

Chapter 21

Platforms for Delivering Adolescent Health Actions

Susan M. Sawyer, Nicola Reavley, Chris Bonell, and
George C. Patton



INTRODUCTION

Adolescent health has been gaining attention in the past decade (Levine and others 2008; UNICEF 2011; WHO 2014; World Bank 2007). As described by the *Lancet* Commission on Adolescent Health and Wellbeing (Patton, Sawyer, and others 2016), the adolescent years are crucial for the development of human capital. During adolescence, neurocognitive and pubertal maturation interact with the social determinants of health, creating a highly dynamic profile of health as individuals pass from childhood through adolescence and into adulthood (Sawyer and others 2012).

During these years, the burden of disease rises, including the burden of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), mental disorders, and injuries. At the same time, new health risks emerge in response to biological maturation (sexual behaviors); marketing of unhealthy products (tobacco; alcohol; foods high in sugar, salt, and fats); and community attitudes, traditions, and values (female genital mutilation, lack of access to secondary education, support for too early marriage, unsafe work practices). Due to the extent of neurocognitive maturation, increasing participation in education and changing social contexts, adolescence is also a time when interventions to improve adolescent health outcomes can expand beyond families or health services to the wider

settings in which adolescents learn, participate, and engage. Actions to improve adolescent health are most effective when embedded in contemporary understanding of adolescent development and prevention science (Catalano and others 2012), which underscores the importance of engaging with young people themselves as they become more active agents in their own lives (Patton, Sawyer, and others 2016).

Patterns of disease burden and health risk vary widely between countries as they progress through the epidemiological transition. As undernutrition, infectious and vaccine-preventable diseases, HIV/AIDS, and reproductive health needs are brought under control, the burden of road traffic injuries, violence, chronic physical disorders, mental disorders, and substance use becomes more prominent (Patton, Sawyer, and others 2016). Actions to improve health in adolescence need to include a wider range of health concerns in addition to sexual and reproductive health, and they also need to extend beyond treating disorders to addressing their root causes, including poverty and homelessness, lack of education, disability, minority sexual identity, indigenous status, and other causes of social marginalization in adolescents.

Following a brief review of the developmental context of adolescent health, this chapter categorizes countries according to their excess burden of disease and then describes six platforms that can be used to deliver health

actions to adolescents (ages 10–19 years): health services, schools, media and social marketing, community, mobile health (m-health), and structural actions. The chapter discusses the rationale of these platforms for delivering health treatments for established health issues, for responding to emerging needs, and for preventing future health problems. It also emphasizes the importance of matching actions to health needs, responding to differences between and within countries, and aligning actions across platforms spanning different sectors, including health and education.

A key message relates to how knowledge of adolescent development promotes understanding of why different platforms are needed to deliver actions for adolescent health. While the term “action” is used interchangeably with the term “intervention,” action is preferred when describing the need for multicomponent interventions that require more than one platform and interventions that are more distal to the individual. The term “platform” is used to describe the mechanism or infrastructure that is required to deliver actions or interventions (health services, schools, laws). In reading the text, 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 limitation is a particular challenge in planning and selecting interventions for this age group and emphasizes the need for much more research into the health of adolescents in LMICs. Definitions of age groupings and age-specific terminology used in this volume can be found in chapter 1 (Bundy, de Silva, and others 2017).

THE DEVELOPMENTAL CONTEXT OF ADOLESCENT HEALTH

During adolescence, neurodevelopment drives adolescents to engage with and challenge their social environments and requires parents to balance their protective role with one that enables adolescents to engage safely with their communities and the wider world. Beyond family, the social context in which young people mature profoundly influences their health and well-being. At this time, adolescents become more sensitive to social standing and engagement with their peers (Crone and Dahl 2012). Bullying and peer victimization become more common in adolescence, increasing the feeling of social exclusion and the odds of mental disorders, especially in girls (Bond and others 2007). Indeed, adolescents are at heightened risk for the onset of mental disorders. Schools become the main context of peer relationships,

and teachers become important adult figures in addition to parents and other family members. Social media becomes an important space for peer relationships, which also shape identity, health, and well-being.

Poverty and homelessness contribute to social marginalization and poor health at all ages, but pose additional risks in the context of adolescent development. The biological amplification of sexual attraction during adolescence increases the risk of too early pregnancy and sexually transmitted infections (STIs). For girls, too early pregnancy, whether within or outside of marriage, results in premature completion of education, which compromises their future employment and financial independence, with accompanying risks to their health and that of their children. For persons who are lesbian, gay, bisexual, or transgender, minority sexual status increases the risk of social marginalization, which makes them vulnerable to violence and stigma. Health outcomes in adolescence (for example, HIV/AIDS, mental disorders, disability) can themselves be a risk for social exclusion and a source of inequality.

As a consequence of age and development, young people lack life experience, have poor health literacy (Manganello and others 2015), are sensitive to stigma and shame, have a strong desire for confidentiality (Ford and others 1997), have poorly developed organizational skills, and lack financial resources. They often depend on their parents or caregivers to transport them to, consent to, and pay for health care. They can have difficulty understanding and regulating their emotional states, which affects their decision making. For example, they may know how to prevent unplanned pregnancies and STIs, but may not use such measures when they are in the midst of powerful emotions or “hot cognitions.” Young people tend to be less influenced than adults by concerns about long-term risks, but are more vulnerable than adults to advertising and marketing of unhealthy products that provide social status. All of these attributes make young people vulnerable to unhealthy behaviors and make it difficult for them to seek and access health care and sustain healthy behaviors.

However, just as the developmental context of adolescence informs the pattern of health risks and outcomes experienced at this time, it also creates opportunities for improving future health and well-being. For example, children who do not smoke during adolescence are unlikely to smoke as adults. Thus, primary prevention (actions to keep adolescents from starting to smoke) is far better at improving health across the life course than secondary prevention (actions to encourage older adults to stop smoking), at less cost.

Some actions are universally applicable to a population but are adolescent-sensitive. For example, tobacco

taxation is a universal action that is adolescent-sensitive, as adolescents are more sensitive to price than adults (Jha and Peto 2014). Other actions are adolescent-specific. For example, school-based actions to raise awareness of the harmful effects of tobacco are adolescent-specific because they only target students. Certain sexual and reproductive health laws are also adolescent-sensitive due to their disproportionate impact on adolescents. Thus, while access to legal abortion is universally relevant for sexually active women, it disproportionately affects adolescents due to their higher unmet need for contraception, the relative impact of unplanned pregnancy on girls' education, and their disproportionate use of unsafe abortion services (Woog and others 2015). Other sexual and reproductive health laws are adolescent-specific (for example, laws that restrict the access of unmarried adolescents to contraception, laws about the age of legal majority, and the minimum legal age for sexual intercourse).

With the exception of schools, platforms to deliver adolescent health actions are universal platforms that can be used to deliver adolescent-specific actions. For example, the universal platform of health services includes adolescent-specific components such as adolescent sexual and reproductive health clinics and school-based clinics.

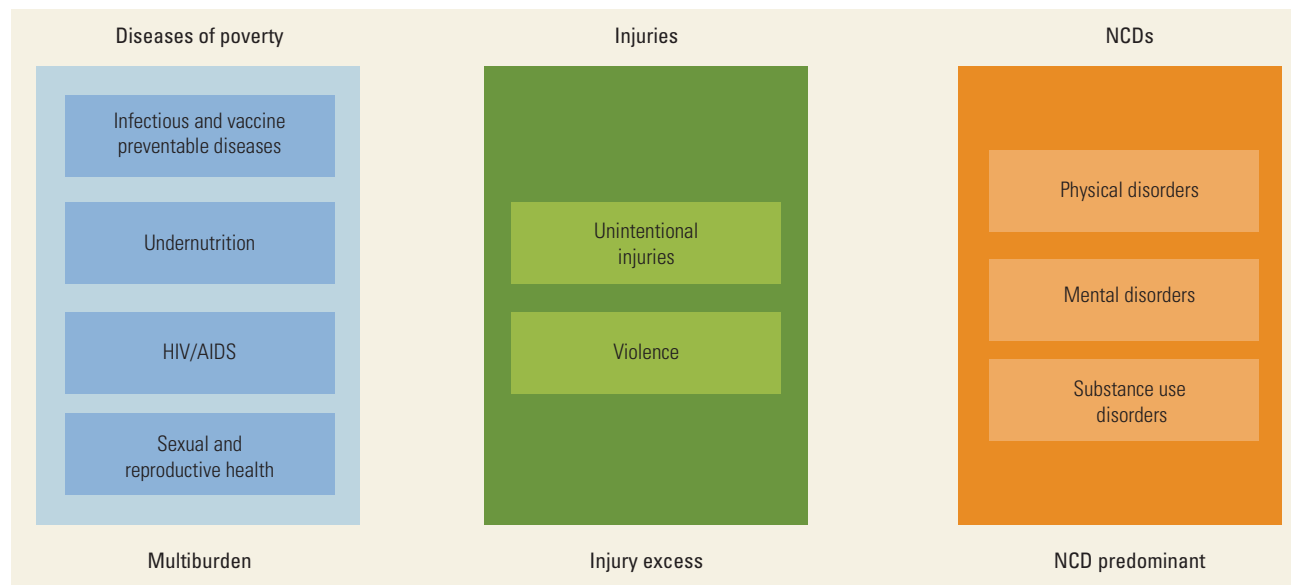
Many actions and interventions that are effective in younger children (for example, community-based

immunization clinics) or older adults (for example, population approaches to HIV/AIDS prevention) do not gain the same traction in adolescents. Legal barriers may prevent unmarried girls from accessing contraception, financial barriers may make it difficult for adolescents to pay for health care without the consent of their parent or spouse, and community immunization clinics may not be convenient for adolescents at school. Adolescent-sensitive and adolescent-specific interventions are most effective when they build on a solid understanding of adolescent development, including how adolescents engage with and pay for health care, and when they empower adolescents to become active protagonists in their own lives.

