

# POPULATION BRIEFS

Reports on Population Council Research

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## TRANSITIONS TO ADULTHOOD

### *Ishraq Expands Horizons for Girls in Rural Upper Egypt*

The transition from childhood to adulthood is often considered a time of growth in self-awareness, opportunities, and knowledge about the world. For girls in rural Egypt, however, this growth often does not occur. As girls reach adolescence, their lives become increasingly confined to the home, their opportunities limited to household chores, and their future prospects restricted to early marriage and childbearing. A comprehensive program in rural Upper Egypt, known as Ishraq (meaning “enlightenment”), has succeeded in expanding the horizons of adolescent girls, increasing their self-confidence and general knowledge as well as promoting their civic engagement.

Ishraq is a collaboration between the Population Council, Caritas, CEDPA (the Center for Development and Population Activities), Save the Children, and two Egyptian government agencies, the Ministry of Youth and the National Council for Childhood and Motherhood.

Out-of-school girls are among the most disadvantaged adolescents in rural Egypt. Compared with girls attending school, they are more likely to be engaged in poorly paid farm work, more likely to be married early, and at greater risk for malnutrition, early childbearing, and poor pregnancy outcomes.

“Considering the many problems faced by adolescent girls deprived of schooling, we recommend programs that will teach them the information and skills that will expand their life choices,” says Martha Brady, researcher at the Population Council. “At the same time, we need to foster family and community support for new and expanded roles for girls.”

In 2001, the partner organizations pooled their expertise to design and implement an intervention program to address the unmet needs of out-of-school adolescent girls in rural Upper Egypt. The pilot phase of Ishraq was launched in four rural villages of the Minya governorate in Upper Egypt, one of the country’s poorest regions.

Targeting girls ages 13–15, Ishraq offered a series of interlocking opportunities: literacy

*“We are ready to learn from the challenges of expanding this program.”*

classes, life skills training, community engagement, and sports, as well as a chance to take the government literacy exam and enter or reenter school. Program managers established safe public spaces—usually in youth centers—where girls could engage in independent activities and interact with others. They also worked to change community norms and beliefs about the capacities and roles of girls in society. Girls met four times a week for three-hour sessions in youth centers or schools in groups of about 25 members each. About 50 girls participated in each village and within the first year, as community enthusiasm grew, there were waiting lists of interested girls.

Each activity was led by “promoters,” respected female high school graduates recruited from the local community and trained as teachers and mentors of participating girls. Promoters became the critical links between girls, their families, and the Ishraq managerial team—quelling the fears of hesitant parents on the one hand, and articulating and addressing girls’ cultural concerns on the other.

Ishraq adapted Caritas’s *Learn to Be Free* literacy curriculum and CEDPA’s *New Horizons* life skills program. *Learn to Be Free* relies on active discussion between teachers and girls. This technique develops girls’ ability to articulate their thoughts while increasing their knowledge of Arabic, math, and other topics. The *New Horizons* curriculum teaches life skills such as communication, negotiation, decisionmaking, and critical thinking, and provides information on reproductive health. It also teaches girls about their rights.

The sports component of Ishraq began with locally familiar games to introduce girls to the benefits of sports. As the program progressed, exercises and kicking of soccer balls were added to help girls feel more comfortable with their bodies. Finally, Ishraq collaborated with the International Table Tennis Federation to include table tennis. Relatively easy and inexpensive to organize and play, table tennis has been favorably received by girls and their families.

Population Council researchers used baseline and endline surveys to measure the

*continued on page 7*

## Council Biologist Discovers Stem Leydig Cells

Population Council reproductive biologist Matthew P. Hardy and his colleagues have discovered the precursors of Leydig cells, the primary source of testosterone in males. These precursor cells, known as stem Leydig cells, were isolated from rats. Unlike embryonic stem cells, which are derived from embryos, these stem cells were taken from animals after birth. This promising discovery may lay the groundwork for the future development of novel ways to replace testosterone in men and boys who suffer from male-hormone deficiency.

### Stem cells

Stem cells are undifferentiated cells that can self-renew indefinitely; thus they remain “young” for a lifetime. They can also differentiate into other cell types, replenishing lost cells and repairing damaged tissue. These properties lead many scientists to believe that the study of stem cells may revolutionize disease treatment.

