Global Epidemiology and Risk Factors

Adolescent Health Globally: Issues and Challenges
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Abstract
Rapid declines in fertility, increasing survival through infancy and childhood and greater longevity mean that this generation of adolescents will be the largest in human history. In low-income countries, the ‘youth bulge’ has the potential to bring great economic prosperity. In contrast, many high-income countries face a ‘demographic cliff’ where a smaller pool of young people poses major economic and social challenges. In both contexts, the health and well-being of this generation of adolescents will determine future national development. Shifts in adolescent development have major implications for health. Falls in the age of puberty together with a rising age of marriage have, for example, given rise to more sexually active unmarried adolescents. In settings where healthcare needs are well met, the benefits are clear in terms of lower pregnancy rates, lower maternal mortality and lower rates of HIV and other sexually transmitted diseases. Conversely, where this shift occurs in settings with poor adolescent health care, where sexual activity in young unmarried women is stigmatized and where poverty forces young women into early marriage or selling sex, both health and life outcomes can be catastrophic. In this context, poor and socially marginalized adolescents, particularly those out of school, without stable accommodation or family, or in juvenile detention, have the worst health profiles. The opportunities for gain or loss are great across all aspects of health in adolescence. It is during these years that the risks for injury and mental disorders are highest, and when risks for later-life noncommunicable diseases (cancer, cardiovascular and respiratory disease) such as tobacco use, obesity and inactivity are established. The great majority of adult mental disorders begin in adolescents. So too, injuries rise sharply with high rates of suicide, motor vehicle injury and violence, including sexual violence in these years. All will affect the future health, social adjustment and economic prospects of today’s adolescents. It will in turn affect their capacities as parents and a healthy start to life for their children. There is great variation between countries, even within the same region, in patterns of adolescent health. For low-income countries, key indicators at national and district levels should include rates of maternal mortality, HIV and sexually transmitted dis-
eases, age of onset of sexual activity, early childbirth, availability of contraception and age of marriage. Countries should also have data on adolescent nutrition including anemia, patterns of injury including sexual violence and coercion, mental health and disorder, and substance abuse. At a local level, data on family functioning (e.g. violence, conflict), educational engagement, peer behavior and community attitudes (e.g. to providing contraception to sexually active unmarried adolescents) are also needed to effectively guide programming and health service delivery. The evidence base for prevention in adolescence is stronger than ever before. Public health approaches that use multiple coordinated actions at national and local levels show great promise. These typically involve steps of using 'best available' data to evaluate local needs, identifying priority targets for intervention, implementing evidence-based programs and policies followed by monitoring, commonly using the same indicators that framed need.

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Adolescent Health and Development: A Global Perspective

Today’s generation of adolescents is the largest in human history. 1.2 billion 10-to 19-year-olds comprise around 18% of the global population. Nearly 90% live in low- and middle-income countries (LMICs) where the ‘youth bulge’ may make up over a third of the country’s population. In contrast, in most high-income countries (HICs), the proportion of young people in the population is at a historic low and represents a ‘youth deficit’.

Adolescence is commonly considered to begin with the completion of puberty and end with the transitions into marriage and parenthood. Although most societies have a similar concept of adolescence, there is little consistency in age definitions between countries. The term ‘young people’ commonly refers to the age group of 10 through to 24 years and is often the focus of policy attention. It is the focus for the current paper, with three distinct age brackets of 10–14 years (early adolescence), 15–19 years (late adolescence) and 20–24 years (young adulthood).

