

Janet Currie began her career as a labor economist, with important work on game and bargaining theory, arbitration and negotiation strategy, and wage and employment determination. Today, as director of Princeton University's Center for Health and Wellbeing, she explores the frontiers of genetic expression during fetal development, the impact of incentives on provision of health care and the effectiveness of the U.S. social safety net. Further, as director of the National Bureau of Economic Research's Program on Children, she encourages cutting-edge research on pollution from cook stoves in India, the impact of drought on education and the distributional effects of Head Start.

The core element of all of this work—the bridge that connects what seem quite disparate fields of economic research—is human capital. It's the idea—once controversial, but now undisputed—that humans possess skills, knowledge and abilities of enormous economic value. Some human capital is innate, but much is acquired through education, training and experience, as well as investment in physical and mental health. Understanding human capital, its many sources and the economic outcomes associated with its enhancement or degradation form a path that Currie has pursued for decades.

Currie is known for her keen insight, innovative technique and unwavering dedication to solid research. "The thing that characterizes Janet and her work is her fierce determination to get to the bottom of social problems—particularly those concerning children," observed economist David Card, a colleague and mentor. "She takes on Head Start, Medicaid or child nutrition, and works on it tirelessly over 15 years or more, using different data and methods to really understand what's going on."

Currie herself has no trouble explaining the coherence of her research agenda. "Labor economists think a lot about human capital and investments in it. Traditionally, that's something to do with education," she notes. "But I'm interested in health as human capital as well, and understanding how health and education intersect." And Currie is finding that interactions are complex and cross-generational. Maternal health affects child educational outcomes; education, in turn, influences parental and child health; and both have tremendous economic consequences. "It is a broad concept, human capital," she observes. "Not all these different boxes, but an integrated whole."

# Janet Currie



Photographs by Peter Tenzer



## FINANCIAL INCENTIVES AND MEDICAL PRACTICE

**Region:** I'd like to start with a few questions regarding your research on incentives and health care. Your 2008 *Quarterly Journal of Economics* study of tort reform and birth outcomes with your husband, Bentley MacLeod, and your 2011 paper together that broadened this "joint and several liability" research beyond childbirth procedures suggested that economic incentives play a crucial role in both the U.S. tort system and medical practice.

Could you tell us more about this work on the complex and sometimes conflicting financial incentives in health care and how it might relate (if at all) to your June 2012 NBER paper on physician-induced antibiotic use in China ...

**Currie:** Yes, it's all very closely related, actually ...

**Region:** And for that matter, perhaps also to your much earlier *American Economic Review* paper with Jonathan Gruber and Michael Fischer on physician payments, which found that increasing Medicaid/private fee ratios significantly decreased infant mortality rates.

Would you tell us more about this body of work?

**Currie:** Sure. Physician incentives are extremely important for the health care system, and everyone—or at least all health economists—thinks that financial incentives can distort people's decisions. But it's very hard to pin that down. There's a lot of literature on things like small area variations in use of medical care saying that utilization rates are much lower in Minnesota than they are in Florida, for instance, but people don't live longer in Florida, even though they get extra care.

**Region:** The Dartmouth research [online at [dartmouthatlas.org/](http://dartmouthatlas.org/)].

**Currie:** Yes. It's argued that these variations show there's waste or inappropriate utilization, but that's not a very direct way to go at it. The *QJE* piece on C-sections was looking at a specific argument about why doctors might be doing too much, which is that they're afraid of legal liability. It's very common for people to say doctors do too much because they're afraid of being sued if they don't. But there's a really obvious alternative hypothesis, which is that doctors do too much because the more they do, the more they get paid.

**Region:** Sure. Incentives work.

**Currie:** Yet no one ever says that, so in our paper, we look at how people respond to changes in the liability environment. One of the things we realized while we were doing it is that for something like childbirth, the doctor often doesn't really face any financial liability because if you have jurisdiction with Joint and Several Liability (JSL), people are going to go for the deep pocket. The deep pocket is not the doctor; the deep pocket is the hospital.

If you actually go and read these cases, sometimes they seem very strange. You have a C-section; something goes terribly wrong. And instead of talking about what went wrong in the surgery, they're spending all of their time saying, "Well, the nurse should have done this or that." The reason for that is that the nurse is an employee of the hospital, while the doctor is an independent contractor. So if you want to nail the hospital, the deep pocket, you have to show that the nurse was negligent.