Because stem cells are, by definition, undifferentiated, it is difficult to find them and prove that they are the precursors of other cells. To do this, scientists must find cells that: (1) are self-renewing; (2) can differentiate into the target cell in a Petri dish; and (3) can colonize tissue in a live animal that is devoid of the target cell and transform themselves into that target cell. To narrow the search, Hardy and his colleagues employed their knowledge of protein factors associated with Leydig cells and of the appearance of Leydig cells at various stages of development.

### Leydig cell development

Previously, Leydig cells were known to progress through three stages of development, from progenitor, to immature, and ultimately to fully differentiated adult Leydig cells. Cells at each of these stages exhibit some aspects of differentiated function, distinguishing even the progenitor cells from stem cells. Although the progenitor cells behave somewhat like adult cells, their appearance is distinct. They are

spindle-shaped, whereas adult Leydig cells are large and round.

### Tracking an elusive cell

Hardy and his colleagues examined the testes of newborn rats and isolated cells that were spindle-shaped but, unlike progenitor cells, did not exhibit characteristics associated with adult Leydig cells or testosterone production. The researchers placed these cells in a Petri dish with a protein made in the testis that promotes the division of cells and found that the cells can self-renew for up to six months without differentiating. When the researchers

*The researchers found that the glowing cells had populated the testes.*

exposed these cells to factors known to trigger differentiation, the cells began to secrete testosterone.

Finally, the scientists exposed rats to a chemical that depletes their testes of Leydig cells. They then injected the rats' testes with the presumed stem cells, which had been altered so that they would glow fluorescently. Ten days later, the testes were removed and examined. The researchers found that the glowing cells had populated the testes and had begun to express key proteins and enzymes involved in the synthesis of testosterone. “We examined the testes at ten days because we were concerned that the rats' immune system might begin to reject the cells,” said Hardy. “We found no evidence of rejection, however, and believe that actual testosterone production would have begun if we had waited longer.”

### Possible treatment

Now that these cells have been identified, scientists can study them to understand how they are regulated and learn what factors cause them to differentiate or inhibit them from doing so. In the future, this research may lead to novel treatments of testosterone deficiency. One approach would be stem cell transplants. Theoretically, stem cells could be removed from hypogonadal boys and men, grown in a Petri dish, and then transplanted back into the same people to treat their male-hormone deficiency. Because the cells come from the person they are transplanted back into, there would be no chance of tissue rejection and no need for anti-rejection drugs, as with other types of transplants. Such transplants may provide a treatment for male-hormone deficiency that is superior to current treatments. Currently hypogonadal males receive testosterone shots or use topical gels. Although they replace testosterone, these shots and gels do not exactly mimic the body's rhythms. The treatments are given at specified times, not based on hormonal cues from the body. Transplanted cells would be under the body's regulation and thus could potentially have fewer side effects.

Another treatment for hypogonadal boys and men that could arise from this research would involve inducing existing stem Leydig cells in the testes to differentiate into their adult, active form. Achieving this objective would require a better understanding of the factors that inhibit or activate the differentiation of these stem cells into Leydig cells. ■

### SOURCE

Ge, Ren-Shan, Qiang Dong, Chantal M. Sottas, Vassilios Papadopoulos, Barry R. Zirkin, and Matthew P. Hardy. 2006. “In search of rat stem Leydig cells: Identification, isolation, and lineage-specific development,” *Proceedings of the National Academy of Sciences* 103(8): 2719–2724. ([www.pnas.org/cgi/doi/10.1073/pnas.0507692103](http://www.pnas.org/cgi/doi/10.1073/pnas.0507692103))

### OUTSIDE FUNDING

National Institutes of Health

## Meeting Explores Pricing of Pharmaceutical Products

For decades, patients, doctors, ethicists, and other observers have debated the economics of the pharmaceutical industry. What is the best way to get medications to the people who need them, regardless of their ability to pay for these drugs? Can prices be lowered without jeopardizing basic research for new drugs? Are drug company pricing practices monopolistic? What are the legal and ethical obligations related to drugs developed—partially or fully—with public funds?