Downward trends in the age of puberty (and thus adolescence) commenced in the 19th century for today’s HICs almost certainly following better childhood nutrition (fig. 1a). This trend attenuated by the 1960s when the mean age of menarche in girls stabilized between 12 and 13 years [1] (fig.1b). There have been similar more recent downward trends in the age of menarche in LMICs [1]. In low-income settings, there is a strong correlation between age of menarche, age of first marriage and birth of first child, a relationship that can be changed by staying in school [2]. Puberty is accompanied by changes in brain function, particularly in the limbic system and subcortical structures involved in emotional processing. One result is a greater intensity of emotional experiences and a life phase in which health problems related to emotion and emotional control (e.g. injury, violence and mental health) are common [3].
There have also been a striking upward extensions in the age at which adult social roles and responsibilities are adopted. In preindustrial societies, the gap between physical maturation and parenthood was generally around 2 years for girls and 4 years for boys \[4\]. In many HICs, first marriage and parenthood now commonly occur 15–20 years after the onset of puberty. Inter-related drivers of this upward extension include industrialization, length of education and urbanization. Transitions into marriage and childrearing commonly brought a ‘matur-
ing out’ of risky adolescent behaviors, including tobacco, alcohol and illicit substance use. With a longer adolescence, young people often come to parenthood with more established and dependent patterns of alcohol and other substance use that may no longer be as readily reduced. So too, obesity is more prevalent in both middle- and high-income countries with heightened risks for infertility and pregnancy complications such as gestational diabetes and hypertension [5].

Longer duration of adolescence is evident in all but the poorest of countries [6]. In LMICs, there are commonly differences in both pubertal timing and transitions into marriage and parenthood between wealthier urban and poorer rural settings. With economic development, traditional linear sequences of social role transitions, e.g. finishing school, getting a job, getting married and having children, are generally less well defined. In settings with good health care, the delays in transition to marriage and parenthood have led to extraordinary reductions in maternal mortality and morbidity.

The pubertal maturation of the limbic system stands in contrast to the later maturation of the brain regions involved in emotional control. Maturation of the prefrontal cortex (PFC) involved in planning, inhibiting inappropriate responses and decision-making continues across adolescence until at least the third decade. The greatest disparity in maturation of these systems (limbic vs. PFC) is during early to mid-adolescence. This developmental imbalance in emotional control favors behaviors driven by emotion and rewards over rational decision-making. Adolescents engage in risky behaviors despite knowledge of risks particularly in the presence of peers [7]. This is also relevant when considering the media that can act as a ‘super-peer’. Indeed, the media’s contribution to adolescent sexual health risks in East Asia has been shown to be equivalent to the influence of peers, families or schools [8]. The wider implications of brain maturation on policies and programming are only starting to be explored. However, current understandings suggest the value of social structures to support the emerging capacity of adolescents in decision making. Such structures are likely to have elements that promote ‘connectedness’ and others that promote ‘regulation’ or setting clear rules and values [9]. These understandings reinforce the value of strategies that promote a graded exposure to health risks, such as graduated driving licenses.

Adolescent Health Risks and Problems

The chapter draws on the conceptual framework used in the recent Lancet series to describe adolescent health and its determinants within the life course [10] (fig. 2).
There are profound reciprocal relationships between adolescent health and economic development. As middle-income countries enter their demographic transition, lower fertility and dependency rates shape both economic prospects and health [11]. In HICs, a loss of labor potential could drive a focus on adolescent contributions to noncommunicable diseases (NCDs), mental illness and injuries. In low-income countries, while the current adolescent health focus remains on diseases of poverty, agendas around injury and violence and risks for NCDs are likely to emerge rapidly.

The following section summarizes current understandings of major global adolescent health problems with an emphasis on adolescent sexual and reproductive health.

**Maternal Mortality**

Maternal deaths account for 1 in 8 of all deaths in 15- to 24-year-olds globally [12]. Adolescent girls account for 14% of maternal deaths but only 11% of births. The highest rates are found in sub-Saharan Africa with a greater than 70-fold variation in rates between countries for girls aged 15–19 years. The complications of abortion are a cause of maternal death that is overrep-
resented in the adolescent age group. In some low-income settings, unsafe termination is the commonest outcome of pregnancy in young unmarried women.

