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LESS WORK FOR NANNY

Fertility and Destiny

CURRENT LOW BIRTHRATES among highly educated women pose a challenge to the U.S. economy and may compound existing social problems, says David Ellwood, Black professor of political economy and dean of the Kennedy School of Government. As a result, the United States faces an imminent shortage of well-educated workers aged 25 to 54. That may mean lower productivity growth, less competitive U.S. companies, and even greater inequality between America's rich and poor. Speaking at a Kennedy School domestic-policy forum last summer, Ellwood said that the personal choices we make about family life—namely, when to marry and when or whether to have children—are reshaping the contours of American society. “Demography,” he declared, “is destiny.”

Faced with the prospect of juggling a career and parenting children, high-skill women are delaying motherhood or skipping it altogether. In fact, among 40-year-old college-educated women, 27 percent have not yet had a child—and many of them never will. Furthermore, those 40-year-olds who *have* given birth are averaging 1.6 children apiece, far below the 2.1 children needed for “replacement,” the rate that would keep the population constant, Ellwood says. Contrast this with women who never finish high school, who produce an average of 2.6 children. Though that number has declined in recent years, “it’s still well above replacement,” he notes.

Well-educated women find plenty of incentive to put off parenting as long as possible, avoiding what Ellwood calls the “motherhood penalty.” In recent research

with Lily Batchelder, M.P.P. '99, and Ty Wilde, a graduate student at Princeton, Ellwood studied fertility patterns and work skills, using data from the National Longitudinal Survey of Youth. This study, begun in 1979 when the subjects were 14 to 21 years old, has gathered data on them at regular intervals. By tracking women's wages over time, the researchers found that college-educated women see their wages level off sharply after childbirth, causing them to lose 15 to 20 percent in income during the subsequent 10 years. Their paper, thus far unpublished, indicates that “in some of our models [the percentage is] even higher,” Ellwood says.

No matter when a high-skill woman has a child, her wages appear to stop their upward trajectory at that point. “Women who had babies earlier saw their wages flatten earlier, and women who had their babies later saw their wages flatten out later,” Ellwood says. The researchers checked out the con-



verse hypothesis: did women who found themselves on a wage plateau decide to leave the workforce to have children? “In fact, the paper concludes pretty decisively that that’s not what’s driving things,” he says.

When Ellwood describes his findings to women, few are surprised. “I think they feel some real sense of frustration and resentment that so much of the burden of raising children ends up falling on women in terms of career costs and other things,” Ellwood says. That burden feels especially disproportionate in that the birth of a first child appears to have little if any effect on fathers' wages.

The story is different for low-skill women, who are less likely to suffer wage declines after they give birth because they aren't making much money to begin with. For them, there are fewer benefits to delaying motherhood.

Babies born to low-skill women often grow up in single-parent families as some of the poorest, most disadvantaged children in the nation's history, Ellwood says. In contrast, college-educated women tend to marry before they have children, and their kids, born in financially comfortable two-parent families, are “among the

most advantaged children that the nation has ever seen.”

Rich and poor, Ellwood notes, these children are the workforce of our future—and he believes this demographic gap will likely have severe economic consequences. With so few children being

Birth Patterns of Women by Level of Education

Women born in 1960-1964

Level of education	Percent with first birth by age 25	Percent with first birth by age 30	Percent with first birth by age 40*	Average number of children born by age 40*
Dropouts	78	83	86	2.6
HS grads	64	79	84	2.0
Some college	49	70	81	1.9
College grads	20	50	73	1.6

Source: Ellwood and Jencks (forthcoming) based on June Current Population Survey data.
 *Estimated based on partial data because entire cohort had not reached 40 by the most recent survey (2000)

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born into homes that offer the advantages of education and steady income, where will tomorrow's high-skill workers come from? "If this economy is going to grow in terms of workers, if productivity is to increase," he says, "we'll have to look to older workers and immigrants."

It is essential, he stresses, for policy-

makers to consider solutions now. "If we don't take seriously a much more thoughtful immigration policy, if we don't ask what we can do to make work pay for low-skill people—so that they, too, might have a chance to postpone childbearing and form families—if we don't think about what it's going to take

to make the family tradeoff less costly for high-skill women," Ellwood says, then "the consequences will affect everything, perhaps even our sense of unity and community." ~ERIN O'DONNELL

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SOUNDS LIKE A GOOD HAIR DAY

Cilia in C-Major

IN THE HUMAN EAR, it takes only a few millionths of a second from the time a sound wave vibrates the receiving "hair cells" to the time the cells generate a neural response. The equivalent process in the human eye, from photon absorption to cellular response, takes a thousand times longer. Hearing "is fast because it's simple," says professor of neurobiology David P. Corey of Harvard Medical School.