The Population Council convened a day-long meeting of an eminent group of academics, scientists, representatives from the non-profit sector, the pharmaceutical industry, foundations, and government donor agencies, as well as practicing lawyers and doctors—all of whom have a connection with pharmaceutical products. The purpose of the Day of Dialogue was to explore ways of getting medicinal products—especially those invented and developed partially or fully using public funding—into the hands of the poor people of the world, wherever they live.

E.M. Scherer—Emeritus Harvard University John F. Kennedy School of Government professor and current lecturer at Princeton's Woodrow Wilson School—spoke about the economics of pharmaceutical research and development and product pricing. Scherer's analysis of profits from pharmaceutical sales and investments in research and development (R&D) showed that when profits increase, so does R&D. This suggests that pharmaceutical companies engage in what economists call "virtuous rent-seeking." However, said Scherer, there is still cause for concern. Most R&D is for diseases prevalent in industrialized countries, not those in developing countries. And, while profits themselves drive R&D, so does the threat that a company will lose profits (via patent expiration, for example).

Arthur Caplan—chair of the University of Pennsylvania's department of medical ethics—explored the question "Can ethics save pharma?" Caplan acknowledged that U.S. government funding is limited and will remain

so for a while. He stated that those who seek innovation in drug availability and pricing will need to look to the pharmaceutical companies. Potential partners of pharmaceutical companies, however, must recognize and find ways to manage the ethical problems of the industry. Moreover, the pharmaceutical industry should rededicate itself to its scientific foundations and commit itself to heeding ethical guidance on how it carries out research, marketing, and sales.

### *Bayh–Dole Act*

One of the key issues that arise in discussions of pharmaceutical pricing is the Bayh–Dole Act, a 1980 law that governs the status of intellectual property resulting from research funded fully or partially by the U.S. government. The law allows universities, businesses, and nonprofit organizations to retain rights to inventions they make or develop with federal funding. In exchange, these organizations are required, among other things, to promote and attempt to commercialize such inventions. Previously, these rights were held by the government. Because organizations did not own the rights to their inventions, they had no incentive to pursue them to commercialization. Government agencies that funded the research often did not pursue the commercialization of the products either. As a result, products based on government-funded research rarely reached the public.

Some observers have argued that the Bayh–Dole Act states that inventions produced with government funding must be made available to the public at a "reasonable price." However, this contention has been publicly refuted by Senators Birch Bayh and Robert Dole, the co-sponsors of the legislation, and by experts in patent law, including Howard Bremer, an expert on the law who spoke at the meeting.

The final segment of the day featured a videotape of Patricia M. Danzon, professor of health care systems and insurance and risk management at the University of Pennsylvania's Wharton School. She presented a proposal for differential drug pricing through confidential

rebates. Discussion of the video was moderated by Ernst R. Berndt, professor of applied economics at the Massachusetts Institute of Technology's Sloan School of Management and the National Bureau of Economic Research. In Danzon's proposed system, manufacturers would sell their products to wholesalers, who would then distribute the drugs at a uniform price worldwide. The manufacturers would negotiate confidential rebates with the final purchasers.

### *Conclusions*

Each of these presentations spurred spirited discussion and debate among the attendees. Participants reached several conclusions during the day's discourse. Among them:

1. Big pharmaceutical companies possess chemical libraries that may include compounds that could be developed into useful drugs; ways should be found for nonprofit research organizations to make use of these resources.
2. Intermittent funding does not enable organizations to pursue drug development; new approaches and mechanisms are needed to ensure consistent funding.
3. The public funding expended before the licensing of a pharmaceutical product is dwarfed by the amounts spent by drug companies to test, obtain approval for, and market these products.
4. A major task is to find appropriate ways for donors to subsidize approved pharmaceutical products for those unable to afford them.
5. License agreements from publicly supported research organizations can include reasonable pricing clauses, tiered royalty rates, and indigent access programs.
6. Getting new products to the dock at a low price in a developing country does not solve the problem. Product introduction, adequate distribution channels, and infrastructure for delivery are also required. Attending to these issues requires time and money. ■

### **SOURCE**

Duclayan, Gina. 2006. "Day of Dialogue on Public Sector Pricing of Pharmaceutical Products," Report of a meeting, New York: Population Council.