MATCHING HEALTH ACTIONS TO HEALTH NEEDS

To begin to understand how needs change as countries pass through the epidemiological transition, the *Lancet* Commission on Adolescent Health and Wellbeing grouped 236 causes of disability-adjusted life years (DALYs) and deaths into nine categories of disease (Patton, Sawyer, and others 2016) and classified countries into three broad categories according to their excess burden of disease (figure 21.1). Within this

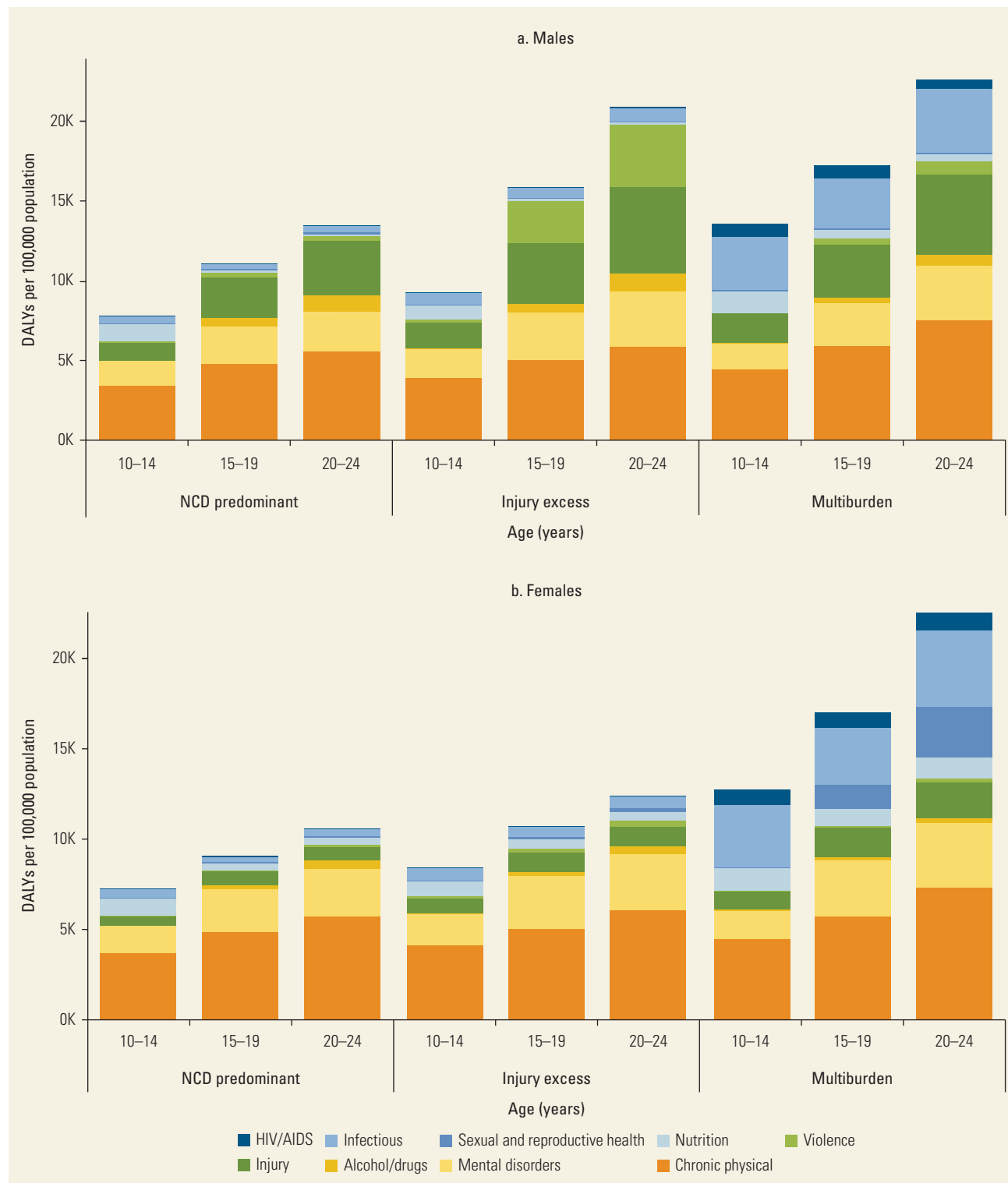
Figure 21.1 Country Categorization Based on Adolescent Burden of Disease



Source: Reprinted from *The Lancet* 387 (10036): G. C. Patton, S. M. Sawyer, J. S. Santelli, D. A. Ross, R. Afifi, and others, "Our Future: A Lancet Commission on Adolescent Health and Wellbeing," 2423–78, © 2016, with permission from Elsevier.

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome; NCD = noncommunicable disease. Countries are categorized according to adolescent burden of disease (per 100,000 people), reflecting their passage through the epidemiological transition. Multiburden countries are defined as having 2,500 or more disability-adjusted life years (DALYs) per 100,000 population per year due to diseases of poverty. Injury-excess countries are defined as having 2,500 or more DALYs per 100,000 population per year due to injury and less than 2,500 due to diseases of poverty. NCD-predominant countries are defined as having less than 2,500 DALYs per 100,000 population due to injury and less than 2,500 due to diseases of poverty.

Figure 21.2 Patterns of Disease Burden by Age and Gender (Ages 10–24)



Source: Reprinted from *The Lancet* 387 (10036): G. C. Patton, S. M. Sawyer, J. S. Santelli, D. A. Ross, R. Afifi, and others, "Our Future: A Lancet Commission on Adolescent Health and Wellbeing," 2423–78, © 2016, with permission from Elsevier.
 Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome; NCD = noncommunicable disease; DALY = disability-adjusted life year.

framework, HIV/AIDS is in its own category because addressing this condition requires distinct health policy and programmatic responses. The burden of suicide is included within mental disorders. A more detailed description of this framework is provided in chapter 5 in this volume (Patton, Azzopardi, and others 2017). Because it is based on DALYs, this framework does not consider behaviors that, while commencing in adolescence, do not influence health until some years later (for example, tobacco use).

Multiburden countries have a high burden of all nine health conditions, including diseases of poverty (HIV/AIDS and other infectious and vaccine-preventable diseases, undernutrition, and poor sexual and reproductive health, including high maternal mortality), injuries and violence, and noncommunicable diseases (NCDs). These countries also have high adolescent fertility. Injury-excess countries have a high burden of unintentional injuries and violence and a high rate of adolescent fertility, together with NCDs. NCD-predominant countries have a high burden of chronic physical, mental (including suicide), and substance use disorders.

Marked variation is also seen within countries, reflecting, among other factors, inequities in the social determinants of health and access to preventive interventions, education, and health services.

The extent of variation in the profile of adolescent health and health risks between countries (Gore and others 2011; Mokdad and others 2016; Patton and others 2009; Patton, Sawyer, and others 2016) reinforces the opportunities and scope for preventive actions and indicates priority targets. For example, in multiburden countries, health actions need to target the diseases of poverty, while avoiding further rises in injuries, violence, and NCDs. In these countries, addressing the unmet need for contraception should be a priority. Injury-excess countries need to prioritize actions that address their high rates of injury and violence as well as high birth rates among adolescents. NCD-predominant countries need to prioritize actions that address the impact of chronic mental health conditions, substance use disorders, and chronic physical conditions, including obesity.

It is important to understand how the burden of disease increases with age and varies by gender across the life course and during adolescence (figure 21.2), as this has implications for health platforms. For example, boys and girls are more vulnerable road users than adults due to their pattern of road use as pedestrians, cyclists, and motorcyclists (Peden and others 2004). Boys are more likely to die from unintentional injury and violence than girls, much of it related to

road traffic accidents (Patton, Sawyer, and others 2016). Thus, in injury-excess countries, the platform of structural actions provides the bedrock for improved road safety (improved roads, traffic control, car safety, drunk-driving legislation, reductions in the speed limit) that will disproportionately benefit adolescents (WHO 2013). Another example is mental health. Across the life course, adolescence is the time of greatest incidence of mental disorders, especially in girls (Kessler and others 2005). Social marginalization, poor school connectedness in early secondary school, and school-based bullying and victimization increase the likelihood of common mental disorders such as depression and anxiety (Bond and others 2007). These conditions also confer risks for health problems such as substance use (Bond and others 2007) and wider developmental outcomes such as early school leaving (Stein and Kean 2000). Not only are preventive actions required to address upstream social determinants, but these interventions also have multiplier effects due to their influence on more than one outcome (Catalano and others 2012).

SIGNIFICANCE OF CHANGING PATTERNS OF HEALTH FOR DELIVERY PLATFORMS

A country's pattern of disease burden has implications for the priority given to different health actions and use of health platforms.

Multiburden Countries

In multiburden countries, the priority is to reduce the excess burden from infectious disease, undernutrition, and sexual and reproductive health, including HIV/AIDS. Health services need to have the human capacity and resources to treat acute and chronic infectious diseases in adolescents. They also have to manage adolescent pregnancies and respond to high unmet needs regarding contraception for adolescent girls, both married and unmarried.

