

Chapter 18

Health and Disease in Adolescence

Nicola Reavley, George C. Patton, Susan M. Sawyer,
Elissa Kennedy, and Peter Azzopardi



INTRODUCTION

Rising adolescent health problems, such as road traffic injuries (RTIs), mental disorders, and substance use disorders, are an increasing cause for concern in countries that have otherwise reduced maternal mortality and boosted child survival (Patton and others 2009). Moreover, with aging populations and a convergence to a disease burden dominated by noncommunicable diseases (NCDs) in later life, adolescent health risks, such as tobacco use, physical inactivity, obesity, substance use, and poor diet, assume greater significance (Jamison and others 2013). Adolescence is defined as ages 10–19 years. Definitions of age groupings and age-specific terminology used in this volume can be found in chapter 1 (Bundy and others 2017).

Better adolescent health requires matching interventions to health profiles, focusing on the important social determinants of health during the adolescent years, considering adolescent development and neurodevelopment, and addressing gender and equity.

The Sustainable Development Goals will put a greater focus on adolescents as recipients of interventions and as decision makers and implementation partners in health-related issues. Although the Millennium Development Goals increased the focus on sexual and reproductive health among adolescents and young adults ages 15–24 years, other areas of health risks and problems received far less attention, and health gains have been weaker among adolescents than among other age groups.

When reading this chapter, it is important to remember that nearly all of the data and evidence come from studies of programs in high-income countries (HICs). We cannot say with any certainty the extent to which the results presented here apply to low- and middle-income countries (LMICs). This lack of research is a particular challenge in planning and selecting interventions for this age group and helps to emphasize the need for much more research into the health of adolescents in LMICs.

MATCHING INTERVENTIONS TO HEALTH PROFILES

Matching interventions to health profiles is critical to achieving a significant improvement in adolescent health. Health profiles vary among and within countries, largely reflecting progress through the epidemiological transition that follows economic development and the demographic transition. In multiburden countries that have yet to pass through this transition, diseases of poverty predominate, including undernutrition, major sexual and reproductive health problems, and infectious diseases (see also chapter 21, figure 21.1, Sawyer and others 2017). In injury-excess countries, high levels of unintentional injury or violence and high adolescent birth rates are recorded, while NCD-predominant countries have high rates of mental and substance use disorders and chronic physical illness. Chapter 5 in this volume

(Patton, Azzopardi, and others 2017) provides further details on the categorization of disease burdens and methods used to derive the three categories of countries.

Addressing the Social Determinants of Adolescent Health

As in any age group, economic and social conditions influence adolescent health. Social determinants that improve adolescent health include policies and environments that support access to education and employment, delay marriage and childbearing, provide universal health coverage, and create opportunities to enhance youth autonomy, decision-making capacity, and human rights (Sawyer and others 2012). These determinants lie largely outside of health services, as do the interventions necessary to address them. Accordingly, the settings for health actions extend from health services, schools, and education to families and communities, places of employment, road transportation, the media, and structural, legal, and policy environments. Chapter 21 in this volume describes these platforms in more detail (Sawyer and others 2017).

Considering Adolescent Development and Neurodevelopment

Adolescent development and our understanding of it are changing. The age of onset of puberty is decreasing, yet the age at which mature social roles are achieved is increasing, and adolescence is lasting longer (NRC and IOM 2005). Interventions for adolescent health need to consider this developmental trajectory; strategies suited to younger adolescents may be inappropriate or ineffective with older adolescents or young adults (Viner and others 2012). Moreover, neuroscience has revealed adolescent neurodevelopment to be particularly dynamic and strongly influenced by social and nutritional environments as well as by exposures to behaviors such as substance use (Blakemore and Mills 2014). The decision making of adolescents, including that affecting health, differs from that of adults. Adolescents are more influenced by peers and often seek out and are more influenced by exciting, arousing, and stressful situations (Steinberg 2008). To maximize effectiveness, interventions for adolescent health need to consider such decision-making processes and provide opportunities for adolescents to exercise self-determination.