HIV and Sexually Transmitted Diseases

Globally, the highest rates of treatable sexually transmitted diseases (STIs; e.g. syphilis, gonorrhea, chlamydia) occur in South and South-East Asia, but with high rates also in sub-Saharan Africa and parts of Latin America. The highest rates of HIV in young people are in sub-Saharan Africa. Within countries, there are commonly wide variations in prevalence rates across areas and between rural and urban settings. In regions where HIV is endemic, incidence rates are substantially higher in young females than males [13].

Early-Onset Sexual Activity (Including Sexual Activity in Unmarried Adolescents)

Patterns of adolescent sexual activity are changing rapidly in many LMICs. Typically, there has been a widening gap between the age of onset of sexual activity and the age of marriage mostly driven by a later age of marriage. Yet there are still wide variations. In some countries (e.g. Philippines, Ethiopia), less than one in 5 adolescents aged 15–19 are sexually active, but in others (e.g. US, Canada, Mozambique) around a half are sexually active. In general, the number of sexually active unmarried females aged 15–19 years has increased in LMICs, but rates generally remain under 20%.

Marriage before 18 Years

Early marriage in low-income settings puts young women at heightened risk for maternal mortality and health problems related to early pregnancy [14]. It is a key factor determining adolescent sexual and reproductive health risks, including HIV risk, for girls in low-income settings. Its negative consequences commonly include loss of educational opportunity and may place girls at risk of domestic violence, particularly where marriage is to an older man. In most regions, including sub-Saharan Africa, there have been recent drops in the proportion of young women marrying as teenagers. There often remains great variation within a country, with rural communities typically having higher rates.
Early Childbirth

Girls under 18 years of age are prone to obstructed and long labors, and subsequently have greater risk of postpartum infection and obstetric injury including obstetric fistula and birth injuries [14]. Adolescent pregnancies are also associated with 50% increases in rates of stillborn and neonatal deaths, as well as higher rates of preterm birth and low birthweight. Adolescent birth rates have declined in almost all regions in the past two decades, but the rate of decline has recently slowed. High rates of having children by the age of 18 years are still found in sub-Saharan Africa, southern Asia, and some countries of the Caribbean and Latin America.

Availability of Contraception

Contraceptives are essential in family planning to ensure a desired number and spacing of children. In sexually active unmarried adolescents, they are also essential in avoiding unwanted pregnancy, its social consequences and unsafe termination of pregnancy. Even though there have been great advances in contraception technology, condoms remain the most widely used form of contraception globally.

Across all ages, contraceptive use in married women globally has increased over the course of two decades from just over half to almost two thirds of women. Yet, unmet need for contraception remains very high in sub-Saharan Africa (60%), in South Asia (34%) and Western Asia (50%). One indicator is the proportion of unintended pregnancies, where of the 208 million pregnancies annually over 40% are unexpected [15]. A further indicator of particular relevance to adolescent girls is the level of induced abortion, with high rates in South and East Asia but with Africa having the highest proportion of unsafe abortions.

There are wide variations between countries in contraceptive use in 15- to 19-year-olds with generally lower rates of use in married adolescents than unmarried. In unmarried sexually active adolescents, contraceptive use is below 25% in many sub-Saharan African countries. In Latin America, the percentage of adolescent sexually active time protected by contraception ranges from less than 20% in many countries to a maximum of 50%. Barriers include poor understanding of the risk of pregnancy, concerns about the effect of contraceptives on health or fertility and opposition from partners. In younger women, further barriers include shyness and community stigma about sexual activity, disapproving attitudes from providers, financial barriers and simply not knowing where to go for contraceptives.
Mental Health

There has been a growing global focus on adolescent mental health problems. The adolescent years are the peak age of onset for a majority of psychiatric disorders with growing evidence that rates of these problems are increasing in high- and middle-income settings. Together with substance use disorders, they contribute nearly half of nonfatal DALYs in 10- to 24-year-olds globally [16]. Poor adolescent mental health is strongly linked to other health and social problems in young people, including lower educational achievements, substance abuse, violence, and poor sexual and reproductive health [17].