Efforts to promote continued education, especially for girls, are important, as longer participation in schooling reduces the burden of infectious diseases in adolescents (Ngimuh and others 2016) and the risk for too early pregnancy in the context of marriage. To this end, the excess burden from infectious diseases requires structural actions to guarantee fresh water and sanitation, including clean toilets, at schools. Actions are also needed to guarantee the physical and emotional safety of students while at school and en route. Schools provide opportunities to deliver important preventive

actions regarding sexual and reproductive health, such as comprehensive sexuality education, and better growth through improved nutrition from school meals. Greater participation in secondary education also expands the opportunities to deliver health services directly through schools, including clinical interventions such as vaccination, antiworming, and iron and folate supplementation.

Beyond schools, social media and community platforms can also be used to promote knowledge of and access to preventive resources for sexual and reproductive health (modern contraception), infectious diseases (insecticide treated bednets), HIV/AIDS (circumcision), and healthy growth and nutrition (nutritional supplements). Opportunities exist to use media and social marketing to explicitly target adolescents in health interventions that increase health literacy, which contributes to adolescent health.

Cash transfers to promote vaccination, school attendance, and HIV/AIDS-free status are also possible. Chapter 18 in this volume (Reavley and others 2017) provides evidence underpinning the strength of evidence for actions in this area.

Given the many barriers that adolescents face accessing health services, multiburden countries need to focus on guaranteeing universal health coverage. Countries that currently provide free health care to children under five should consider extending it to adolescents.

Injury-Excess Countries

In injury-excess countries, health services need to develop accessible trauma services in addition to primary care. Actions across the structural platform need to include legislation regarding driving under the influence of alcohol, graduated driver's licenses, and mandatory use of motorbike helmets. Schools, communities, media, and social marketing can support these actions by delivering messages that seek to change social norms, as have been progressively implemented in many HICs (Sauber-Schatz and others 2016).

To address high adolescent birth rates, schools should provide comprehensive sexuality education to all adolescents and, ideally, link education to the provision of contraception. Health services need to be able to make contraception legally available to adolescents. In some countries, this will require legislation. Other structural actions relate to laws enabling clinicians to provide legal abortions and cash transfers promoting school attendance and discouraging pregnancy in childhood. Once again, aligning actions across sectors is important; schools, media, and social

marketing platforms can each be used to change social norms regarding too-early pregnancy and the role of contraception.

NCD-Predominant Countries

In NCD-predominant countries, health services need to prioritize interventions for chronic physical conditions, mental disorders, and substance abuse disorders. Enabling clinicians, including nurses, to identify and manage common mental disorders requires shifting the focus of medical education and reorienting health services toward NCDs. Most health services require greater clinical capacity to respond to mental health conditions. In addition to human capacity, opportunities exist for mobile health, with m-health applications offering opportunities for well-being (for example, mindfulness apps) and treatment (for example, cognitive behavioral therapy apps, and crisis-support telephone and text services).

Schools in NCD-predominant countries can promote physical activity. Schools, communities, and social media can also help to change social norms regarding tobacco, alcohol, and other drug use, body image, and the stigma of mental disorders.

Most NCD-predominant countries have implemented laws that have greatly reduced adolescents' access to tobacco. Less progress has been made in introducing legislation to reduce adolescents' access to alcohol. As with structural actions to curb substance use among adolescents, there is precedence to use taxation of food and beverages with added salt, sugar, or fats, given early evidence of effect (Colchero and others 2016).

PLATFORMS TO DELIVER ACTIONS FOR HEALTH

The health care system is the sum of the people, institutions, and resources that maintain and improve the health of the people they serve (WHO 2007). Health services are just one of the platforms that can deliver actions and interventions for adolescent health. Indeed, major actions for adolescent health occur outside health services, suggesting that an integrated system of delivery platforms would improve the response to conspicuous and emerging health needs and efforts to prevent other health issues from developing.

The *Lancet* Commission on Adolescent Health and Wellbeing (Patton, Sawyer, and others 2016) described the opportunities for health actions delivered across six platforms: health services, schools, communities,

m-health, media and social marketing, and structural actions. These platforms are not mutually exclusive. For example, direct clinical care is delivered mostly by traditional health services such as community clinics and hospitals. However, direct clinical care can also be delivered via school-based clinics and mobile clinics that visit schools and workplaces. M-health approaches can also deliver direct clinical care, as an adjunct to clinical care, and for a wide variety of educational and health-promoting activities.

These platforms are interdependent. For example, the ability of clinicians to prescribe contraception to unmarried girls depends on a nation's legal framework, religious dictates, and community expectations. And, as described in chapter 18 in this volume (Reavley and others 2017), health benefits occur in the context of multicomponent actions. Thus, for any single area of health need, aligning actions across different platforms will bring added benefits.

Health Services

Health services manage adolescents' conspicuous health needs, identify and respond to emerging health issues (for example, contraception for new-onset sexual activity or interventions to address suicidal ideation), and deliver preventive interventions that reduce the likelihood of the onset of a particular health risk (for example, obesity). This requires access to primary care, specialist, and hospital services. Until recently, there has been little focus on health services for adolescents or what is needed to guarantee universal health coverage for this age group. Such a focus is predicated on a robust knowledge of adolescent development, as this influences how adolescents engage with health services and the particular barriers they experience.

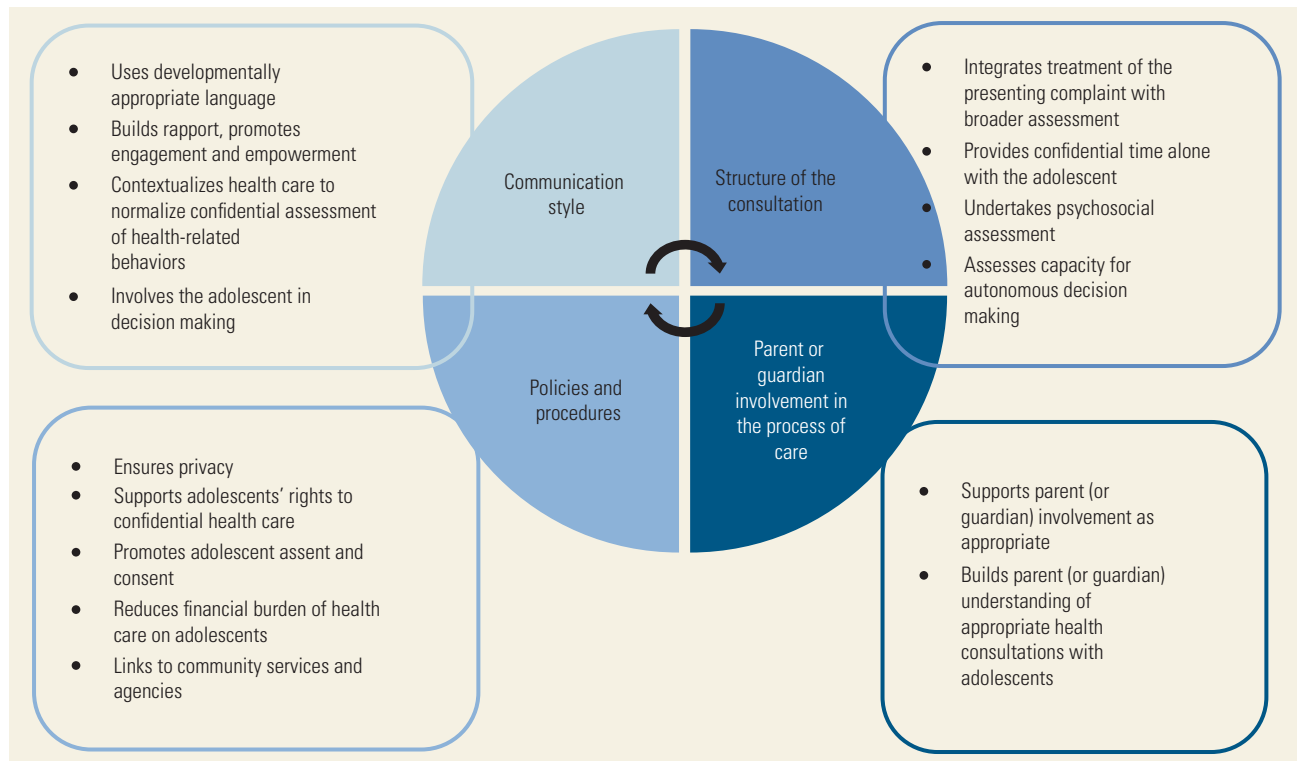
Barriers to access reside within the health care system, within health care providers, within families and communities, and within adolescents themselves. The major health system barriers—lack of geographically accessible services and lack of clinicians—are not unique to adolescent health care. In contrast, the direct and indirect costs of health care are significant barriers for adolescents who, for developmental reasons, do not place the same value on current or future health as older adults. Most adolescents rely on family for transportation and payment of health care, making free health care particularly valuable for them.