## Could Eliminating Malaria Significantly Extend Life Expectancy?

Malaria, a life-threatening parasitic disease, is endemic in about 90 countries of the world, half of which are in Africa. The disease kills more than one million people every year, most of them children. Malaria, like HIV and tuberculosis, is a major public health challenge in the poorest countries of the world. Despite this fact, little systematic attention has been directed to researching the demographic impact of malaria in Africa. Recently, Ayaga A. Bawah, a Population Council Berelson Postdoctoral Fellow, and his colleague Fred N. Binka, executive director of the INDEPTH-Network in Ghana, investigated how many years of life could be saved if malaria were eliminated from a hyperendemic area of northern Ghana.

### What is malaria?

The parasite that causes malaria is transmitted from person to person by the bite of a female *Anopheles* mosquito. Malaria produces fever, headache, vomiting, and other flu-like symptoms. If drugs are not available for treatment or if the parasite develops resistance to them, the infection can progress rapidly and become life-threatening. The malaria parasite kills by destroying red blood cells and by obstructing the capillaries that carry blood to the brain or other vital organs. Malarial infections have been eliminated in some locales through programs of spraying pesticides, by using insect repellents on the body and bed-nets impregnated with insecticide, and by promptly treating all infections. There is currently no preventive vaccine against malaria.

Using classic demographic methodology, Bawah and Binka analyzed data that had been collected in the Navrongo Demographic Surveillance System (NDSS). Researchers working on this database record information on nearly all births, deaths, migrations, marriages, and pregnancies in the Kassena-Nankana District of northern Ghana. They conduct “verbal autopsies” on all recorded deaths to ascertain

the probable cause of death. Verbal autopsies involve interviews with relatives and caregivers who were closely involved with the deceased during and up to the time of death. Verbal autopsies are used in settings where the majority of deaths occur outside of health facilities and where official records of the cause of death do not exist.

Bawah and Binka used 1995 data, which at the time of their analysis represented the only complete data set on causes of death. They looked only at the rural population, because data on the urban population were not inte-

*“If malaria had been eliminated, life expectancy could have increased by as much as 6 years.”*

grated into the NDSS until the end of 1995. The data set comprised a total population of 126,000 with about 2,000 deaths.

Their verbal autopsies revealed that nearly a third of all childhood deaths and about a fifth of adult deaths are attributable to malaria in this setting. The researchers analyzed the data using both single- and multiple-decrement life tables, showing the probability of surviving to each age with and without malaria. This analytic technique allowed them to determine the extent to which mortality could be reduced and life expectancy increased if malaria were eliminated from the population. They also established which age groups would benefit the most from a decline in mortality from malaria.

In the first stage of the analysis, they separated out malaria from all other causes of

death, including deaths for which the cause could not be established from the verbal autopsy accounts. They then estimated the impact of deaths from malaria on overall mortality. In the second stage of the analysis, they assumed that the deaths from unknown causes actually were caused by ailments similar to those for which the cause is known. Thus, they proportionately distributed the unknown cases among the known causes and reran the analysis.

The data showed that life expectancy at birth in 1995 was 48.8 years. The first stage of the analysis—in which unknown causes of death were assumed to be unrelated to known causes—showed that if malaria were eliminated, life expectancy at birth would increase to 54.9 years.

“As of 1995, if malaria had been eliminated, life expectancy could have increased by as much as 6 years,” explains Bawah. “That is a huge increase from eliminating a single cause of death. Since mortality from malaria is greatest in childhood, the biggest contribution to the potential increase in life expectancy at birth is likely to come from eliminating deaths among infants and children younger than five years.”

Moreover, the second stage of the analysis—in which the deaths from unknown causes were proportionately distributed among known causes of death—showed that life expectancy at birth would increase to 58.2 years if malaria were eliminated, representing an estimated probable gain of 9.4 years.