Injury

Injury is the largest cause of death in young people globally. Injuries account for around 40% of all youth mortality. This is in striking contrast to older age groups in whom these injuries account for only 12% of deaths [12]. Adolescent injury is often linked to other aspects of health. There is, for example, a strong relationship between reproductive rights, domestic violence and health including rates of depression and self-harm, unsafe sex, HIV and STI risk, unwanted pregnancy and poor pregnancy outcomes [18]. In young married women, husbands and in-laws are common perpetrators of violence and harassment. In Central America, one in 8 young women report having been forced to have sex by an intimate male partner [19]. Married adolescents are more commonly victims of domestic violence than older married women. In the Democratic Republic of Congo, 70% of girls aged 15–19 years who had been married reported a history of domestic violence. The consequences for mental health and suicide risk, HIV and other STIs, and unwanted pregnancy are high [20]. Sexual violence and coercion are disempowering for young women, reducing their ability to negotiate future sex, condom and contraceptive use, and access to health services.

Nutrition and Preconception Health Risks

A range of other health risks have the potential to affect either maternal health during pregnancy or the developing fetus. These include viral infections such as rubella and HIV, maternal malnutrition and micronutrient deficiency, obesity and insulin resistance, and health risk behaviors such as alcohol, tobacco and psychotropic drug use. Maternal undernutrition has been estimated to contribute to 800,000 neonatal deaths annually and is a major contributor to
stunting and micronutrient deficiencies [21]. ‘Next-generation’ effects of adolescent health status are likely to be important in low-income countries, where both adolescent malnutrition and micronutrient deficiency are high and early pregnancy common. About half of 15- to 19-year-old girls in India are underweight and anemic, and a similar proportion are married before 19 years of age [22].

**Substance Use and Abuse**

Adolescence is typically the point of first experience of tobacco, alcohol and illicit drugs. Together with obesity and low physical activity, substance abuse can have profound effects on later life health and fitness. They pose significant reproductive health risks through heightening risks for fetal failure to thrive in utero. Tobacco use is particularly high in Latin America and the Caribbean. So too, changing patterns of illicit drug use have major implications for sexual health. There are growing links between illicit drug use and HIV infection particularly in central Asia. Adolescent alcohol use is also increasing in many countries, with heavy use a predictor of risky sexual activity, unplanned pregnancy and HIV.

**Health and Social Development in Adolescence**

Many aspects of adolescent health and social development are interlinked [11]. Education has clear health benefits in addition to enhancing employment prospects and human rights, and promoting community wealth [11]. Health similarly affects educational engagement and progress. The adverse effects of child marriage and early pregnancy (<18 years) on the health and human rights of girls is well appreciated, but just as potent is the dislocating effect of early pregnancy on girls’ education and skill development that underpin their future health and that of their children [22].

National wealth, income inequality and access to education are powerful determinants of adolescent health [23]. Inequality is strongly associated with poor health across a wide range of health outcomes, with the effect particularly large in young women. Adolescents living in poverty in low-income countries are 2–4 times more likely to give birth than adolescents from the wealthiest quintiles [24]. Other structural (macro-) determinants (e.g. gender inequality) and proximal (micro-) determinants of health (e.g. intrafamilial violence, inconsistent parenting, parent mental disorder and substance abuse,
peer relationships) also influence health in adolescence [23]. Some social risks (e.g. poverty) operate across the life course; others such as peer and media influences have particular salience in adolescence. Peer victimization, for example, increases the risks for substance abuse, unsafe sex, depression, antisocial and illegal activities and dangerous driving [25]. Health is clearly promoted by policies and environments that support access to education for both boys and girls, provide relevant resources for health (e.g. contraception or condom availability), and create opportunities to enhance young people’s autonomy, decision-making capacities and human rights [26]. Beyond educational achievement, schools are important as a social environment. Creating a stronger engagement with teachers, commitment to education and emotional safety can result in reduced substance use, violence and other antisocial behaviors in adolescents [27].