The upshot of our study is that different types of tort reforms have quite different effects. We found that if you put caps on damages, you actually got more C-sections, not less. People found that counterintuitive because their belief was the reason the doctors are doing C-sections is to avoid liability.

**Region:** The conventional wisdom, right?

**Currie:** Yes, but on the other hand, if you're doing too many C-sections and

causing surgical complications, then putting caps on damages makes you do more and not fewer.

JSL reforms, which had been largely neglected, are interesting from an economic standpoint because they get you away from this deep pockets regime to one where you're going to sue the hospital *and* the doctor. So it increases the doctor's legal liability if they do something wrong.

**Region:** So the new JSL regime apportioned liability among concerned parties, not simply to the deepest pocket.

**Currie:** That's right. And it reduced C-sections. So our results point to the idea that the reason we have so many C-sections is that doctors make twice as much money doing them, which is the same thing we had found in an earlier study of Medicaid fees where we were looking at the differential [in payment] between doing a C-section or doing a normal delivery. When that differential increased, the rate of C-sections went up for the Medicaid people. So it's consistent with that.

In the more recent paper about JSL, we were trying to look more broadly at what happened to accident rates. We're looking at accidental deaths, and most accidental deaths are actually among the elderly. Many of them are trip-and-fall cases: Somebody leaves something lying around or doesn't fix the handrail, and an elderly person falls and dies. And again, we found that going away from the common law regime that encouraged going after deep pockets to a legal regime where everybody is responsible for the damage that they cause reduced accident rates.

**Region:** So there, too, the economic incentives mattered. And then there's the Chinese study—a totally different culture, a very different health care system.

**Currie:** Well, yes, but economists think that people are the same everywhere, right? In some fundamental sense.

In China, you don't go to the doctor, you go to the hospital. Everybody's treated on an outpatient basis. Also in China, hospitals are financed largely from drug sales. There's a very strong incentive to sell people drugs. Our study was an experimental audit where we sent people complaining of vague symptoms suggestive of mild colds or flu to clinics and then kept track of what medicines they were prescribed.

The results were really kind of hair-raising in the sense that none of the people we sent in should have gotten antibiotics, but I think 60 percent of them got antibiotic prescriptions. Most of them got more than one antibiotic prescription, and many of them were getting very sophisticated, expensive antibiotics that you're not supposed to use for trivial infections because they're supposed to be saved for more dangerous sorts of infections.

**Region:** And you had three or four varia-

tions in that study, with, for instance, patients offering gifts to the doctor or clearly stating that the doctor's recommendation would not influence what they would actually do.

**Currie:** Yes, in our initial study, our people [the "patients"] just presented with these symptoms, and the experimental treatment was that they would say, "I saw on the Internet that you shouldn't give antibiotics for a cough or cold." That simple intervention reduced antibiotic prescriptions by 20 percent. But other researchers said to us, "Well, that doesn't really establish why the doctors are prescribing the drugs. Maybe they're prescribing the drugs because they think that's what the patients want."

We wanted to get at *that* mechanism, and so in our second experiment, we had a number of different treatments. The results of the gift treatment were

very striking. The person comes in and gives this really trivial gift. We have a picture of it. It's this funny pen with a little "Hello Kitty" or something on it. The "patient" also makes a little speech about how much they respect doctors, which perhaps is the real gift involved. In this experiment, the doctors who receive the pen are less likely to prescribe antibiotics, and they also spend a longer time with the patient and generally are more attentive. They do respond to that small gift. And so, we thought, that shows that the doctor doesn't think that the antibiotics are what the patient wants because if it was, then they would be responding to the gift by doing more of what the patient wants instead of less.

**Region:** It makes one think about the impact of far more significant gifts from the manufacturers, often through pharmaceutical reps.



It's very common for people to say doctors do too much because they're afraid of being sued if they don't. But there's a really obvious alternative hypothesis, which is that doctors do too much because the more they do, the more they get paid. ... Our results point to the idea that the reason we have so many C-sections is that doctors make twice as much money doing them, which is the same thing we had found in an earlier study of Medicaid fees.