Focusing on Gender and Equity

Better adolescent health also requires focusing on gender, since strategies that are effective and appropriate for

girls may be less effective for boys, and vice versa. In addition, considering the impact of interventions on equity is critical. For example, school-based interventions may increase inequity, as they do not reach adolescents who are not in school. Addressing gender disparities in access and targeting more resources to disadvantaged adolescents (including ethnic minorities; lesbian, gay, bisexual, or transsexual youth; persons with disabilities; and persons who are homeless or in juvenile detention) are critical to closing equity gaps.

METHODS

We conducted a series of systematic reviews to assess current knowledge on the effectiveness of prevention interventions outside formal health care settings across nine areas of health¹ (see figure 21.1 in chapter 21 by Sawyer and others 2017). We included both specific health outcomes and health risks. Some responses (for example, policy measures such as taxation, or legislation such as gun control) are not directly targeted at young people but may have particular benefits for them compared with other age groups. Other actions target adolescents directly.

From March 15 to March 30, 2015, we searched the peer-reviewed literature and websites of key organizations. Annex 18A offers further details on the inclusion and exclusion criteria, classification of levels of evidence, appraisal of quality, and synthesis methods.

SEXUAL AND REPRODUCTIVE HEALTH, INCLUDING HIV/AIDS

More than any other area of health, a country's cultural, religious, legal, political, and economic contexts affect the sexual and reproductive health of adolescents, and actions for sexual and reproductive health need to take these contexts into account. The evidence suggests that implementing multicomponent interventions that act in two or more settings improves sexual and reproductive health and reduces the impact of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS): structural or policy settings, community settings (including schools), and health services (annex 18B, table 18B.1). For example, high-quality, comprehensive sex education is more likely to prevent pregnancy and reduce the prevalence of sexually transmitted infections (STIs) or HIV/AIDS if it is combined with the provision of contraceptives (Chin and others 2012; Oranganje and others 2009). Legislation to protect adolescents from early marriage and pregnancy is more likely to be effective if accompanied by actions to

encourage favorable community and professional attitudes (Gottschalk and Ortayli 2014). Although evidence exists to show the impact on safe-sex behaviors of interventions to promote universal health coverage, relatively little exists to show their impact on STI or HIV/AIDS prevalence (Denno, Hoopes, and Chandra-Mouli 2015). The quality of training for providers is likely to be an important factor in the success of such interventions, and studies targeting marginalized or vulnerable adolescents, including those not in school, are needed (Chandra-Mouli and others 2015).

INFECTIOUS AND VACCINE-PREVENTABLE DISEASES

Vaccination against infectious diseases has received far less attention in adolescents than in children. Yet adolescents are also important for ensuring completion of immunization schedules (such as measles-rubella and hepatitis B vaccine), administering booster doses (such as diphtheria-tetanus), and ensuring primary immunization (such as for human papillomavirus). Rubella vaccination is important for adolescent girls given intergenerational risks, although hepatitis B vaccine is important for both genders, given its adult burden. Other vaccines to consider according to local prevalence of disease and cost are tuberculosis, influenza, and meningitis vaccines.

Lack of basic knowledge has hindered responses to common infectious diseases in adolescents. In contrast to diarrheal disease in children, the etiological agents, proportion of vaccine-preventable morbidity and mortality, and comorbidities are largely unknown in adolescents. Similarly, adolescent tuberculosis has received little attention, even though it is the leading contributor to the burden of infectious disease in young adults in multiburden countries (Snow and others 2015).