Well, yes and no. On a basic level, it's easy to explain how we hear: sound waves, traveling through the air, vibrate the eardrum at certain frequencies and magnitudes, which the brain interprets to identify the sound's pitch and volume. Betwixt vibration and human perception, though, lie several intermediate steps. Hair cells in the inner ear convert sound waves—a form of mechanical energy—into electrical signals. In the brain, those messages make several transformations between electrical and chemical signals and back again, bouncing from neuron to neuron until they reach a final resting point where we per-

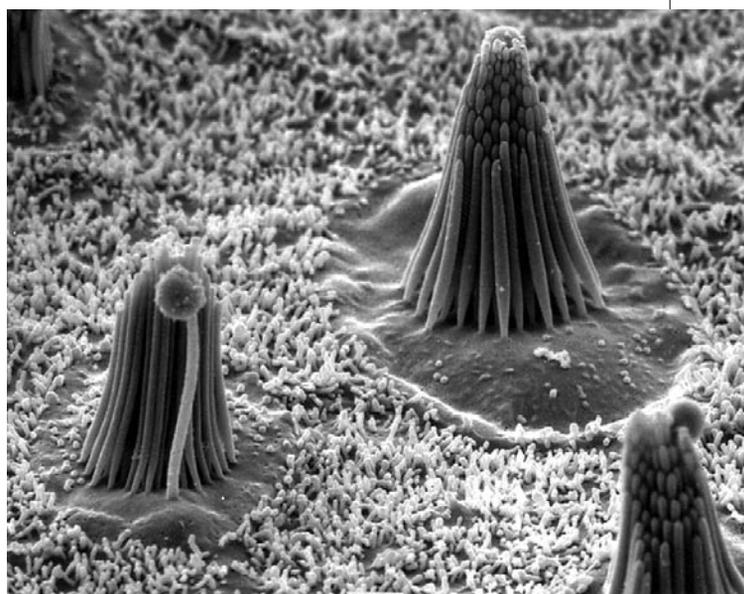
ceive them as sound.

It was 30 years ago when Corey, as a graduate student at the California Institute of Technology, began applying his undergraduate background in physics—and his childhood drive to take things apart and figure out how they work—to the mystery of hearing. In a recent article in *Nature*, he and his colleagues describe a protein they believe adds a crucial piece to this intricate puzzle.

Scientists have long known that the eardrum vibrates and transmits the vibration to the inner-ear bones, touching off a mechanical process in the cochlea, the snail-shaped organ containing hair cells with bristly cilia that vibrate back and forth in response to sound waves—the greater the cilia vibration, the louder the sound. (A video clip on this magazine's website, www.harvardmagazine.com/av/hearing.html,

shows these cilia vibrating in response to a piece of music.) Different areas along the cochlea's length correspond to different sound frequencies: the brain determines pitch according to the location of

Then: An 1884 German lithograph depicts structures of the inner ear.

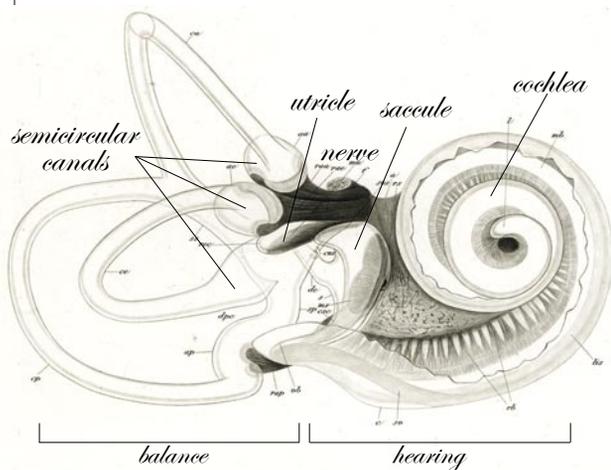


Now: Three hair cells from the inner ear, greatly magnified. These cells are from the balance, rather than hearing, part of the inner ear, but the differences are minor.

the hair cells activated. Timbre derives from pitch, and reflects a sound's characteristic profile of harmonics or overtones: a flute's sweet sound signals its pure fundamental pitch, while the violin's more raspy notes include many harmonics.

When a sound wave enters the inner ear, cilia all along the cochlea's length vibrate. So how do hair cells detect the vibration of their cilia? In the 1970s, Corey and his graduate adviser at Caltech, A. James Hudspeth, found that moving the cilia directly opens pores called ion channels at the tips of the cilia. Electrically charged potassium ions enter the hair cells through open ion channels and change the cells' voltage.

Then, in 1984, British neurobiologist James Pickles discovered "tip links," microscopic connectors that stretch between the tips of cilia. When sound



Photograph and medical illustration courtesy of David Corey