Regardless of country grouping, health services and clinicians need to have the same competencies (attitudes, knowledge, skills) if they are to work effectively

with adolescents (WHO 2015a), summarized in figure 21.3. Adolescents in high-, middle-, and low-income countries alike value patient- and family-centered care with an emphasis on respect, quality communication including confidentiality, appropriate provision of information, involvement in decisions about their care, and coordination of care (Ambresin and others 2013). Routine psychosocial assessment, such as the HEADSS (home, education, activities/employment, drugs, suicidality, sex) approach (Goldenring and Rosen 2004), has been shown to improve the identification of emerging risks (Sanci and others 2000; Sanci and others 2015) and to provide a context for anticipatory guidance and preventive interventions. Adolescents desire privacy and confidentiality regarding their health care. They are quick to feel embarrassment and shame and are often afraid of being judged, all of which are barriers to seeking health care. Health care for adolescents often takes place in the context of families, including parents or extended family members, other caregivers and guardians, or partners. A unique feature for adolescents is concern that their parents and families will be informed about sensitive issues such as sexual behaviors, substance use, and mental disorders (Ford and others 1997). Not only do health care providers need to be nonjudgmental, willing to maintain confidentiality, and able to engage with adolescents and young adults, but they also need to do this while remaining appropriately engaged with families. Health care providers need to understand the legal and ethical challenges of providing health care to legal minors while delivering health care that is consistent with the United Nations Convention on the Rights of the Child, which requires young people to become increasingly involved in their health care as they mature (United Nations General Assembly 1989).

More than a decade ago, the World Health Organization developed a framework for delivering quality primary health care to adolescents. The framework emphasized the importance of adolescent- or youth-friendly health care that has equity of access; is effective, accessible, and acceptable to young people; and is appropriate to their needs (WHO 2002). The principles of what is increasingly referred to as adolescent-responsive health care apply to all levels (clinic, hospital) and all types (mental health) of health services (Sawyer, Proimos, and Towns 2010). More recently, the World Health Organization developed policy guidelines for delivering quality health care to adolescents from the perspective of both individual providers (WHO 2015a) and health services (WHO 2015b). Governments in LMICs are using these guidelines to improve the quality of health care they

Figure 21.3 Domains That Require Special Attention in Health Consultations with Adolescents



Source: © Springer. Used with the permission of Springer. Further permission required for reuse.

provide to adolescents, with some evidence of benefit (Chandra-Mouli, Chatterjee, and Bose 2016).

In HICs, there has been a move toward large primary care clinics that include doctors, nurses, and allied health staff. In LMICs, there is growing interest in using non-physician clinicians to supplement health personnel (Mullen and Frehywot 2007). This model is suitable for providing a range of resources, including nurses who may have fewer communication barriers with adolescents than doctors (AlBuhairan and Olsson 2014).

Historically, specialist pediatric services ceased around the time of puberty, resulting in adolescents from the age of 12–13 years being managed by adult providers in adult settings. Extending specialist pediatric services to a higher upper age is more consistent with adolescent development. In many HICs, the practice of pediatrics now extends up to age 19 years. This practice is starting in LMICs. For example, the Indian Academy of Pediatrics raised the upper age of pediatrics to 19 in 1999. However, adolescents requiring inpatient care in Saudi Arabia continue to be nursed with adults from the age of 14 years (AlBuhairan and Olsson 2014).

Specialist mental health services are usually separate from specialist pediatric and other health services,

although hospital services are inconsistently colocated. The age criteria for adolescent mental health services also vary by country.

Specialist adolescent medicine first emerged in the United States more than 50 years ago. An increasing number of countries now support specialist training (Argentina, Canada), while other countries have embedded adolescent health competencies within generalist pediatric, family medicine, and obstetric and gynecology specialties. Specialist pediatric services should be linked with adult services to prevent adolescents from dropping out of health care at key transitions, such as when specialist services end. In HICs, the risk of dropping out of care or poor engagement with adult services is best appreciated for chronic physical health conditions. In LMICs, the issue has arisen especially in the context of HIV/AIDS (Lee and others 2015).

Table 21.1 summarizes the effective and promising actions that can be delivered by health services, categorized by health group. Interventions were deemed to be effective when at least 50 percent of review studies reported positive outcomes. Interventions with some positive evidence not reaching this threshold were deemed as promising and in need of further research.

Table 21.1 Effective and Promising Health Service Actions and Adolescent Health

Health condition	Action
Sexual and reproductive health, including HIV/AIDS	<ul style="list-style-type: none"> • Condoms and affordable modern contraception, including long-acting reversible contraception • Early diagnosis and treatment of HIV/AIDS and sexually transmitted infections • Male circumcision • Antenatal, delivery, and postnatal care • <i>Transition to adult care for HIV/AIDS</i>
Undernutrition	<ul style="list-style-type: none"> • Screening and micronutrient supplementation
Vaccine-preventable and infectious diseases	<ul style="list-style-type: none"> • Early identification and treatment • Adolescent vaccinations (human papillomavirus, childhood catch-up) • <i>Deworming</i> • <i>Bednet distribution</i> • <i>Seasonal malaria chemoprevention</i>
Injury and violence	<ul style="list-style-type: none"> • Trauma care, including first responders (ambulances)
Tobacco, alcohol, and illicit drugs	<ul style="list-style-type: none"> • <i>Risk screening</i> • <i>Motivational interviewing to promote cessation</i>
Mental disorders, including suicide	<ul style="list-style-type: none"> • Management of condition • Practitioner training in recognizing and treating depression • <i>Routine assessment of mental health, including suicide risk</i>
Chronic physical disorders	<ul style="list-style-type: none"> • Management of condition • <i>Promotion of self-management</i> • <i>Promotion of transition to adult health care</i>
Obesity	<ul style="list-style-type: none"> • Management of comorbidities

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome. Actions in italics are promising but lack a strong evidence base in adolescents and young adults.

Training to improve clinician competency is needed in all areas. It is especially important for recognizing and treating depression.

Schools

Schools offer three distinct benefits for adolescent health (chapter 20 in this volume, Bundy, Schultz, and others 2017). First, participation in education is beneficial for an individual's current and future health and well-being. Second, schools provide a setting for delivering preventive actions. Third, schools provide a setting for managing emerging and conspicuous health problems.

Education is a powerful determinant of adolescent health and human capital as well as a driver of socioeconomic progress (Cutler and Lleras-Muney 2012; Plaut and others 2017, chapter 22 in this volume). The Millennium Development Goals have focused attention

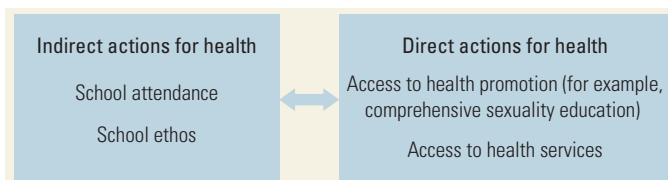
on universal primary education, and primary school enrollment has expanded rapidly in LMICs (IHME 2015); between 2000 and 2012, the number of out-of-school children of primary school age fell 42 percent (UNESCO 2015). In 2015, at least lower-secondary education (8–10 years of education) was the norm in 34 percent of countries for young men and in 18 percent of countries for young women. Upper-secondary or beyond (10+ years of education) was the norm in 44 percent of countries for young men and 56 percent of countries for young women (IHME 2015).

Participation in secondary education has significant potential to improve adolescent health, yet the health benefits of secondary education for adolescents have been poorly studied in LMICs. In HICs, there may be a threshold effect of upper-secondary education for self-reported health, mental health, and alcohol use, with little additional benefit from tertiary education (Miyamoto and Chevalier 2010). In countries with high

participation in secondary education, using schools to promote health explicitly can bring benefits above and beyond the health benefits of educational participation alone.

The benefits of expanding secondary education for health and well-being accrue through various mechanisms, including healthier behaviors, greater cognitive capacity, and longer productive lives (NRC and IOM 2005). While most attention has focused on direct health actions that can be delivered through schools, such as comprehensive sexuality education or school-based health services, indirect actions are just as, if not more, powerful (figure 21.4).

Figure 21.4 Indirect and Direct Actions for Health That Can Be Delivered in Schools



Greater participation in secondary education is associated with reductions in all-cause injury and mortality for ages 15–19, adolescent fertility, and maternal mortality (Patton, Sawyer, and others 2016). The quality of the school environment, or school ethos, also has a profound influence on health (Villa-Torres and Svanemyr 2015). A school’s ethos reflects many factors, including the school’s management and organization, social and physical environment (including physical and emotional safety, clean toilets, and adequate sanitation), quality of teaching, perceived fairness of discipline, availability of pastoral care, access to health services, whole-of-school health promotion, and access to extracurricular activities, such as sports, art, and music.

As summarized in table 21.2, the most effective actions delivered through schools are multicomponent interventions that involve whole-school activities, changes in the school’s policies, curriculum, and social and physical environment, together with family and community engagement (Bonell and others 2013; Fletcher, Bonell, and Hargreaves 2008). These types of actions show consistently positive outcomes for

Table 21.2 Effective and Promising School-Based Actions and Adolescent Health

Health condition	Action
Sexual and reproductive health, including HIV/AIDS	<ul style="list-style-type: none"> • Quality secondary education • Comprehensive sexuality education • Safe schools with clean toilets and facilities for menstrual care • School-based health services with condoms and modern contraceptives • <i>Peer-led interventions</i>
Undernutrition	<ul style="list-style-type: none"> • Micronutrient supplements • Healthy school meals
Vaccine-preventable and infectious diseases	<ul style="list-style-type: none"> • Human papillomavirus vaccination • <i>Deworming</i>
Injury and violence	<ul style="list-style-type: none"> • Multicomponent interventions targeting violent behavior and substance use
Tobacco, alcohol, and illicit drugs	<ul style="list-style-type: none"> • Alcohol-free policies • Smoke-free policies • Multicomponent
Mental disorders, including suicide	<ul style="list-style-type: none"> • <i>Educational interventions</i> • <i>Gatekeeper training</i> • <i>School-based mental health services</i>
Chronic physical disorders	<ul style="list-style-type: none"> • <i>School-based health services</i>
Obesity	<ul style="list-style-type: none"> • <i>Multicomponent interventions involving education about healthy diet and increasing opportunities for physical education</i>

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome. Actions in italics are promising but lack a strong evidence base in adolescents and young adults.

adolescent sexual health, violence, and tobacco smoking and may also be beneficial for other health risks (Shackleton and others 2016).