Adolescents in Sub-Saharan Africa also carry a substantial burden of malaria. In high-transmission areas, rates are higher in adolescent girls than in boys, with pregnant girls experiencing additional risks (Desai and others 2007). In endemic regions, people are exposed to malaria earlier in life and more frequently. In these settings, partial immunity develops relatively early, and the risk of severe malaria in adolescence declines. However, in areas of lower transmission, clinical disease is more common in adolescents and young adults. As infection in endemic areas is controlled and the development of childhood immunity becomes less likely, the risk of malaria in adolescents and young adults increases (Laloo, Olukoya, and Olliaro 2006). In low-transmission regions, the incidence of malaria among adolescents reflects their use of

individual preventive interventions, such as insecticide treated bednets. A study from Nigeria, where an estimated 50 percent of the community experiences an episode of malaria each year, showed that only 8.5 percent of students ages 13–18 years reported sleeping under insecticide treated bednets (Udonwa, Gyuse, and Etokidem 2010).

UNDERNUTRITION

No adolescent-specific evidence exists of the benefit of interventions for the prevention of undernutrition. Interventions do not typically target adolescents alone or report age-disaggregated outcomes. However, good evidence exists about interventions targeting nutrition-related risks that commonly affect adolescents. These risks include iron-deficiency anemia, protein-energy malnutrition, and other micronutrient deficiencies. Energy and iron requirements increase during puberty and are required for optimal growth (Haider 2006).

Interventions to reduce protein-energy malnutrition, including balanced protein-energy supplementation (Bhutta and others 2013), cash transfers (DFID 2012), and improved household food storage systems (Masset and others 2011), may be particularly beneficial in adolescents (Prentice and others 2013). As adolescence is a period of rapid growth, it is plausible that interventions that support catch-up growth in young children might also promote catch-up growth in stunted adolescents, although further research is required to confirm this (Reinhardt and Fanzo 2014).

The additional iron necessary to meet menstruation-related needs places adolescent girls at increased risk of iron-deficiency anemia. Iron fortification of staple foods, such as flour, can reduce iron deficiency anemia at a population level by up to 63 percent and has been shown to be cost-effective (DFID 2012). Interventions addressing food insecurity may also improve iron levels (Bhutta and others 2013).

Adolescent Pregnancy

Adolescent pregnancy places girls at increased risk of undernutrition; children born to adolescent girls are more likely to have low birth weight, independent of socioeconomic or maternal preconception nutritional status (Gibbs and others 2012). Preconception interventions, such as multiple-micronutrient supplementation or iron and folic acid supplementation continuing into pregnancy, deworming to reduce nutrient loss, and antenatal nutrition counseling and education, can play a role in preventing undernutrition and poor health outcomes

in offspring (Bhutta and others 2013). Delaying first pregnancies, spacing subsequent births, and increasing young women's access to education and health care or control over household resources are likely to be central in preventing adversity (Bushamuka and others 2005; Chandra-Mouli, Camacho, and Michaud 2013). Delaying the first pregnancy is essential in stunted adolescent girls (King 2003).

UNINTENTIONAL INJURY

Much of the disease burden of adolescent unintentional injury is related to RTIs. Adolescents and young adults, particularly those in LMICs, are at high risk; they are more likely to be vulnerable road users, such as pedestrians, cyclists, and motorcyclists (Peden and others 2004). Moreover, in young men in particular, developmental immaturity, risky behavior, and poor decision making increase the risks (Toroyan and Peden 2007).

In HICs, improvements in road design, equipment and maintenance, traffic control, vehicle design and protective devices, driver training and regulation, police enforcement and sanctions, public education and information, and postcrash care have significantly reduced the burden of injury, including in adolescents (WHO and ExpandNet 2013). Chapter 3 in volume 7 discusses RTIs in more detail (Bachani and others 2017). More targeted actions include the following:

- *Graduated licensing systems* that extend the learning period, increase low-risk supervised driving, and regulate exposure to high-risk settings, such as driving at night without supervision, driving with other young passengers, or using alcohol during an initial licensing period (Simpson 2003). Robust testing of competence before issuing licenses is generally an essential element.
- *Legislation and enforcement of mandatory helmet wearing for motorcyclists* in countries where a high proportion of adolescents and young adults ride motorcycles (Norton and others 2006).
- *Investment in pedestrian safety* in regions where pedestrian injuries are common, such as Sub-Saharan Africa. Effective actions include the imposition of lower speed limits on lengths of road where pedestrians mix with other traffic and enforcement of these limits (Afukaar 2003), regulation including police enforcement of the behavior of drivers and riders at pedestrian crossings (Elvik and Vaa 2009), improved pedestrian facilities such as footpaths and crossings (Forjuoh 2003), separation of pedestrians

and vehicles (Retting, Ferguson, and McCartt 2003), and increased visibility of pedestrians (Porchia and others 2014).

Although education programs have shown some benefits (Williams 2006), school-age driver education programs that focus on selecting driving instructors and offering theory and practical tests should be avoided, as they may encourage earlier driving and lead to greater risk of accident (Roberts and Kwan 2001).

Intersectoral coordination, underpinned by strong information systems, clear governance, civil society advocacy, and a capacity to implement effectively within different sectors, is central to achieving reductions in RTIs.

VIOLENCE

Violent behavior in adolescents and young adults develops because of complex interactions among individual, relationship, community, and societal factors (Krug and others 2002). Individual risk factors include substance use, impulsivity, low educational attainment, and childhood aggression. Relationship risk factors include peer involvement in problem behavior, family conflict, poor family management, child abuse, and pro-violent parental attitudes and behavior. Communities with poor social cohesion, low socioeconomic status, high residential mobility, drug trafficking, and unemployment also increase the risk of violence. Societal risk factors include inequality, availability of weapons, and laws and cultural norms that support violence.

Adolescent-specific violence prevention strategies are implemented in three principal settings: schools, communities, and families, and policy interventions are most often targeted to the broader community (WHO 2010a) (annex 18B, table 18B.2). Universal school-based interventions have shown some evidence of effectiveness in reducing violent or aggressive behavior (Fagan and Catalano 2013; Hahn and others 2007), with similar impacts in schools in areas characterized by lower socioeconomic status and high crime rates (Hahn and others 2007).

School-based interventions are likely to be more effective in at-risk adolescents, with beneficial effects in mixed groups and boys-only groups (Limbos and others 2007; Mytton and others 2006; Park-Higgerson and others 2008). Family-focused interventions seek to promote parent-child communication and improve parenting skills, such as providing children with information about the positive and negative consequences of their behavior (Fagan and Catalano 2013; Woolfenden, Williams, and Peat 2002). Some interventions use a

combined family and school approach (Fagan and Catalano 2013). Although good evidence exists of the impact of parenting interventions targeted to younger children (Furlong and others 2012), less research has been conducted among adolescents. However, family-focused and family- and school-based interventions have shown beneficial effects (Fagan and Catalano 2013). Limited evidence exists on the effectiveness of community-based social development interventions that target risk factors for violence (Fagan and Catalano 2013; Sethi and others 2010).

Most evidence of the effectiveness of policy interventions comes from studies conducted in the broader population. Reducing the availability and harmful use of alcohol and reducing the access to weapons (for example, laws against owning and carrying weapons, fines for carrying weapons, policies on school-based weapons) have been shown to reduce violence in adolescents and young adults (Krug and others 2002; WHO 2010a).

Reducing the violence-related burden of disease in young people is likely to require a multifaceted approach that is integrated with policies directed at social and political risk factors, such as inequality, lack of access to education, unemployment, availability of weapons and laws, and cultural norms that support violence (WHO 2010a). This is likely to be particularly important in countries in which many adolescents are not in school.

Early adolescence is a period in which gender role differences intensify and boys and girls begin to explore intimate relationships. Interventions at this stage offer opportunities to promote attitudes and behaviors that reduce the risk of interpersonal and sexual violence.