**Currie:** Oh, yes, there's a huge literature on that. It's very interesting. If you Google "pen and pharmaceuticals" or "pen and doctor," you come up with all of this literature where people are arguing about whether physicians can be influenced by a trivial gift like a pen, which pharmaceutical companies give out all the time, along with little memo pads or things like that.

**Region:** Let alone funding medical conferences and the like.

**Currie:** That's right; everybody realizes that, yes, conference funding could influence people, and so that's bad. But there are lots of people who've written in very respected publications saying, "It's ridiculous to think that doctors' behavior could be influenced by these trivial things." I suppose the same people would say, "Oh, you can't learn anything from a study about these Chinese doctors because they're poor, or maybe a pen means more to them," or something. I don't think so. I think it's just human nature to want to reciprocate.

## HEALTH INSURANCE AND HEALTH CARE

**Region:** With several colleagues, over a number of years, you've examined the impact of public health insurance, such as Medicaid, especially in the context of managed care, and the effect of expanding public health insurance on health care utilization and health status. You've also looked at the interaction between private and public provision of health care.

Two studies in particular caught my eye—your 2011 work with Douglas Almond and Emilia Simeonova of the expiration of Hill-Burton requirements in Florida and your 2007 piece with Anna Aizer and Enrico Moretti on Medicaid managed care in California.

What does this research, those two and the others you've done, tell us about the incentives, market structures and public institutions that are most conducive to provision of quality health care at a reasonable cost?

**Currie:** Yes, that's a good question. I think both of those papers show that providers are incredibly responsive to incen-

tives and that they typically find the least costly way to deal with mandates. Maybe they also say something about unintended consequences of laws. The Hill-Burton study looked at this old law ...

**Region:** Enacted in 1946.

**Currie:** Yes, but it went on for some period of time, and hospitals that got money under Hill-Burton were required for 20 years to devote 3 percent of their revenues to indigent care. We show in our study that the hospitals did do that: They were spending 3 percent of their revenues on indigent care. But the other thing—and this is consistent with some work that Mark Duggan did in California—was that we looked at who they choose to serve [Duggan, Mark. 2000. "Hospital Ownership and Public Medical Spending." *Quarterly Journal of Economics* 115 (November): 1343-74].

The hospitals seemed to have looked around and said, "OK, what class of patients are the best people to serve, given that we have to serve a bunch of indigent people?" And they picked pregnant women. Most pregnant women are

Providers are incredibly responsive to incentives, and they typically find the least costly way to deal with mandates. ... Hospitals that got money under Hill-Burton were required for 20 years to devote 3 percent of their revenues to indigent care. ... The most striking thing is how rapidly the hospitals responded and how much they can change their service mix to try and attract the type of patients that are profitable.





healthy. They typically have a short stay, so you don't have this huge right tail of expenses.

But they don't look around and say, "Oh, let's get elderly diabetics," right, who might have a huge right tail, or kidney dialysis people. So we were looking at what happened when these mandates expired. Many hospitals just closed their maternity units. They were like, "OK, we can get out of that business." In our data, we were able to follow the same women over time, and we saw women being shifted from one hospital to another either because the maternity service closed or because the hospital would no longer take Medicaid.

I think that's the most striking thing, is how rapidly the hospitals responded and how much they can change their service mix to try and attract the type of patients that are profitable. Also, it doesn't really make very much difference whether they're private hospitals or public hospitals or for profit or not.

**Region:** Yes, that surprised me a bit. You might expect different reactions from private versus public providers. And your 2007 study?

**Currie:** On Medicaid managed care. The whole argument about managed care is that if you have a patient and you have a capitated payment for that patient, then you should want to be providing preventive care to them so that you minimize your costs down the road.

I think the problem with that argument from the point of view of Medicaid is that there's so much churning of patients on and off Medicaid that the company looks at you and instead of saying, "I should provide you good preventive care," they say, "There's a good chance you'll be gone in a couple years and not my problem, so I want to give you as little as possible."

Added to that, in this particular case, was the fact that in California, they had carve-outs out of the managed care contracts. Carve-outs are things that don't

have to be covered by the capitated payment. It turned out they had a carve-out for neonatal intensive care, which sounds fair on the face of it because neonatal intensive care is very expensive, and so maybe it is unfair to the plan to expect it to be covered by the one capitated payment if they happen to get a very sick infant. But that meant that Medicaid managed care plans had zero incentive to try to prevent very sick infants because if the infant was sick, the cost of care would go back to the state program.