Providing comprehensive sexuality education through schools, especially when coupled with the provision of contraception and condoms, is increasingly efficient as a site of health promotion as more girls participate in secondary education (Blank and others 2010; Blank and others 2012; Chin and others 2012). Comprehensive sexuality education has been shown to be effective in LMICs as well as HICs. Abstinence-only education has not been found to prevent HIV/AIDS, other STIs, or adolescent pregnancy (Chin and others 2012; DiCenso and others 2002).

Most interventions to increase access to and retention in education have targeted younger adolescents, largely in primary schools. Scholarships, school fee reductions, cash transfers conditional on remaining in school, efforts to reduce grade repetition, school proximity, and mother tongue education are cost-effective actions (Glewwe and Kremer 2006; UNESCO 2015). In some circumstances, providing free school uniforms, abolishing school fees, and offering deworming programs are among the most cost-effective interventions (chapter 29 in this volume, Ahuja and others 2017), while in others providing school meals for students and financial support for parent-teacher associations is less cost-effective (chapter 12 in this volume, Drake and others 2017; chapter 22 in this volume, Plaut and others 2017). Building schools close to students has high upfront costs, but is considered cost-effective, as one school can serve children for many years (UNESCO 2015). Addressing gender disparities in access and targeting more resources to the poorest regions and to disadvantaged students (notably children affected by armed conflict, children whose home language is not used at school, and children with disabilities) are critical to closing equity gaps (UNESCO and UNICEF 2015). Also needed are informal and flexible approaches to reaching children outside of mainstream education, such as child laborers and married adolescents who have left school (Yasunaga 2014).

Many forces operate to exclude or divert adolescents from secondary education. Prominent among these are the costs of education and the opportunity costs to families of the loss of adolescent labor, especially in rural areas. In many LMICs, poor adolescents are less likely to attend secondary school (UNESCO 2015). Early marriage accounts for higher dropout rates among girls in many LMICs (chapter 28 in this volume, Verguet and others 2017). Hence actions to promote continued education in secondary education need to be supported by legislation that prevents

child marriage and actions to engage communities and enable them to appreciate the benefits of schooling, especially for girls.

Community

Young people are deeply embedded in their communities and are affected by the behavior, norms, and values of adults, as well as other adolescents. Communities can influence adolescent health in various ways. They can do so directly, by reducing access to harmful substances, preventing violence, or providing safe environments, including transportation to and from school. They can also do so indirectly by encouraging healthy behaviors through community attitudes and norms. Communities provide formal and informal opportunities for young people to engage, participate, and learn, which are beneficial for adolescent health and well-being. Beyond these roles, communities are also places to deliver preventive actions and treatment services.

Community-based youth-focused activities (sports, mentorship, leadership activities) can have multiple benefits. Positive youth development programs seek to promote self-confidence and empowerment, social and emotional skills, and problem solving. Using a variety of strategies (theater, music, and the arts; sports and outdoor education; leadership training and mentorship), these programs also provide opportunities to address and challenge harmful attitudes toward gender, violence, mental health, and disability. Some of these benefits can accrue through informal community programs. For example, the promotion of sports for girls can improve physical fitness, challenge harmful gender norms, and empower girls (Shaw and others 2014). However, it can be challenging to promote access for the most disadvantaged adolescents who have the most to gain from these programs.

Health services can also be delivered in community settings, distinct from primary care clinics. Community-based health care workers are likely to be most effective in places with low levels of trained health workers and few formal health clinics. Unlike the large workforce trained to offer community-based maternal and child health services, in most countries, no equivalent workforce is trained to address adolescents' particular health needs. Adolescents, especially girls who are not in school, can access community-based sexual and reproductive health education. While this will be of benefit, the extent to which community-based sexuality education meets their needs and how well it compares to school-based comprehensive sexuality education is not known. Poor quality is a likely challenge in both contexts. Ethiopia (Health Extension Worker Program),

India (Accredited Social Health Activist Program), and Pakistan (Lady Health Worker Program) have established community-based health worker programs in an effort to overcome critical deficiencies in human resources; if targeted to adolescents and supported by training, these programs could offer important benefits to adolescents, especially girls (Bhutta and others 2010; Liu and others 2011).

In socially and geographically disadvantaged areas, mobile clinics that visit different communities may also provide health services to adolescents. Mobile clinics that are located close to secondary schools, staffed by clinicians who have been trained to work with adolescents, and adequately resourced (especially with contraception) could provide services efficiently to smaller populations. The relative anonymity of mobile health workers may be advantageous for adolescents from small

communities who are particularly concerned about confidentiality.

Few programs have been well evaluated or taken to scale. The best examples of community platforms have generally incorporated elements that build on available community structures, use good information on health needs and risks, adopt a multicomponent strategy, and monitor progress (table 21.3). For example, the Communities That Care framework, which has been piloted in several U.S. sites, has been found to have clear benefits for health outcomes such as substance use and violence and to be cost-effective (Catalano and others 2012).

Community-based interactions have particular opportunities to benefit adolescents who are out of school or from marginalized groups. This platform is particularly relevant in LMIC areas with the lowest

Table 21.3 Effective and Promising Community Actions and Adolescent Health

Health condition	Action
Sexual and reproductive health, including HIV/AIDS	<ul style="list-style-type: none"> • Cash transfer programs, with payments tied to staying in school • <i>Positive youth development</i> • <i>Peer education</i>
Undernutrition	<ul style="list-style-type: none"> • Micronutrient supplements (particularly in pregnancy) • Protein-energy supplementation • Deworming • <i>Cash transfer programs</i> • <i>Nutrition education</i>
Vaccine-preventable and infectious diseases	<ul style="list-style-type: none"> • <i>Deworming</i> • <i>Bednet distribution</i>
Injury and violence	<ul style="list-style-type: none"> • <i>Promotion of parental skills and parent-child communication</i> • <i>Positive youth development</i> • <i>Promotion of gender equality</i> • <i>Economic empowerment</i> • <i>Group training for awareness, knowledge, and skills</i> • <i>Police enforcement of traffic injury control</i>
Tobacco, alcohol, and illicit drugs	<ul style="list-style-type: none"> • <i>Promotion of parent-child communication and parenting skills</i> • <i>Needle-syringe exchange access</i> • <i>Mentoring</i> • <i>Interventions to promote parental skills and parent-child communication</i>
Mental disorders, including suicide	<ul style="list-style-type: none"> • <i>Gatekeeper training</i>
Chronic physical disorders	<ul style="list-style-type: none"> • <i>Peer support initiatives</i>
Obesity	<ul style="list-style-type: none"> • <i>Opportunities for maintaining physical activity in daily life</i>

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome. Actions in italics are promising but lack a strong evidence base in adolescents and young adults.

enrollment in secondary education. However, these areas also have the least access to community programs. The more that adolescents participate in quality upper-secondary education, the less need there is for parallel community-based interactions.

Mobile Health

Young people are the earliest adopters of information and communication technologies such as mobile phones, the Internet, instant messaging, and social networking. Rapid uptake of these technologies, even in the most remote communities, means that online interventions have the potential to be a powerful platform for adolescent health. These technologies offer a strategy for delivering health care, preventive interventions, and education and health information. Digital media have the potential to reach diverse groups, including geographically and socially marginalized adolescents, while low costs offer the potential to sustain interventions over long periods (Puccio and others 2006).

Using m-health approaches, adolescents can directly engage with clinicians from a distance (for example, by telehealth). Other direct clinical approaches include cognitive behavior therapy or texting with trained counselors (for example, Crisis Text Line) and online prescription and payment of medication. During consultations, clinicians can access online diagrams, videos, or other materials that are likely to educate adolescents more powerfully than traditional means. In time, virtual reality games are likely to be used to deliver health education and promote adolescent health literacy. As adjuncts to clinical care, clinicians can recommend mindfulness or adherence apps for adolescents to use following consultations. M-health approaches can promote efficiency during consultations by facilitating clinically required information before the consultation (for example, online psychosocial assessment). After consultations, m-health can provide opportunities to improve quality or evaluate services, such as using text feedback to assess patient-reported experiences of care or patient-reported outcomes, and to monitor outbreaks of disease (for example, UNICEF’s U-Report).

The same benefits pertain to health services themselves, especially in remote regions, where m-health is used to report the quality of medical investigations (for example, medical imaging, electrocardiograms). Benefits are similarly available for training remotely based professionals, where interactive Webinars and more extensive online courses (for example, massive open online courses) are now common aspects of professional development in many parts of the world.

These new tools provide a platform for delivering health services to all populations. Adolescents may be more comfortable accessing m-health services than older adults, especially if confidentiality can be assured. For example, mobile apps could be used to offer treatment for conditions such as mental disorders, where stigma functions as a barrier to accessing treatment. Such interventions would offer particular benefits for adolescents living in countries without an effective mental health workforce. However, adolescents will need adult supervision of their engagement with m-health services, at least initially.