The researchers conclude, “Our analysis suggests that the malaria epidemic represents one of the major challenges facing Africa medically, socially, and economically. Our results attest to the need for a concerted effort to build scientific understanding of this preventable yet deadly disease.” ■

### SOURCE

Bawah, Ayaga A. and Fred N. Binka. 2005. “How many years of life could be saved if malaria were eliminated from a hyperendemic area of northern Ghana?” *Policy Research Division Working Paper no. 203*. New York: Population Council.

## Poverty and School Dropout in Pakistan

What elements of schooling and home environments in rural Pakistan have the greatest influence on whether girls and boys start and remain in school? Is there a link between investments in children's schooling and a mother's reproductive behavior? Recent Population Council research provides unique longitudinal data that give insights into these questions. The analysis is based on two waves of panel data, collected in rural Punjab and North West Frontier Province in December 1997 and January 2004. A noteworthy feature of the study is the availability of data on the arrival of "unwanted" births between the two surveys—a shock to the household whose effects have rarely been investigated.

The sample of communities was chosen to cover the range of schooling conditions prevalent in North West Frontier Province and Punjab. Twelve rural communities were selected from six districts, three from each province. The original participants were 731 married women aged 20–45 and their husbands. In the second round of data gathering, 81 percent of women were re-interviewed. Participants were asked in detail about the schooling of all their children and their household living circumstances. In addition to household data, researchers collected information on the primary schools attended by the children in the sample and on key features of each of the communities.

Over the course of six years, many of the sample communities experienced substantial improvements in schooling opportunities, community infrastructure, and the availability of basic health services and facilities. Only three communities showed no change in their infrastructure while a decline was witnessed in two. In addition to public health investment in sewerage, many communities had also established additional health facilities.

The researchers found that more girls are enrolling in school and more boys and girls are remaining in school for more years. However, communities with fewer new schools and lower levels of community development have largely preserved the gender disparities in enrollment

and schooling attainment observed in 1997. In contrast, districts with higher levels of development and more new schools show little difference between the enrollment rates of girls and boys.

### *Economic shocks*

Having experienced the birth of an "unwanted" sibling in the years between the two surveys (based on the mother's expressed desire in 1997 for no more children) and having lived in a household that experienced a sudden loss

*"A girl is expected to help out at home when there are extra domestic duties to perform."*

in remittances in that time were two factors that increased the likelihood of school dropout.

For girls, the arrival in the family of an unwanted birth and enrollment in a government primary school—widely viewed as being of lower quality than private schools—significantly increased the likelihood of dropout. In contrast, the availability of postprimary schooling in the community, having a mother who had been to school, and living in a household with higher consumption levels reduced the probability of dropout.

For boys, a loss of remittances in the household significantly increased the likelihood of dropping out. Conversely, school quality—as measured by the percent of teachers in the primary school who reside in the community (which reduces teacher absenteeism)—and living in a more-developed community significantly reduced the probability of dropping out.

"Here we can see a clear division of labor between boys and girls," explains Cynthia B. Lloyd of the Population Council, a lead

researcher on the study. "Whereas boys are expected to contribute to cash income when a family experiences economic difficulty, a girl is expected to help out at home when there are extra domestic duties to perform."

The researchers also investigated other links between children's schooling and the reproductive behavior of their mothers. "Our initial analysis indicates a strong positive association between enrollment of girls, particularly older girls, and contraceptive prevalence rates among their mothers. No such association was seen with boys' enrollment," said Zeba A. Sathar, director of the Population Council's Pakistan office and a lead researcher on this study.

### *Policy recommendations*

The researchers conclude that better access to and improved quality of care in the delivery of family planning services to the rural poor could reduce unwanted births and have a major impact on grade progression rates, particularly for girls. Increased government investment in community development and new schools likely will pay dividends in the form of increased and more equitable schooling for girls and boys. Additionally, improving the quality of public schools and increasing their accountability to parents and the community might improve retention. Increasing the number of private schools in the absence of other changes is unlikely to be sufficient to achieve universal primary enrollment, the researchers conclude. ■

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The Spencer Foundation and the United Kingdom Department for International Development