### IMPACT OF THE AFFORDABLE CARE ACT

**Region:** In this context, it was roughly a month ago that the Supreme Court issued its ruling on the Affordable Care Act. Given this ruling, what is your sense of the impact of the reform bill on health care in the United States, specifically child health?

Will this part of the "invisible safety net," as your book calls it, become more secure than it now is? Or does the decision's limit on federal powers over Medicaid expansion by states *mute* that effectiveness?

**Currie:** There are a bunch of different issues with respect to children. The original legislation focused on extending Medicaid to low-income, able-bodied adults. That mostly didn't affect children because poor children are already covered up to age 19, and in a lot of states, the children are covered up to 200 percent or even 300 percent of the poverty level. There might have been an indirect effect on children through the workings of the whole system in that if hospitals ended up being more stable or being more able to offer indigent care or something like that, then perhaps there would have been a spillover onto children.

The Supreme Court ruling could have several potential effects on children. One is that if states choose not to participate in the Medicaid expansion for adults, then hospitals are in big trouble. In the

A number of states seem to be interpreting the ruling as saying that the federal government can't boss them around when it comes to Medicaid and they can change the provisions of the program however they like. ... That would be really bad for kids. So the really scary part about the Supreme Court ruling is that it could have the effect of undoing a lot of the Medicaid expansions for infants and children that happened from the '80s basically through the middle of the '90s.

negotiations over this bill, hospitals agreed to give back money to Medicare on the understanding that there were going to be many more people who had health insurance, including Medicaid, so that the burden of providing indigent care would be reduced. Hospitals anticipated that they would do at least as well or better under the ACA than they had been doing before.

Now, with the ruling, in a big state like Texas, for example, if the hospitals are getting less for Medicare and they don't get the people coming in with health insurance, then they're in big trouble. Hospitals may have been not very profitable for a long time, so reducing their revenues further could have negative effects on the provision of indigent care or care to existing Medicaid patients, including children. So that's one way.

But then a more direct threat, I would say, to children is that a number of states seem to be interpreting the ruling as saying that the federal government can't boss them around when it comes to Medicaid and they can change the provisions of the program however they like. Maine has already thrown many thou-

sands of 19-year-olds off their Medicaid program. There was also a headline to-day saying that 14 states were restricting the services covered under the Medicaid program.

States have many things they have to cover, and then there are a bunch of things that are optional. States have always had the right to cut back on the optional things. But it may be that they're taking this Supreme Court ruling to mean that they can challenge the federal government's ability to mandate what must be covered. And if that's true, then you could have essentially a rollback in many states of the Medicaid coverage that children have. That would be really bad for kids. So the really scary part about the Supreme Court ruling is that it could have the effect of undoing a lot of the Medicaid expansions for infants and children that happened from the '80s basically through the middle of the '90s.

And my research suggests that would be really bad.

## LABOR MARKETS IN U.S. HEALTH CARE

**Region:** I'd like to ask about your paper on hospital staffing and market structure in California, *Cut to the Bone*? Very intriguing work. Could you summarize that study briefly and tell us what bearing it might have for the future of labor markets in the U.S. health care industry?

**Currie:** We were looking at the big hospital chains. One of the things that have been going on in the hospital market is that big chains like Tenet or HCA have been taking over hospitals. We wanted to see how they reorganized the hospitals when they took them over. What we found was that they tended to change the way that the hospital was staffed.

Although there is a large literature arguing that there is monopsony in the market for nurses, we did not see any effect on nurse wages or employment levels when a hospital was taken over by a chain. But nurses were expected to work

Although there is a large literature arguing that there is monopsony in the market for nurses, we did not see any effect on nurse wages or employment levels when a hospital was taken over by a chain. But nurses were expected to work harder after the takeovers, in that they ended up with more patients per nurse. ... The quality of the nurse labor force may fall over time if wages stay constant while the effort that is demanded rises.

harder after the takeovers, in that they ended up with more patients per nurse. We couldn't, in that paper, show that there were direct effects on health, but it seems likely that there might be because many of the things that go wrong in hospitals have to do not really so much with doctors, but with the quality of the nursing care that people get.