Evidence for the prevention of intimate-partner and sexual violence in adolescents and young adults is largely lacking. In many cases, particularly in LMICs, studies are of poor quality, with small sample sizes, varied outcome measures, and short follow-up periods. The most common types of interventions targeted to this age group are educational and skills-based interventions, which can be effective in changing attitudes but which appear to have little impact on violent behavior (Fellmeth and others 2013). Moreover, most of these interventions have been implemented in schools and tertiary institutions in HICs, particularly the United States. Community-based programs to promote gender-equitable norms are the most common interventions in LMICs, but the evidence for their effectiveness is mixed (Lundgren and Amin 2015).

Programs are needed that more fully address the risk factors for intimate-partner and sexual violence, alcohol misuse, family-derived attitudes to violence, and social norms, such as those that condone violence and gender inequality. They need to be tailored to local contexts,

include families where appropriate, target persons at high risk, and be subject to rigorous evaluation (Ellsberg and others 2015; Whitaker and others 2006). Legislative and judicial responses are important, but they are unlikely to reduce intimate-partner and sexual violence in isolation (Ellsberg and others 2015).

MENTAL DISORDERS

Most mental disorders begin before age 25 years, most often at ages 11–18 years (Kessler and others 2005). Although not all adolescent mental health problems persist into adulthood, particularly if the episodes are brief, those that do often have lifelong impacts (Copeland and others 2011; Patton and others 2014). This has led to increased emphasis on early intervention, either in primary health care or, in some countries, through adolescent-focused mental health services (McGorry, Bates, and Birchwood 2013). Although access to health services has increased in some places, evidence that these increases have led to detectable improvements in adolescent mental health is largely lacking (Jorm 2015).

Although prevention of mental disorders is increasingly seen as a public health priority, evaluation studies have focused mainly on taking effective clinical treatments, such as cognitive-behavioral therapies, and applying them to the general population of adolescents or to at-risk subgroups to test if they prevent the development of disorders. A systematic meta-review and meta-analysis of randomized controlled trials of prevention interventions for depression or anxiety in children and adolescents showed that these interventions produced a minimal to moderate reduction in symptoms in the short term, but no effect beyond 12 months of follow-up (Stockings and others 2016).

Innovative approaches are needed, including those that focus on developmental mental health risks such as bullying and interpersonal violence. Exploration is also needed into the role of digital and social media as risk factors and as potential avenues for preventive interventions (Nesi and Prinstein 2015).

SUICIDE

The risk factors for suicide in adolescents include suicidal behavior in families, depression, alcohol abuse, use of hard drugs, mental health problems, suicidal behavior of friends, family discord (especially for females), poor peer relationships, living apart from parents, antisocial behavior (especially in females), sexual abuse, physical abuse, and unsupportive parents (Evans, Hawton,

and Rodham 2004). Contagion—when a suicidal act increases the likelihood of other suicides in a community—is a further factor in up to 60 percent of suicides in adolescents and young adults (Hazell 1993). Deliberate self-harm is also common in adolescents, particularly in females, and heightens the risks for subsequent suicide (Hawton, Zahl, and Weatherall 2003).

Adolescent suicide prevention strategies typically include one or more of the following goals: increased help-seeking for suicidal thoughts and behaviors; identification and referral of at-risk young people by health professionals, teachers, parents, or peers; reduction of risk factors for suicide; and promotion of mental health (Gould and others 2003). School-based interventions are the most commonly evaluated interventions in the adolescent age group; although some evidence shows that universal interventions improve attitudes toward suicide (Cusimano and Sameem 2011; Katz and others 2013; Klimes-Dougan, Klingbeil, and Meller 2013; Robinson and others 2013), these gains are unlikely to be maintained at follow-up, and iatrogenic effects remain largely untested (Robinson and others 2013). Gatekeeper training, which teaches specific groups of people to identify people at high risk of suicide and refer them for treatment, also improves knowledge and attitudes toward suicide and builds confidence in providing help (Katz and others 2013; Klimes-Dougan, Klingbeil, and Meller 2013; Miller, Eckert, and Mazza 2009; Robinson and others 2013).