Ready access to free, health-related information and interactive games is a particular feature of new media (for example, PlayForward). While relevant for all adolescent health issues, the benefits are likely to be greater for more sensitive and stigmatized topics that might not otherwise be raised with peers, family, or community-based professionals, such as sexuality, abuse, interpersonal violence, and mental health. Web access is likely to be most important for adolescents whose cultures or religions are most controlling of their access to information, including comprehensive sexuality education (Latifnejad Roudsari and others 2013). Some websites in the United States focus sensitively on adolescent sexual and reproductive health (sexetc.org, bedside.org). As with all health actions, engaging young people in the development of m-health resources would help to ensure that this approach meets their needs.

At this stage, notwithstanding the enthusiasm for m-health actions, current evidence of effectiveness is very limited regarding the longer-term benefits for health. This means that only promising, rather than effective, interventions are shown in table 21.4.

Table 21.4 Promising Mobile Health Actions and Adolescent Health

Health condition	Action
Sexual and reproductive health, including HIV/AIDS	• <i>Targeting of knowledge, attitudes, and risk behaviors</i>
Tobacco, alcohol, and illicit drugs	• <i>Targeting of knowledge, attitudes, and risk behaviors</i> • <i>Text messaging to encourage quitting</i>
Obesity	• <i>Interactive and personalized feedback</i>

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome. Actions in italics are promising but lack a strong evidence base in adolescents and young adults.

Once evidence has been gained, a particular challenge will be finding ways to bring effective interventions to the attention of young people and those who work with them, including families, teachers, and health professionals.

Reflecting their neurodevelopment and life experiences, younger adolescents are less adept at judging the reliability and accuracy of online information, which may render them vulnerable to extreme views (Coiro and others 2015).

The reach of platforms for m-health has greatly expanded (ITU 2015). For example, in Bangladesh, more than 70 percent of women of reproductive age have access to a mobile phone within the household (Labrique and others 2012). So, while access to the Internet is still challenging in many parts of the world, it is changing rapidly, even in remote parts of Sub-Saharan Africa:

- By the end of 2015, there were more than 7 billion mobile cellular subscriptions, corresponding to a penetration rate of 97 percent, up from 738 million in 2000.
- Between 2000 and 2015, global Internet penetration grew sevenfold from 6.5 to 43.0 percent.
- Mobile broadband penetration reached 47 percent in 2015, a twelvefold increase since 2007.
- The proportion of houses with Internet access at home increased from 18 percent in 2005 to 46 percent in 2015.

However, there is still global inequality of access:

- Two-thirds of people from LMICs remained offline in 2015.
- Only 9.5 percent of people in the poorest countries currently use the Internet.

Media and Social Marketing

Media and social marketing have the potential to target the health-related attitudes and values of adolescents as well as those of their families and the broader community. While previously considered distinct, the line between mass media and social marketing is increasingly blurred. Both can be used to shape community and adolescent attitudes, which is one component of setting expectations that support the implementation of other actions, whatever the platform.

Media include traditional approaches (radio, television, newspapers) as well as social and mass media. Social media and marketing have greater capacity than traditional media to target actions according to adolescents' interests. Actions range from the provision of health information, including embedding health messages within traditional media, as well as more focused strategies targeting behavior change. Partnerships with civil society and media professionals are powerful in exploiting the potential of these platforms. Here again, partnerships with young people themselves are an important aspect of meaningful and influential social marketing that targets young people. One example is Youth for Road Safety (YOURS), a global youth-led organization and a member of the UN Road Safety Collaboration. Beyond social media, YOURS uses youth ambassadors to empower young people to develop evidence-based road safety actions that make sense to them. Schools and communities could facilitate access to this platform, creating opportunities to leverage and integrate resources for wider learning.

The strongest evidence of effect pertains to advertising restrictions and multimedia campaigns to reduce tobacco use (table 21.5). These efforts are most effective when linked with structural interventions (taxation and legislation to reduce access). As with m-health, there is remarkably little evidence of health benefits for specific

Table 21.5 Effective and Promising Media and Social Marketing Actions and Adolescent Health

Health condition	Action
Sexual and reproductive health, including HIV/AIDS	<ul style="list-style-type: none"> • <i>Promotion of community support for sexual and reproductive health and HIV/AIDS health access for adolescents</i>
Injury and violence	<ul style="list-style-type: none"> • Promotion of knowledge of the effects of violence and available services • Promotion of knowledge of risks
Tobacco, alcohol, and illicit drugs	<ul style="list-style-type: none"> • Advertising restrictions • Campaigns to build community awareness
Mental disorders, including suicide	<ul style="list-style-type: none"> • <i>Promotion of adolescent mental health literacy</i>
Obesity	<ul style="list-style-type: none"> • <i>Promotion of physical activity</i>

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome. Actions in italics are promising but lack a strong evidence base in adolescents and young adults.

social media interventions. However, the benefits of using social media to change attitudes and behaviors related to the purchase of commercial products suggests that, in time, these approaches will be able to change health-related behaviors, especially in the young.

Structural Actions

Legislation, taxation, and implementation of policies are essential structural actions to improve adolescent health. Indeed, for many health risks, such as tobacco and alcohol, road traffic injuries, violence, unsafe work, and obesity, structural actions are the most effective interventions for adolescent health (table 21.6). In addition to protecting adolescents from hazards, laws are equally important in guaranteeing that adolescents have access to resources for health, such as effective contraception. Other laws function to address social determinants, such as age of marriage, legal driving age, legal working age, and protection from hazards. International agreements are also important for tackling transnational influences such as

Internet advertising and Internet gambling (Patton, Sawyer, and others 2016; Sawyer and others 2012).

Knowledge of adolescent neurodevelopment provides a framework for thinking about how adolescents require both protective and empowering structural actions. Most laws have developed historically without attention to adolescent development. More rational legal frameworks would take greater account of adolescents' evolving cognitive and emotional capacities. With access to knowledge, adolescents demonstrate similar or even greater cognitive capacity than adults to make good judgments in calm and emotionally neutral situations. However, emotions are more likely to drive their decision making in emotionally charged situations of stress or excitement, especially with peers. In addition to protecting adolescents from harm, legal frameworks should ensure age-appropriate autonomy, freedoms, and rights (United Nations General Assembly 1989). Most adolescents are capable of voting at age 16, and doing so both empowers adolescents and promotes civic engagement. This is an example where there are few risks but many

Table 21.6 Effective and Promising Structural Actions and Adolescent Health

Health condition	Action
Sexual and reproductive health, including HIV/AIDS	<ul style="list-style-type: none"> • <i>Legislation making 18 years the minimum age of marriage</i> • <i>Legislation legalizing the provision of contraception to minors</i> • <i>Legislation legalizing abortion</i>
Undernutrition	<ul style="list-style-type: none"> • Fortification of foods with nutrients such as iron and folate
Injury and violence	<ul style="list-style-type: none"> • Gun control legislation • Legislation legalizing homosexuality and using legislation to protect women from violence and sexual coercion • Youth justice reform to promote second chances and diversions from custody • Legislation making 16 the minimum age for criminal responsibility • Graduated drivers' licensing • Mandatory wearing of motorcycle helmets • Multicomponent traffic injury control
Tobacco, alcohol, and illicit drugs	<ul style="list-style-type: none"> • Restrictions on alcohol sales to minors • Taxes on alcohol • Drunk-driving legislation • Restrictions on illicit drugs • Interventions in licensed premises
Mental disorders, including suicide	<ul style="list-style-type: none"> • Restricted access (gun control, safe containers)
Obesity	<ul style="list-style-type: none"> • Tax on foods high in sugar, salt, and fat • <i>Front-of-package nutrition labels</i> • <i>Restrictions on fast-food advertising</i>

Note: HIV/AIDS = human immunodeficiency virus/acquired immune deficiency syndrome. Actions in italics are promising but lack a strong evidence base in adolescents and young adults.

benefits from a law that enables younger participation of adolescents. Yet adolescents need laws, policy safeguards, and support for decisions made in contexts where heightened emotion affects the choices they might make (Patton, Sawyer, and others 2016). The notion of graduated laws and policies is one approach to balancing protection with empowerment. For example, graduated driving licenses support young people to acquire appropriate driving skills and experience before they can obtain a full license (Lyon, Pan, and Li 2012).

Structural actions depend on sound governance, implementation capacity, and good information systems to monitor implementation and health outcomes. Thus, legal reforms are unlikely to be successful without addressing the values, knowledge, attitudes, and behavior of the judiciary and police responsible for their implementation. They are more likely to succeed when broader community engagement and education lead to wider support. In fragile states, structural actions are difficult, as the governmental systems for implementation are generally weak. In many other countries, information systems to support structural actions are also weak. Yet, structural actions are the bedrock of any country's capacity to improve adolescent health.

CONCLUSIONS

As children mature through adolescence, the platforms available to deliver health actions need to expand from a sole reliance on families to the inclusion of schools, communities, media, health services, and wider structural actions that shape behaviors through legislative and financial means. Actions are needed that match conspicuous health needs, address emerging health issues, and are oriented toward prevention. Beyond health services, other platforms are critically important in shaping adolescent health. The most effective actions for adolescents are multisectoral and span different platforms. Alignment across sectors provides potent opportunities for amplification of effect. Thus, the relatively modest effect of school-based sexuality education programs on reducing pregnancy is enhanced when aligned with school-based health services that provide ready access to contraception. Without alignment across platforms, certain actions cannot be implemented. For example, health services cannot confidentially provide contraception to adolescents if this contravenes national or customary laws. Given the extent to which these platforms span different government ministries, funding, and programming silos, the development of national adolescent health policies would help to advance the delivery of multisectoral actions.