**Region:** Do you have any sense of what impact, therefore, current consolidation trends in the United States might have on labor markets in health care? Of course, there's huge demand for nurses now, and there are many nursing strikes.

**Currie:** There is a high demand for nurses, but the quality of the nurse labor force may fall over time if wages stay constant while the effort that is demanded rises. Also, a lot of schools that used to train RNs in four-year programs no longer do that; the nurses are being trained in community colleges with two-year degrees. So you're getting a different sort of person doing it.

**Region:** Less human capital.

**Currie:** Exactly.

## WOMEN IN ECONOMICS

**Region:** As you well know, women are underrepresented in economics, from undergraduate to professional levels. This is a broad question, but what are the impediments, trends and possible means of addressing this inequality?

Your research on mentoring is of particular interest here, of course. Your findings on the CeMENT program established by the American Economic Association's Committee on the Status of Women in the Economics Profession (CSWEP) suggested that mentoring could indeed have an impact on professional development.

Have you or others been able to follow up on the results reported in 2010, which I believe covered CeMENT participants from 2004 to 2008, with a look at how those and the January 2010 cohort have fared?

**Currie:** One of the main impediments to women in economics is the same impediment for women in STEM [science, technology, engineering and mathematics] fields generally, and that is an underrepresentation in math historically. Now perhaps that's going to go away. I understand that for girls in high schools, test scores are now exceeding boys' test scores in math as well as in reading, whereas before it used to be the reverse.

So women have been catching up. But when they go to college, they still tend not to go into STEM fields and not to take mathematics. These days, if you don't have any math background, it's virtually hopeless to try to do an economics Ph.D. program. You can't even get off the starting block. I think that's one issue.

Another issue is the whole work/family thing. The problem there is more societal than it is with academic employers. There are problems with academic employers, and people think that universities could do more, but by and large, a university is an incredibly flexible workplace compared to most other



One of the main impediments to women in economics ... is an underrepresentation in math historically. ... Women have been catching up. But when they go to college, they still tend not to take mathematics. ... Another issue is the whole work/family thing. ... Personally, I found that the major challenges had to do with [my children's] schools. ... The trends are, I think, slow—very slow—improvement over time.

workplaces. ... Many departments really do kind of bend over backwards to help people manage their work/family issues.

Personally, I found that the major challenges had to do with [my children's] schools. Schools are always expecting you to show up in the middle of the day and on very short notice, which is odd given that they are largely staffed by working women themselves. They put pressure on mothers who are not able or willing to, say, show up with cupcakes on short notice.

And it's always the mom who is supposed to do that. If you're a dad and you do anything at the school, then you're a hero, whereas if you're a mom and you don't show up at least a couple of times a year, then you're just a bad mother. That kind of societal expectation is I think much more oppressive than most of what I experienced from my employers.

**Region:** And trends for women in economics?

**Currie:** Well, the trends are, I think, slow—very slow—improvement over time. It takes an awfully long time for people to go through graduate school and go through the hierarchy and become full professors somewhere.

**Region:** It's a long pipeline.

**Currie:** Yes, it is. I think role models are important too. I know some women don't believe that, but personally, you know, when [Harvard economist] Claudia Goldin visited when I was a graduate student, that was tremendously influential for me. I am not sure that Claudia herself believes in role models, but she was a tremendous role model for me. I think the lack of successful role models has been an issue, though that has certainly changed with, for example, the recent female Clark medalists, Susan Athey, Esther Duflo and Amy Finkelstein. [See the interviews with Goldin and Duflo in the September 2004 and December 2011 *Region*, respectively, online at [minneapolisfed.org](http://minneapolisfed.org).]

Now, the mentoring aspect is interesting in part because it's such a small intervention. What we do in CeMENT is to bring young female academics together for a couple of days at the end of the AEA convention. Women who apply are first grouped according to field, and then we randomly assign them to be in the treatment or the control group. At the meeting, the women from each field who are in the treatment group meet with a senior mentor and a junior mentor. And they are supposed to submit a piece of work, which everybody in their group reads and discusses with them. Other sessions deal with work/life balance, the tenure process, grant writing, the publication process and other issues as well.