Evidence is mixed on the effectiveness of universal school-based interventions, gatekeeper training, public education and mass media interventions, screening or intervention-after-suicide programs (Andriessen 2014), and clinical treatments (Robinson, Hetrick, and Martin 2011) on help-seeking behavior, help-giving behavior, suicidal ideation, or suicide attempts in adolescents.

Evidence from studies among the broader population suggests that training health practitioners to recognize depression and evaluate suicide risks and restricting access to lethal methods show some benefits for preventing suicide (Mann and others 2005).

Many studies of suicide prevention interventions are of poor quality, and evidence for effective interventions to prevent suicide in young people is largely lacking, particularly in LMICs. Reducing the suicide-related burden of disease in young people is likely to require a multifaceted approach that focuses on restricting access to means and training health practitioners, particularly in depression and substance use (Burns and Patton 2000; Gould and others 2003; Robinson, Hetrick, and Martin 2011). Help-seeking behavior is likely to differ between males and females, and future evaluations of preventive actions should address gender differences

(Klimes-Dougan, Klingbeil, and Meller 2013). Chapter 9 in volume 4 addresses this issue in more depth (Vijayakumar and others 2015).

PHYSICAL HEALTH AND HEALTH RISKS

Prevention of Overweight and Obesity

The prevalence of overweight and obesity in a population commonly increases in mid-adolescence and continues into early adulthood (Ng and others 2014). Because adolescent obesity strongly predicts adult obesity and associated morbidity, preventing obesity in adolescence is essential (Whitaker and others 1997), particularly when considering the maternal and intergenerational health risks of obesity in young women (Ruager-Martin, Hyde, and Modi 2010).

Modifiable risks for obesity also change rapidly across adolescence. Physical activity commonly decreases, and sedentary behavior increases (Dumith and others 2011); adolescents have greater autonomy in their choice of food and are more likely to eat outside of the home, increasing the likelihood that they will choose less healthy food (Niemeier and others 2006). Exposure to media influences and susceptibility to the marketing of processed foods also intensify (Jordan, Kramer-Golinkoff, and Strasburger 2008).

In summary, although the evidence for interventions to reduce body mass index and increase physical activity in adolescents is mixed, multicomponent interventions incorporating support for increased physical activity and education about the importance of a healthy diet and physical activity are more likely to be effective (Clemmens and Hayman 2004; Crutzen 2010; De Bourdeaudhuij and others 2011; Murillo Pardo and others 2013; Pearson, Braithwaite, and Biddle 2015; Seo and Sa 2010) (annex 18B, table 18B.3). Further research is needed to explore obesity prevention interventions that capitalize on other aspects of adolescence, including peer and social network influences. Further research is also needed to explore the impact of gender on the response to obesity prevention interventions, since it is likely that gender becomes increasingly important during adolescence (Rees and others 2006). Barriers to participation may be greater for girls than for boys and may include sensitivity regarding body image, a focus on competitive sports, and inadequate facilities in schools, such as changing rooms and showers (Camacho-Miñano, LaVoi, and Barr-Anderson 2011; Pearson, Braithwaite, and Biddle 2015; Rees and others 2006).

Further research is also needed into interventions targeting adolescents and young adults who are not in educational settings, are from minority groups, or

are disadvantaged (De Meester and others 2009; Rees and others 2006; Stice, Shaw, and Marti 2006; van Sluijs, McMinn, and Griffin 2008). However, policy approaches such as taxing unhealthy foods and beverages, reducing fast-food advertising, and front-of-pack, traffic-light nutrition labeling are more likely to work best and be cost-effective (Gortmaker and others 2011; Laska and others 2012).

