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Global Trends in Adolescent Fertility, 1990–2012, in Relation to National Wealth, Income Inequalities, and Educational Expenditures

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A B S T R A C T

Purpose: National wealth, income inequalities, and expenditures on education can profoundly influence the health of a nation's women, children, and adolescents. We explored the association of trends in national socioeconomic status (SES) indicators with trends in adolescent birth rates (ABRs), by nation and region.
Methods: An ecologic research design was employed using national-level data from the World Bank on birth rates per 1,000 women aged 15–19 years, national wealth (per capita gross domestic product or GDP), income inequality (Gini index), and expenditures on education as a percentage of GDP (EduExp). Data were available for 142 countries and seven regions for 1990–2012. Multiple linear regression for repeated measures with generalized estimating equations was used to examine independent associations.
Results: ABRs in 2012 varied >200-fold—with the highest rates in Sub-Saharan Africa and lowest rates in the Western Europe/Central Asia region. The median national ABR fell 40% from 72.4/1,000 in 1990 to 43.6/1,000 in 2012. The largest regional declines in ABR occurred in South Asia (70%), Europe/Central Asia (63%), and the Middle East/North Africa (53%)—regions with lower income inequality. In multivariable analyses considering change over time, ABRs were negatively associated with GDP and EduExp and positively associated with greater income inequality.
Conclusions: ABRs have declined globally since 1990. Declines closely followed rising socioeconomic status and were greater where income inequalities were lower in 1990. Reducing poverty and income inequalities and increasing investments in education should be essential components of national policies to prevent adolescent childbearing.

IMPLICATIONS AND CONTRIBUTION

Declines in national adolescent birth rates from 1990 to 2012 were profoundly and independently shaped by national income, income inequalities, and expenditures on education. National strategies to reduce adolescent fertility should include investments in economic development, job creation, and improvement and expansion of schooling—in addition to improving access to contraception.

Adolescent fertility declined dramatically around the globe during the second half of the 20th century, reflecting enhanced educational, occupational, and economic opportunities for young women; rising age at marriage; greater access to modern contraception; and safe abortion [1–3]. While adolescent fertility has

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fallen markedly in high-, middle-, and low-income nations, high adolescent birth rates (generally accompanied by high total fertility) persist in many countries, particularly in Sub-Saharan Africa [4]. By contrast, in Western Europe and other high-income countries, adolescent birth rates are now very low: the European Union region had an adolescent birth rate of only 10.7/1,000 women aged 15–19 years in 2013 [5], although, among high income nations, the United States continues to have among the highest rates of adolescent fertility (27/1,000 in 2013), despite a decline of 51% between 1990 and 2012 (the period of time for this study) [6].

Fertility among adolescents is influenced by a multitude of social, structural, biological, and behavioral factors. These include factors reducing adolescent fertility risk such as educational and employment opportunities, robust economic development, family stability, prosocial cultural norms, contraceptive use, and access to safe abortion. Factors increasing risk of fertility include greater income disparities and earlier age at menarche, at first sex, and at first marriage [7–9]. Importantly, social and structural factors such as socioeconomic status (SES) directly influence behavioral factors such as contraceptive use [10–12]. Comparing research findings from high-income and low- and middle-income countries, factors such as poverty, family instability, and education appear to influence adolescent sexual behaviors in similar ways, despite enormous differences in social context [9,13]. Adolescent childbearing is associated with adverse health and social consequences for the mother and the child; poverty and social deprivation are both causes and consequences of adolescents becoming parents [14].