Risks related to families, schools, peer groups and local communities may be health problem specific (e.g. favorable attitude to tobacco use); many are more general (e.g. family conflict) and predict multiple health and social problems including substance abuse, early unplanned pregnancy, violence, delinquency, school dropout, and mental disorder. Prevention programs commonly focus on the creation of positive social, neighborhood and school contexts [28]. Although most programs have been evaluated in high-income settings, the principles are likely to apply in LMICs.

Programs focusing on sexual and reproductive health in adolescents have generally addressed six areas [29]: preventing early marriage; preventing early pregnancy through sexuality education, increasing education opportunities and economic and social support; increasing the use of contraception; reducing coerced sex; preventing unsafe abortion, and increasing the use of prenatal care childbirth and postpartum care.

**Challenges and Opportunities**

The picture of adolescent health at national levels is patchy with major data gaps, particularly in lower-income countries. Sexual and reproductive health has had the greatest attention, leading to greater consensus on indicators and the production of data. Outside the high-income world, few countries have yet compiled status reports on the health and development of young people. There are significant gaps even for countries that have taken part in recent household or school-based health surveys. Major health problems such as mental disorders and substance abuse are rarely covered in current data collections. There is also a good deal of difficulty in capturing reliable informa-
tion on health in younger adolescents in low-income settings, where many do not go to secondary school or where attendance rates are low. A failure to extend household surveys below 15 years of age compounds this problem. Of particular concern are those who are sometimes described as ‘most at risk adolescents’. This group generally comprises the most disadvantaged adolescents who are typically out of school and out of home, possibly drug dependent or engaged in the sex industry.

**Prevention Policies**

Prevention policies targeting adolescents have potential from local administrative districts to entire nations. Until now, they have been mainly evaluated in HICs such as the US, Canada, Australia, and the UK. Successful strategies have included providing younger adolescents with free and/or easier access to contraception, raising taxes on tobacco and alcohol, increasing the minimum legal drinking age, and introducing graduated licensing policies for adolescent drivers (e.g. restrictions on when and under what conditions young people are allowed to drive). Sound evaluations have demonstrated reductions in unintended adolescent pregnancy and risky sexual behavior, harmful drinking, traffic accidents and crime [28].

**Education Systems**

The growing spread of secondary education and a growing number of adolescents attending school has great implications for adolescent health [30]. With the exception of West Africa, a majority of boys and girls are still attending school at 15 years. Schools are the site of the most important relationships outside of the family, i.e. with teachers and peers. There is much evidence that both the degree of school connection and quality of education affect health risks in adolescents. In particular, where girls are not treated equitably, they are more likely to drop out of school. So too, the acquisition of basic literacy and language skills in primary school is predictive of the timing of first childbirth and sexual health outcomes [30]. There have been a variety of trials of school-based prevention programs addressing school and individual risk factors. Examples outlined in the recent *Lancet* review included conditional cash transfer in very poor communities changing classroom and school ethos and promoting greater emotional competencies in higher-income settings [28].
Community Strategies

The lives of young people are generally deeply embedded in their community and the behaviors, norms and values of adults around them. Religious organizations and local government have important influences on attitudes as well as access to health services. Positive youth engagement, whether through civic engagement, memberships of local organizations or through volunteering, is protective against a range of health and social problems. One recent review identified 30 community-based positive youth development programs, mainly from HICs [31]. Those that improved health promoted positive social connections with either school or adults in the local community, a sense of optimism and confidence in the future, or social and emotional competence. The program content typically engaged adolescents in real community and school participation, strengthened family engagement, communicated clear expectations, empowered young people to take on new challenges and generally lasted for at least 2 years.

Peer Strategies

Interventions with peers often aim to promote positive peer relationships, interpersonal skills and skills to counteract negative peer influences. They have been evaluated in several European nations, South Africa, the US, and Hong Kong. Positive effects have included reduced alcohol and other substance use, delinquency, risky sexual activity, STI, unwanted pregnancy, and academic failure, and increased psychosocial competencies.

Disclosure Statement

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