Alcohol, Illicit Drugs, and Tobacco

Alcohol

Consumption of alcohol often begins and then increases during adolescence, with some evidence suggesting that adolescents are starting at increasingly early ages (Francis and others 2014). Early initiation of alcohol use is linked to binge drinking, heavy drinking, and alcohol-related problems in adolescence and adulthood (Bonomo and others 2004). Evidence suggests that early consumption may impair neurological development (Ewing, Sakhardande, and Blakemore 2014).

Although evidence suggests that interventions in schools and family settings have achieved small but significant impacts on alcohol consumption and alcohol-related harm (Foxcroft and Tsertsvadze 2011a, 2011b; Smit and others 2008), regulatory or statutory enforcement interventions are likely to show the greatest benefit in preventing harmful use (Martineau and others 2013), as shown in annex 18B, table 18B.4. Regulating access to alcohol through age restrictions on purchases is particularly effective for preventing alcohol-related harm in adolescents and young adults. However, most of this evidence is from HICs; interventions should be tailored to the local context, taking into consideration the level of alcohol consumption, age- and gender-related drinking patterns, and level of harm (WHO 2010b). Chapter 7 in volume 4 provides more detail on this issue (Medina-Mora and others 2015).

Illicit Drugs

As with alcohol, adolescence is a time when most people are first exposed to drugs and start using them. School-based interventions aim to prevent drug use, delay initiation, or prevent regular use (see annex 18B, table 18B.5). However, interventions that provide information alone are not likely to be effective in reducing use, although evidence shows that programs with a social competence approach have significant but minimal benefits (Carney and others 2014; Faggiano and others 2014). Evidence also shows that brief interventions have small but significant effects on substance use, with greater benefits if delivered in an individual format and over multiple sessions (Barnett and others 2012). Evidence is mixed about the effectiveness of

family-based (Kumpfer, Alvarado, and Whiteside 2003), community-level (Gates and others 2006; Strang and others 2012), and online (Champion and others 2013; Wood and others 2014) interventions, and some evidence supports using screening and motivational interventions in health care settings (Barnett and others 2012; Jensen and others 2011). Further studies are needed, particularly in LMICs. However, since the effects of such programs are small, they should form part of more comprehensive strategies for preventing drug use. Mass media interventions are unlikely to be effective (Ferri and others 2013).

Treatment and rehabilitation services and strategies to minimize harm have been the main focus in reducing the consequences of illicit drug use. Harm minimization strategies are essential in preventing the transmission of blood-borne viruses, including HIV/AIDS and hepatitis, and may include needle and syringe exchange programs, drug substitution programs that switch users from black market drugs to legal drugs dispensed by health professionals, HIV/AIDS testing and counseling, prevention and services for the management of STIs, overdose prevention, and education relating to wound and vein care (WHO and ExpandNet 2011). Strategies need to be tailored to the local context, including patterns of use and levels of harm.

Tobacco Use

As most adult smokers began smoking in adolescence, regular tobacco use in adolescence increases the likelihood of associated adult and intergenerational health risks. Whether or not an adolescent initiates tobacco use depends on diverse factors, such as gender; concerns with body weight; attitudes to smoking; parental, peer, and community smoking; socioeconomic status; and level of education (Warren and others 2009). School- (Thomas, McLellan, and Perera 2013), family- (Thomas and others 2015), community- (Carson and others 2011), and media-based (Brinn and others 2010) interventions can be beneficial, but the effects are small (annex 18B, table 18B.6). There is good evidence that policies to control tobacco are associated with lower prevalence of smoking in young people. These policies include age restrictions on purchase, taxation and pricing, smoke-free-air laws, and funding for tobacco control programs (Farrelly and others 2013; Wakefield and Chaloupka 2000). The Framework Convention on Tobacco Control provides clear guidance on the minimum standards governing the production, sale, distribution, advertisement, and taxation of tobacco that are needed to protect adolescents and young adults from the harms of smoking.