What we found in the initial evaluation was that there did seem to be a positive effect of being in the program in terms of publications and grants. Maybe you could say it was directly because of the intervention. You know, you bring a piece of work, people look at it and then you're more likely to get your piece of work published.



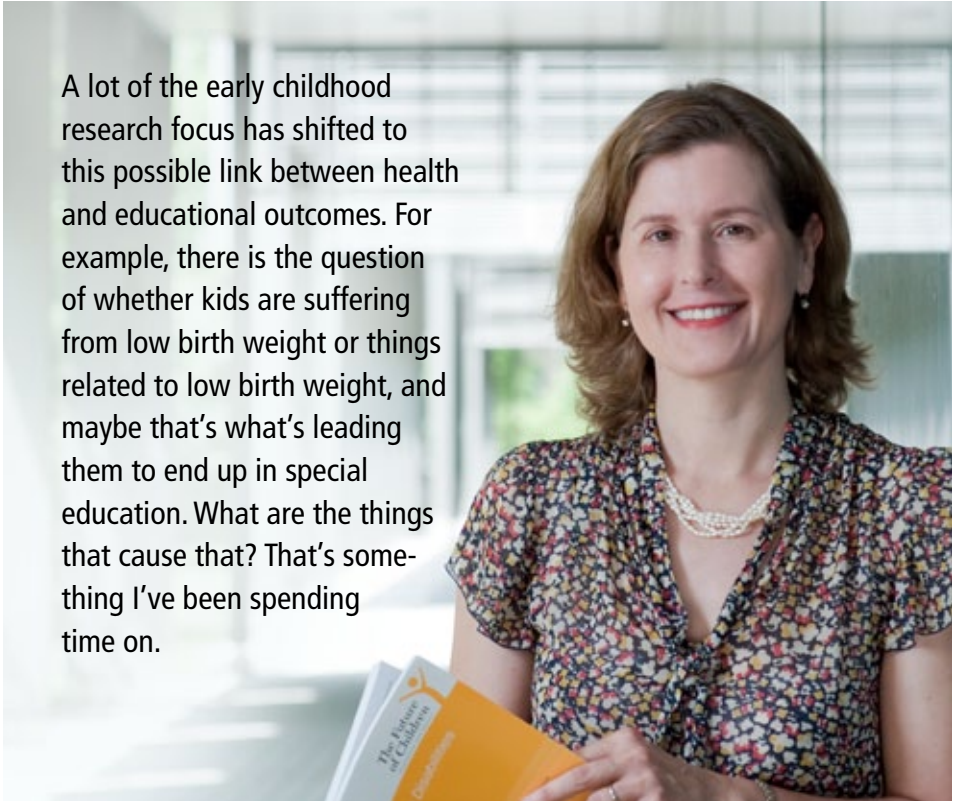
We are following up people over time. We don't survey them, but we look for their CVs online and see how they're doing. I guess I'll probably be doing that for the foreseeable future, trying to track down these cohorts every couple of years. Some of the anecdotal evidence was really very interesting about who benefits and why they benefited from it. Some women felt very isolated. They often had no other woman to talk to. If they felt they had problems that their male colleagues wouldn't understand ...

**Region:** Cupcake expectations.

**Currie:** Yes, cupcakes. Then they would ask other members of their group about that. Also, when they graduate, some people are better connected than others, you know. One of the benefits of coming from an elite program is that you know people who also came from an elite program, so you tend to be better connected in the profession. If you don't have that advantage, you may not have any kind of group. We saw that people who were not as connected to begin with, or who had no women in their departments, seemed to rely on the group they were assigned to as a sort of peer group to discuss issues with and to get advice.

The mentors don't actually get contacted a whole lot, but they often do get contacted for advice about the really big things like, "I'm putting together my tenure package. Should I include this or that?" Or "What should I say when they ask me about letter writers?" So it seems like people gained access to an unbiased senior person who could help them when it really counted.

I don't know if it will ultimately play out in terms of a difference in tenure rates, for example, which is the hope, because it is a quite small intervention. But I think it has had some positive effects already.



A lot of the early childhood research focus has shifted to this possible link between health and educational outcomes. For example, there is the question of whether kids are suffering from low birth weight or things related to low birth weight, and maybe that's what's leading them to end up in special education. What are the things that cause that? That's something I've been spending time on.