There are obvious priorities to address in all countries if health actions are to match needs. First, as adolescents have significant need for, but poor access to, health services, efforts to orient the health service platform toward adolescents are urgently required. Such efforts include improving the competencies of the health workforce and considering different financing models. Innovative approaches need to include schools and community-based health care, social media, and m-health actions.

Second, the health benefits from participation in secondary education are clear, especially for girls. Education is one of the smartest investments for adolescent health. Schools also provide a scalable platform for evidence-based actions, including comprehensive sexuality education, condoms and contraception, meals and nutritional supplements, and routine immunization.

Third, as the major determinants of adolescent health, growth, and development lie beyond the health and education sectors, actions for health must also include legislative and financial reforms to limit adolescents' access to hazardous commodities and environments and to promote their access to multisectoral resources for health. Attention needs to be paid to the family and community sectors (cash transfers to reduce poverty and keep adolescent girls in school).

Notwithstanding these clear directions, the evidence base for adolescent health actions is relatively weak, with the predominant evidence from HICs and the focus on sexual and reproductive health. The lack of evidence from LMICs is a particular challenge in planning and selecting interventions for adolescents; more research on the health of adolescents in LMICs is clearly needed, especially regarding efforts to adapt effective interventions from HICs to LMICs. The lack of benefit-cost ratios limits the capacity of governments to be as confident as they would like in taking programs to scale. Better understanding of the costs of implementation and the benefits of interventions is expected to provide more compelling evidence for actions that support adolescent health. However, there are high priority actions to be implemented in every country.

Beyond financial resources, the extent to which these platforms can deliver necessary actions for adolescent health is more often the sum of a country's political and community support and technical capacity, including a trained workforce. Effective interventions will only achieve health outcomes if widely implemented. For this, attention needs to be paid to local communities and cultures, which will entail the involvement of all stakeholders. As much as possible, it will mean using existing system capacities, but additional investments will, without doubt, also be required. Ongoing monitoring and

evaluation of interventions in different contexts are critical to building the evidence base (Patton and others 2016).

Regardless of the balance of platforms and actions, ensuring that new investments include strategies to reorient existing workforces (including the education, health, and community workforce) to the health and developmental needs of adolescents is a priority, as is ensuring that mechanisms are put in place to engage adolescents meaningfully so that they can positively influence the systems in which they live and learn and from which they obtain health care.

NOTE

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.

REFERENCES

- Ahuja, A., S. Baird, J. Hamory Hicks, M. Kremer, and E. Miguel. 2017. "Economics of Mass Deworming Programs." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- AlBuhairan, F. S., and T. M. Olsson. 2014. "Advancing Adolescent Health and Health Services in Saudi Arabia: Exploring Health-Care Providers' Training, Interest, and Perceptions of the Health-Care Needs of Young People." *Advances in Medical Education and Practice* 5 (September 4): 281–87.
- Ambresin, A. E., K. Bennett, G. C. Patton, L. A. Sanci, and S. M. Sawyer. 2013. "Assessment of Youth-Friendly Health Care: A Systematic Review of Indicators Drawn from Young People's Perspectives." *Journal of Adolescent Health* 52 (6): 670–81.
- Baltag, V., and S. M. Sawyer. 2016. "Quality Healthcare for Adolescents." In *International Handbook on Adolescent Health and Development: The Public Health Response*. Cham, Switzerland: Springer International Publishing.
- Bhutta, Z. A., Z. S. Lassi, G. Pariyo, and L. Huicho. 2010. *Global Experience of Community Health Workers for Delivery of Health-Related Millennium Development Goals: A Systematic Review, Country Case Studies, and Recommendations for Integration into National Health Systems*. Geneva: WHO, Global Health Workforce Alliance.
- Blank, L., S. K. Baxter, N. Payne, L. R. Guillaume, and H. Pilgrim. 2010. "Systematic Review and Narrative Synthesis of the Effectiveness of Contraceptive Service Interventions for Young People, Delivered in Educational Settings." *Journal of Pediatric and Adolescent Gynecology* 23 (6): 341–51.
- Blank, L., S. K. Baxter, N. Payne, L. R. Guillaume, and H. Squires. 2012. "Systematic Review and Narrative Synthesis of the Effectiveness of Contraceptive Service Interventions for Young People, Delivered in Health Care Settings." *Health Education Research* 27 (6): 1102–19.
- Bond, L., H. Butler, L. Thomas, J. Carlin, S. Glover, and others. 2007. "Social and School Connectedness in Early Secondary School as Predictors of Late Teenage Substance Use, Mental Health, and Academic Outcomes." *Journal of Adolescent Health* 40 (4): e9–e18.
- Bonell, C., W. Parry, H. Wells, F. Jamal, A. Fletcher, and others. 2013. "The Effects of the School Environment on Student Health: A Systematic Review of Multi-Level Studies." *Health and Place* 21 (May): 180–91.
- Bundy, D.A.P., N. de Silva, S. Horton, G. C. Patton, L. Schultz, and D. T. Jamison. 2017. "Child and Adolescent Health and Development: Realizing Neglected Potential." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Bundy, D. A. P., L. Schultz, B. Sarr, L. Banham, P. Colenso, and L. Drake. 2017. "The School as a Platform for Addressing Health in Middle Childhood and Adolescence." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Catalano, R. F., A. A. Fagan, L. E. Gavin, M. T. Greenberg, C. E. Irwin Jr., and others. 2012. "Worldwide Application of Prevention Science in Adolescent Health." *The Lancet* 379 (9826): 1653–64.
- Chandra-Mouli, V., S. Chatterjee, and K. Bose. 2016. "Do Efforts to Standardize, Assess, and Improve the Quality of Health Service Provision to Adolescents by Government-Run Health Services in Low and Middle Income Countries, Lead to Improvements in Service-Quality and Service-Utilization by Adolescents?" *Reproductive Health* 13 (February 6): 10. doi:10.1186/s12978-015-0111-y.
- Chin, H. B., T. A. Sipe, R. Elder, S. L. Mercer, S. K. Chattopadhyay, and others. 2012. "The Effectiveness of Group-Based Comprehensive Risk-Reduction and Abstinence Education Interventions to Prevent or Reduce the Risk of Adolescent Pregnancy, Human Immunodeficiency Virus, and Sexually Transmitted Infections: Two Systematic Reviews for the Guide to Community Preventive Services." *American Journal of Preventive Medicine* 42 (3): 272–94.
- Coiro, J., C. Coscarelli, C. Maykel, and F. Forzani. 2015. "Investigating Criteria That Seventh Graders Use to Evaluate the Quality of Online Information." *Journal of Adolescent and Adult Literacy* 59 (3): 287–97.