A key social structural influence on adolescent fertility is SES. SES can be measured at a national level as per capita gross domestic product (GDP); at an individual level, SES is generally measured as family or household income or as parents' educational attainment. National rates of adolescent fertility are associated with national income and parental educational attainment, as well as SES disparities within nations [15,16]. For example, the pattern of higher rates of adolescent fertility in the United States compared with other high income nations has been ascribed to greater SES disparities within the United States [16]. Within the United States, adolescent birth rates in states and smaller areas are strongly associated with per capita income, disparities in income, proportion of families living in poverty, educational attainment among adults aged 25+ years, adult unemployment, social capital, and the proportion of the population who are members of disadvantaged minority groups [17–19]. Similar associations of adolescent birth rates with poverty and income inequality have been found among cities in Brazil, a middle-income country with considerable income inequalities [20]. Given these relationships, poverty reduction within nations, removing regional inequalities and disparities, and promoting economic development of nations could have important impacts in reducing adolescent birth rates and in improving health and social outcomes for women and children.

In this study, we examined the effects of national income (per capita GDP), income inequality within nations (the Gini Index), and national expenditures on education as a percentage of GDP on adolescent birth rates and rates of decline in adolescent fertility among 142 nations over the period 1990–2012. We hypothesized that GDP, Gini, and educational expenditures would be independently associated with national rates of adolescent births and trends in these rates. To our knowledge, this is the most comprehensive examination of income and income inequalities and their relationship to trends in global adolescent fertility.

Methods

Country-level data on adolescent birth rates, GDP, Gini index, and education expenditures were retrieved from the World Bank online Open Data database (http://data.worldbank.org/) [5]. Sources for these data were authoritative national estimates drawn from registration data provided by national statistical offices or regional organizations (e.g., European Union, the Pacific Community) and from international surveillance studies such as the Demographic and Health Survey or the UNICEF Multiple Indicator Cluster Survey. World Bank data on adolescent birth rates come from the United Nations.

In the data set, adolescent birth rates were based on the number of births per 1,000 adolescent women (aged 15–19 years) [5]. Per capita gross domestic product (GDP) in current U.S. dollars was used as the indicator of wealth [5]. The Gini index (range 0–100), the most commonly used measure of national income inequality, was also used for this study [5]. A Gini score of 0 corresponds with perfect equality (where everyone has the same income), and a score of 100 corresponds with perfect inequality (i.e., one person has all the income). Thus, a higher national Gini index score indicates greater income inequality within a nation. The Gini index is as valid as people's reports of income are valid; our data suggest that Gini scores are reliable given strong correlation across years within each nation reporting data. Educational expenditures were calculated as the total government expenditure on education expressed as a percentage of GDP [5].

With the exception of Gini index, data were available for most years in high income countries, but the majority of middle- and low-income countries had incomplete data sets due to lack of data in particular years. Many countries do not report economic data every year. Thus, data were missing for Gini from 70.0% of country-years of observation, EduExp (46.5% of country-years), GDP (3.2%), and adolescent birth rates (0%). Because data for Gini and EduExp for most countries did not change or changed slowly over time, we were able to use nearest neighbor imputation for years where data were missing. Although GDP did change over time, the number of years with missing data was low; thus, we also used nearest neighbor imputation. The most recent data on adolescent birth rates in the majority of countries were from 2013; data on GDP and EduExp were available through 2014, whereas Gini data were only available through 2012. Thus, these analyses were limited to the period 1990–2012. Data were limited to the 142 countries which had available data on ABR, GDP, Gini, and EduExp in at least 1 year. Countries (n = 52) were dropped because of missing data (generally on Gini index); these countries came from all regions of the world and were primarily smaller countries, island nations, and city–states, or countries with weak health systems. Data were also examined by region, using World Bank region designations, including East Asia/the Pacific (n = 14 countries), Europe and Central Asia (n = 42), Latin America and the Caribbean (n = 24), the Middle East and North Africa (n = 10), North America (n = 2), South Asia (n = 8), and Sub-Saharan Africa (n = 42).

Analyses

We examined ABR using data from 2012, first describing the ABR by country and region. Then, the bivariate association between the ABR and each macroeconomic factor in 2012 was tested for all countries. Using scatterplots, the relationships