## EARLY CHILDHOOD EDUCATION

**Region:** As you know, the Minneapolis Fed has long been interested in the economic impact of early childhood education, and we were honored to have you participate in our 2003 conference. [See "The ABCs of Early Childhood Development" in the December 2003 *Region*, online at [minneapolisfed.org](http://minneapolisfed.org).] At that time, you presented a paper on the "black box" of Head Start—what we knew at that time about what does and doesn't work in the Head Start program.

Your research suggested that more expensive programs were more effective in terms of gains in reading and vocabulary, and that spending should focus more on children and less on programs for parents and community development.

What have we learned since then about the impact of Head Start, specifically, and other ECE programs, more generally?

**Currie:** Well, one thing is that I was very happy to learn that my initial results seemed to hold up.

**Region:** Always reassuring.

**Currie:** There's a paper by David Deming, which uses the same research design as my early work on Head Start. [Deming, David. 2009. "Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start." *American Economic Journal: Applied Economics* 1 (July): 111-34. Online at [people.fas.harvard.edu/~deming/papers/Deming\\_HeadStart.pdf](http://people.fas.harvard.edu/~deming/papers/Deming_HeadStart.pdf).]

But in the NLSY [National Longitudinal Study of Youth] data you can now follow the children for much longer. He looks at outcomes when they're teenagers and finds generally positive effects. There's another paper by Pedro Carniero and Rita Ginja looking at Head Start using a somewhat different research strategy,

which finds positive effects on mental health outcomes. The focus on mental health in that paper is certainly an important new direction for research on early childhood. I have been surprised in my work on the longer-term effects of mental health problems in childhood by how big the effects are relative to the effects of physical health problems. [Carneiro, Pedro, and Rita Ginja. 2009. "Preventing Behavior Problems in Childhood and Adolescence: Evidence from Head Start." University College London. Online at [ucl.ac.uk/~uctprcp/headstart.pdf](http://ucl.ac.uk/~uctprcp/headstart.pdf).]

I think a lot of the early childhood research focus has shifted to this possible link between health and educational outcomes. For example, there is the question of whether kids are suffering from low birth weight or things related to low birth weight, and maybe that's what's leading them to end up in special education. What are the things that cause that? That's something I've been spending time on, trying to look at whether pollution or stress or other things during pregnancy might have an impact on health at birth, which would then lead to poorer educational outcomes.

## FETAL ORIGINS OF INEQUALITY

**Region:** That certainly leads to your research on fetal origins, so perhaps we could talk about that. Since your work with Rosemary Hyson in 1999, if not earlier, you've been exploring the long-term relationship between health and economic outcomes.

In your 2011 Ely lecture to the AEA, you reviewed much of this research on determinants of health at birth and their link to adult outcomes, with new evidence about *in utero* exposure to pollution. And you shed further light on mechanisms underlying perpetuation of poverty.

Recently, you've explored the economic side of the fetal origins hypothesis. And you've been looking at early disease

Economic studies are examining a wide range of things that might affect fetal health and asking whether they have long-term consequences ... and I raised the idea of "epigenetic" changes as one possibility. ... Epigenetics implies that it does not make sense to talk about nature versus nurture. If nature is the gene and nurture is the thing that sets the switches, then the outcome depends on both of those things.

environments and their long-term effects on both mothers and children.

Could you briefly review the fetal origins hypothesis and how economists have expanded its reach—to test scores, education and income as well as health?

**Currie:** I think the phrase itself was coined by David Barker, a physician who was interested in whether there was a biological mechanism such that if the fetus was starved *in utero* it would be more likely to be obese or more likely to have heart disease or diabetes, things related to that in later life. The idea is that you are sort of training the fetus to think this is a hungry environment so that they should be really thrifty with food. An infant programmed in this way would then be more likely to gain a lot of weight later on and to have diseases related to obesity. So that was specifically what the fetal origin hypothesis was about.

I believe Thalidomide was the first thing that really shocked people and showed that if you give drugs to the woman, that it could have an effect on the fetus. People were also working on the Dutch "Hunger Winter" prior to Barker, looking into whether being

literally starved *in utero* had long-term effects.