CONCLUSIONS

Major gaps in the evidence base for effective actions in many health areas reflect the relative lack of investment in adolescent health programs, especially in LMICs. For example, for health areas such as undernutrition and RTIs, no adolescent-specific evidence has been gathered through systematic reviews. Even in the area of sexual and reproductive health, the evidence from systematic reviews is limited on what might need to be done differently to allow adolescents to access interventions that are effective in adults (Mavedzenge, Luecke, and Ross 2014).

However, because the social and environmental determinants of health among adolescents and young adults vary widely, intersectoral and multicomponent interventions offer the best opportunity to improve adolescent health. For example, school- and health-service-based interventions to prevent early marriage and pregnancy are more likely to succeed if accompanied by interventions that generate community support, such as public hearings, meetings, and fairs (Gottschalk and Ortayli 2014). School-based interventions that go beyond teaching health education in classrooms to encompass changes to the curriculum and the wider social environment, as well as engagement with families and the community, are more likely to improve sexual health, reduce violence, and decrease smoking-related outcomes (Blank and others 2010; Harden and others 2009; Langford and others 2014). In the broader population, intersectoral action has been central to public health gains in HICs, including reducing RTIs and helping to control tobacco use (Elvik and Vaa 2009; Farrelly and others 2013).

With the exception of sexual and reproductive health, available evidence is mostly from HICs, particularly the United States. Implementation in other countries, in particular in LMICs, is uncertain. As effective interventions will only have benefits if widely implemented, consideration must be given to local contexts, including culture, beliefs, knowledge, lifestyles, and health systems. Effective implementation and scale up require a systematic approach to addressing these factors and to achieving a balance between desired outcomes and implementation constraints. It also requires involving all stakeholders and engaging existing system capacities, wherever possible, rather than imposing additional burdens (WHO and ExpandNet 2010). Ongoing monitoring and evaluation of interventions in different contexts are critical to building the evidence base (Milat and others 2013).

Within any country, marked differences exist in health between different regions and adolescent groups, with poverty, gender, and social marginalization important determinants. Although groups such as ethnic minorities; lesbian, gay, bisexual or transsexual youths; persons with

disabilities; and youth who are homeless or in juvenile detention have the greatest health needs, scant evidence exists to suggest the effectiveness of interventions across the spectrum of disadvantage. Some interventions may not reach vulnerable groups and may actually worsen inequities. Interventions should therefore be designed and implemented with an equity lens to ensure that benefits extend to the most hard-to-reach adolescents and young adults (O'Neill and others 2014). Scaling up should also give careful consideration to gender, race, ethnicity, sexuality, geography, socioeconomic status, and disability (Chandra-Mouli, Lane, and Wong 2015).

Finally, nearly all of the data and evidence come from studies of programs in HICs. We cannot say with any certainty the extent to which the results presented here apply to LMICs. This lack of research is a particular challenge in planning and selecting interventions for adolescents and emphasizes the need for much more research into the health of adolescents in LMICs.

ANNEXES

The annexes to this chapter are as follows. They are available at <http://www.dcp-3.org/CAHD>.

- Annex 18A. Methods
- Annex 18B. Evidence of Effectiveness and Cost-Effectiveness of Sexual and Reproductive Health Interventions, including HIV

NOTES

World Bank Income Classifications as of July 2014 are as follows, based on estimates of gross national income (GNI) per capita for 2013:

- Low-income countries (LICs) = US\$1,045 or less
- Middle-income countries (MICs) are subdivided:
 - a) lower-middle-income = US\$1,046 to US\$4,125
 - b) upper-middle-income (UMICs) = US\$4,126 to US\$12,745
- High-income countries (HICs) = US\$12,746 or more.

1. The nine areas of health included in this chapter are infectious and vaccine-preventable diseases; undernutrition; HIV/AIDS; sexual and reproductive health; unintentional injuries; violence; physical disorders; mental disorders; and substance use disorders.

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