- Colchero, M. A., B. M. Popkin, J. A. Rivera, and S. W. Ng. 2016. "Beverage Purchases from Stores in Mexico under the Excise Tax on Sugar Sweetened Beverages: Observational Study." *BMJ* 352 (January 6): hh704.
- Crone, E. A., and R. E. Dahl. 2012. "Understanding Adolescence as a Period of Social-Affective Engagement and Goal Flexibility." *Nature Reviews Neuroscience* 13 (9): 636–50.
- Cutler, D. M., and A. Lleras-Muney. 2012. "Education and Health: Insights from International Comparisons." NBER Working Paper 17738, National Bureau of Economic Research, Cambridge, MA.
- DiCenso, A., G. Guyatt, A. Willan, and L. Griffith. 2002. "Interventions to Reduce Unintended Pregnancies among Adolescents: Systematic Review of Randomised Controlled Trials." *BMJ* 324 (7351): 1426.
- Drake, L., M. Fernandes, E. Aurino, J. Kiamba, B. Giyosa, and others. 2017. "School Feeding Programs in Middle Childhood and Adolescence." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Fletcher, A., C. Bonell, and J. Hargreaves. 2008. "School Effects on Young People's Drug Use: A Systematic Review of Intervention and Observational Studies." *Journal of Adolescent Health* 42 (3): 209–20.
- Ford, C. A., S. G. Millstein, B. L. Halpern-Felsher, and C. E. Irwin Jr. 1997. "Influence of Physician Confidentiality Assurances on Adolescents' Willingness to Disclose Information and Seek Future Health Care." *JAMA* 278 (12): 1029–34.
- Glewwe, P., and M. Kremer. 2006. "Schools, Teachers, and Education Outcomes in Developing Countries." In *Handbook of the Economics of Education*, edited by E. Hanushek and F. Welch, 945–1017. Oxford, U. K.: Elsevier.
- Goldenring, J. M., and D. S. Rosen. 2004. "Getting into Adolescent Heads: An Essential Update." *Contemporary Pediatrics* 21 (January 1): 64–90.
- Gore, F., P. Bloem, G. C. Patton, B. J. Ferguson, V. Joseph, and others. 2011. "A Systematic Analysis of the Global Disease Burden for 10–24 Year Olds." *The Lancet* 377 (9783): 2093–102.
- IHME (Institute for Health Metrics and Evaluation). 2015. "Global Educational Attainment 1970–2015." IHME, Seattle.
- ITU (International Telecommunication Union). 2015. "ICT Facts and Figures." ITU, Geneva.
- Jha, P., and R. Peto. 2014. "Global Effects of Smoking, of Quitting, and of Taxing Tobacco." *New England Journal of Medicine* 370 (January 2): 60–68.
- Kessler, R. C., P. Berglund, O. Demler, R. Jin, and K. R. Merikangas. 2005. "Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication." *Archives of General Psychiatry* 62 (6): 593–602.
- Labrique, A. B., S. S. Sikder, S. Mehara, L. Wu, R. Huq, and others. 2012. "Mobile Phone Ownership and Widespread mHealth Use in 168,231 Women of Reproductive Age in Rural Bangladesh." *Journal of Mobile Technology in Medicine* 1 (Suppl 4): 26.
- Latifnejad Roudsari, R., M. Javadnoori, M. Hasanpour, S. Hazavehei, and A. Taghipour. 2013. "Socio-Cultural Challenges to Sexual Health Education for Female Adolescents in Iran." *Iranian Journal of Reproductive Medicine* 11 (2): 101–10.
- Lee, L., A. L. Agwu, B. Castelnuovo, M. Trent, and A. D. Kambugu. 2015. "Improved Retention in Care for Ugandan Youth Living with HIV Utilizing a Youth-Targeted Clinic at Entry to Adult Care: Outcomes and Implications for a Transition Model." *Journal of Adolescent Health* 56 (2): S50.
- Levine, R., C. Lloyd, M. Greene, and C. Grown. 2008. *Girls Count: A Global Investment and Action Agenda; a Girls Count Report on Adolescent Girls*. Washington, DC: Center for Global Development.
- Liu, A., S. Sullivan, M. Khan, S. Sachs, and P. Singh. 2011. "Community Health Workers in Global Health: Scale and Scalability." *Mount Sinai Journal of Medicine* 78 (3): 419–35.
- Lyon, J. D., R. Pan, and J. Li. 2012. "National Evaluation of the Effect of Graduated Driver Licensing Laws on Teenager Fatality and Injury Crashes." *Journal of Safety Research* 43 (1): 29–37.
- Manganello, J. A., R. F. DeVellis, T. C. Davis, and C. Schottler-Thal. 2015. "Development of the Health Literacy Assessment Scale for Adolescents (HAS-A)." *Journal of Communication in Healthcare: Strategies, Media, and Engagement in Global Health* 8 (3): 172–84.
- Miyamoto, K., and A. Chevalier. 2010. "Education and Health." In *Improving Health and Social Cohesion through Education*, 111–79. Paris: OECD Publishing.
- Mokdad, A., M. H. Forouzanfar, F. Daoud, A. A. Mokdad, C. El Bcheraoui, and others. 2016. "Global Burden of Diseases, Injuries, and Risk Factors for Young People's Health during 1990–2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *The Lancet* 387 (10036): 2383–401. [http://dx.doi.org/10.1016/S0140-6736\(16\)00648-6](http://dx.doi.org/10.1016/S0140-6736(16)00648-6).
- Mullen, F., and S. Frehywot. 2007. "Non-Physician Clinicians in 47 Sub-Saharan African Countries." *The Lancet* 370 (9605): 2158–63.
- Ngimuh, L., B. E. Fokam, J. K. Anchang-Kimbi, and W. Samuel. 2016. "Factors Associated to the Use of Insecticide Treated Nets and Intermittent Preventive Treatment for Malaria Control during Pregnancy in Cameroon." *Archives of Public Health* 74 (February 1): 5. doi:10.1186/s13690-016-0116-1.
- NRC (National Research Council) and IOM (Institute of Medicine). 2005. "Growing Up Global: The Changing Transitions to Adulthood in Developing Countries." In *Panel on Transitions to Adulthood in Developing Countries*, edited by C. B. Lloyd. Washington, DC: National Academies Press.
- Patton, G. C., P. Azzopardi, E. Kennedy, C. Coffey, and A. Mokdad. 2017. "Global Measures of Health Risks and Disease Burden in Adolescents." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*,

- edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Patton G. C., C. Coffey, S. M. Sawyer, R. M. Viner, D. Haller, and others. 2009. "Global Patterns of Mortality in Young People: A Systematic Analysis of Population Health Data." *The Lancet* 374 (9693): 881–92.
- Patton, G. C., S. M. Sawyer, J. S. Santelli, D. A. Ross, R. Afifi, and others. 2016. "Our Future: A Lancet Commission on Adolescent Health and Wellbeing." *The Lancet* 387 (10036): 2423–78.
- Peden, M., R. Scurfield, D. Sleet, D. Mohan, A. A. Hyder, and others. 2004. *World Report on Road Traffic Injury Prevention*. Geneva: WHO.
- Plaut, D., T. Hill, M. Thomas, J. Worthington, M. Fernandes, and B. Burnett. 2017. "Getting to Education Outcomes: Reviewing Evidence from Health and Education Interventions." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Puccio, J. A., M. Belzer, J. Olson, M. Martinez, C. Salata, and others. 2006. "The Use of Cell Phone Reminder Calls for Assisting HIV-Infected Adolescents and Young Adults to Adhere to Highly Active Anti-Retroviral Therapy: A Pilot Study." *AIDS Patient Care and STDs* 20 (6): 438–44.
- Reavley, N., G. C. Patton, S. M. Sawyer, E. Kennedy, and P. Azzopardi. 2017. "Health and Disease in Adolescence." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Sanci, L. A., P. Chondros, S. M. Sawyer, J. Pirkis, E. Ozer, and others. 2015. "Responding to Young People's Health Risks in Primary Care: A Cluster Randomised Trial of Training Clinicians in Screening and Motivational Interviewing." *PLOS One*, September 30.
- Sanci, L. A., C. M. M. Coffey, F. C. M. Veit, M. Carr-Gregg, G. C. Patton, and others. 2000. "Evaluation of the Effectiveness of an Educational Intervention for General Practitioners in Adolescent Health Care: Randomised Controlled Trial." *BMJ* 320 (7229): 224–30.
- Sauber-Schatz, E. K., D. J. Ederer, A. M. Dellinger, and G. T. Baldwin. 2016. "Vital Signs: Motor Vehicle Injury Prevention—United States and 19 Comparison Countries." *Morbidity and Mortality Weekly Report* 65 (July 8): 26. <http://www.cdc.gov/mmwr>.
- Sawyer, S. M., R. A. Afifi, L. H. Bearinger, S. J. Blakemore, S. J. Ezay, and others. 2012. "Adolescence: A Foundation for Future Health." *The Lancet* 379 (9826): 1630–40.
- Sawyer, S. M., J. Proimos, and S. J. Towns. 2010. "Adolescent Friendly Health Services: What Have Children's Hospitals Got to Do with It?" *Journal of Paediatrics and Child Health* 46 (5): 214–16.
- Shackleton, N., F. Jamal, R. M. Viner, K. Dickson, G. C. Patton, and others. 2016. "School-Based Interventions Going beyond Health Education to Promote Adolescent Health: Systematic Review of Reviews." *Journal of Adolescent Health* 58 (4): 382–96.
- Shaw, A., B. Brady, B. McGrath, M. A. Brennan, and P. Dolan. 2014. "Understanding Youth Civic Engagement: Debates, Discourses, and Lessons from Practice." *Community Development* 45 (4): 300–16.
- Stein, M. B., and Y. M. Kean. 2000. "Disability and Quality of Life in Social Phobia: Epidemiological Findings." *American Journal of Psychology* 157 (10): 1606–13.
- UNESCO (United Nations Educational, Scientific and Cultural Organization). 2015. *Education for All 2000–2015: Achievements and Challenges*. Paris: UNESCO.
- UNESCO Institute for Statistics and UNICEF (United Nations Children's Fund). 2015. *Fixing the Broken Promise of Education for All: Findings from the Global Initiative on Out-of-School Children*. Montreal: UNESCO Institute for Statistics.
- UNICEF. 2011. *The State of the World's Children 2011: Adolescence, an Age of Opportunity*. New York: UNICEF.
- United Nations General Assembly. 1989. "Convention on the Rights of the Child." United Nations Treaty Series 1577, United Nations General Assembly, New York.
- Verguet, S., A. K. Nandi, V. Filippi, and D. A. P. Bundy. 2017. "Postponing Adolescent Parity in Developing Countries through Education: An Extended Cost-Effective Analysis." In *Disease Control Priorities* (third edition): Volume 8, *Child and Adolescent Health and Development*, edited by D. A. P. Bundy, N. de Silva, S. Horton, D. T. Jamison, and G. C. Patton. Washington, DC: World Bank.
- Villa-Torres, L., and J. Svanemyr. 2015. "Ensuring Youth's Right to Participation and Promotion of Youth Leadership in the Development of Sexual and Reproductive Health Policies and Programs." *Journal of Adolescent Health* 56 (1): S51–57.
- WHO (World Health Organization). 2002. *Adolescent-Friendly Health Services: An Agenda for Change*. Geneva: WHO.
- . 2007. *Everybody's Business: Strengthening Health Systems to Improve Health Outcomes; WHO's Framework for Action*. Geneva: WHO.
- . 2013. *Global Status Report on Road Safety 2013: Supporting a Decade of Action*. Geneva: WHO.
- . 2014. "Second Chance for the Second Decade." WHO, Geneva.
- . 2015a. "Core Competencies in Adolescent Health and Development for Primary Care Providers." WHO, Geneva.
- . 2015b. "Global Standards for Quality Health-Care Services for Adolescents." WHO, Geneva.
- Woog, V., S. Singh, A. Browne, and J. Philbin. 2015. *Adolescent Women's Need for and Use of Sexual and Reproductive Health Services in Developing Countries*. New York: Guttmacher Institute.
- World Bank. 2007. *World Development Report 2007: Development and the Next Generation*. Washington, DC: World Bank.
- Yasunaga, M. 2014. "Non-Formal Education as a Means to Meet Learning Needs of Out-of-School Children and Adolescents." UNESCO Institute of Statistics, Montreal.

