-year strategy and has taken the lead on coordinating all partners. The Ethiopian government has established joint steering committees at the national and regional levels to strengthen accountability by removing taxes and tariffs on malaria preventive tools and by promoting demand through communication efforts [36].

Diarrhoeal Diseases

Diarrhoea is defined as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual). It is generally the symptom of an infection in the intestinal tract, which can be caused by several of bacterial, viral and parasitic organisms. Infection is spread through contaminated food or drinking water, or from person to person as a result of poor hygiene [37].

Globally, most cases in children are caused by rotavirus. In adults, norovirus and *Campylobacter* are the most common. Less common causes include other bacteria (or their toxins) and parasites. Transmission can occur due to consumption of improperly prepared foods or contaminated water or via close contact with individuals who are infectious [38].

Diarrhoeal diseases amount to an estimated 4.1 % of the total disability-adjusted life years (DALY) global burden of disease, and are responsible for 1.8 million deaths every year. An estimated 88 % of that burden is attributable to unsafe supply of water, sanitation and hygiene [39]. Children in the developing world are the most affected by diarrhoeal disease: It is estimated that diarrhoeal diseases account for one in nine child deaths worldwide, making diarrhoea the second leading cause of death among children under the age of 5 after pneumonia [40].

Two recent advances in managing diarrhoeal disease—(1) oral rehydration salts (ORS) containing lower concentrations of glucose and salt, and zinc supplementation as part of the treatment; and (2) rotavirus vaccine—can drastically reduce the number of child deaths. These new methods, used in addition to prevention and treatment with appropriate fluids, breastfeeding, continued feeding and selective use of antibiotics, have been shown to reduce the duration and severity of diarrhoeal episodes and lower their incidence [41].

Diarrhoea prevention focused on safe water and improved hygiene and sanitation, however, remains the most successful and cost-effective intervention in diarrhoeal diseases control: every US$ 1 invested yields an average return of US$ 25.50 [42].

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