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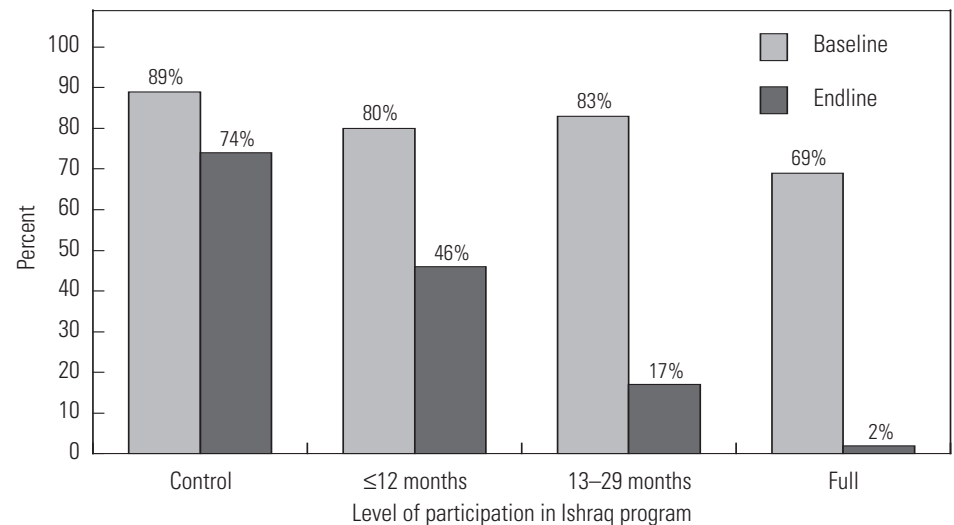
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# Transitions to Adulthood

*continued from page 1*

## Percent of girls who intend to circumcise daughters



impact of the program by comparing changes in knowledge, attitudes, and behavior among adolescent girls. The surveys were conducted before and after the intervention in the four program areas and in two other villages where no program activities took place, and which served as experimental controls.

Ninety-two percent of Ishraq participants who took the government literacy exam passed. Sixty-six percent of girls who completed the program have entered the formal school system, compared with 4 percent of girls who did not complete the program. (In the second round of Ishraq, the entry age will be lowered to 11 years, increasing the possibility that a higher proportion of girls who pass the exam will be young enough to enter secondary school.) Girls who participated fully in Ishraq were significantly less likely than other girls to say they intend to subject their future daughters to female genital cutting, a common traditional practice in Egypt (see graph).

The program made great strides in fostering civic engagement. The Ishraq team worked with government officials to issue the Ishraq girls public identification cards. Additionally, the success of the program led villages to designate times for youth centers to be "girls-only," allowing graduates of the program to continue to meet and learn. Ishraq

graduates and promoters have gone on to participate in and lead a number of community development activities.

Ishraq is moving from the innovative pilot phase described here to a larger program with the potential to change the lives of thousands of girls throughout Upper Egypt. Several new villages in Minya and Beni Suef have been selected to participate in the Ishraq program. Expanding the program, however, is unlikely to follow the typical path of scaling up. "We are ready to learn from the challenges of expanding this program, which is designed to serve poor, unschooled adolescent girls who have few advocates in seats of power and few opportunities to articulate demands on their own behalf," says Ragui Assaad, the Population Council's regional director for West Asia and North Africa. ■

## SOURCE

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 **Population Council**

One Dag Hammarskjöld Plaza, New York, NY 10017

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*Writer/Editor:* Gina Duclayan

*Editorial Board:* Cynthia B. Lloyd, Melissa May, Irving Sivin, C. Johannes van Dam

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*Circulation:* Debra Warn

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## IN THIS ISSUE

### BIOMEDICINE

The discovery of stem Leydig cells may lay the groundwork for the development of novel ways to replace testosterone in men and boys who suffer from male-hormone deficiency.

*See page 2*

### DRUG DEVELOPMENT

The public funding expended before the licensing of a pharmaceutical product is dwarfed by the amounts spent by drug companies to test, obtain approval for, and market these products.

*See page 3*

### PUBLIC HEALTH

“Our analysis suggests that the malaria epidemic represents one of the major challenges facing Africa medically, socially, and economically.”

*See page 4*

### SCHOOLING

“Our initial analysis indicates a strong positive association between enrollment of girls, particularly older girls, and contraceptive prevalence rates among their mothers.”

*See page 5*