So economists have taken that idea and run with it. Economic studies are examining a wide range of things that might affect fetal health and asking whether they have long-term consequences. I think there's pretty broad acceptance now of the idea that all kinds of things that happen when people are *in utero* seem to have a long-term effect.

One of the things I talked about in my Ely lecture was what mechanism might underlie the long term effects, and I raised the idea of "epigenetic" changes as one possibility. The way I like to think about that is you have the gene, which only changes very slowly when you have mutations. But then kind of on top of the gene you have the epigenome, which determines which parts of the gene are expressed. And that can change within one generation. There are animal experiments that do things like change the diet of guinea pigs and all the baby guinea pigs come out a different color. It can be pretty dramatic.

**Region:** So, far different, and far quicker, than natural selection.

**Currie:** Yes, it's a different mechanism, and it makes some sense from an evolutionary perspective because it's a way for populations to change rapidly when it's necessary. The idea is that the fetal period might be particularly important because these epigenetic switches are being set one way or another. And then once they're set, it's more difficult to change them later on.

I think we haven't really been able to look at all of the implications of that given the limitations of the data. We don't have very much data where we can follow people from, say, *in utero* to some later period. But, that's where the frontier is, trying to do that kind of research and make those linkages. What I've been able to do is to categorize a whole set of things that have systematic impacts on

the fetus. I'm really happy I didn't know any of these things when I was pregnant.

**Region:** How old are your kids?

**Currie:** My kids are 12 and 15, so I didn't learn about any of this until afterwards. I would have been a nervous wreck!

I think a really interesting thing about the fetal origins hypothesis for public policy is that if it's really important what happens to the fetus, and some people think that maybe the first trimester is the most important or the most vulnerable period, then you're talking about women who might not even know that they're pregnant. It really means you should be targeting a whole different population than, say, 15 years ago, when we thought, oh, we need to be targeting preschool kids instead of kids once they reach school age. Now we're kind of pushing it back. Then it was, "We need to be playing Mozart to infants." Now the implication is that we've got to reach these mothers before they even get pregnant if we really want to improve conditions.

Epigenetics implies that it does not make sense to talk about nature versus nurture. If nature is the gene and nurture is the thing that sets the switches, then the outcome depends on both of those things. So you can't really talk about nature or nurture in most situations. It has to be some combination of both.

**Region:** It just struck me that that contrasts a bit from your early childhood education finding that you don't want to focus program spending on mothers or parents. Focus on the kids, not on the moms.

**Currie:** That's true enough. I guess a cynical view would be, "Well, if they've already had their kids, then there's no point, right? Quit worrying about them." But many moms who have one young child are likely to have another, so maybe that would be a good way to target them. But in a different way than they get targeted now.

Things we're looking at here in the United States, like the effects of *in utero* exposure to pollution on child health and economic outcomes, involve problems that are much worse in developing countries. ... If there are children in developing countries who are damaged from the start because of the conditions they're exposed to *in utero*, or in early childhood, then that would definitely be a drag on development.

## THE NBER SUMMER INSTITUTE

**Region:** One more question, about your work as director of the NBER's Program on Families and Children. You've pulled together a number of papers that will be presented here in Cambridge tomorrow. What key themes are you hoping will be covered at that session? And therefore, what themes are you perhaps hoping to encourage in future economic research? I don't know if that's how you choose papers but ...

**Currie:** Well, the way I choose papers is that people submit them, and we had an awful lot of papers submitted this time, and then we just pick the ones that seemed best.

But, indeed, some themes do seem to be emerging. One thing that is interesting—and I'm starting to do a little bit of work like this myself—is thinking about children in developing countries. Things we're looking at here in the United States, like the effects of *in utero* exposure to pollution on child health and economic outcomes, involve problems that are much worse in developing countries.

So if we can find an effect here ... for instance, my E-ZPass paper suggested

that the incidence of low birth weight was 8 percent higher for pregnant women who are subjected to large amounts of auto exhaust because they live near highway toll plazas. If that is true here, then what must be the effect in Beijing? It must be even bigger than that.

**Region:** Right, or other sorts of pollution that you've looked at: toxic releases or factory closings/openings, for instance.

**Currie:** Yes. So one thing I'm excited about is that people are starting to think about these issues in developing countries. I think it's really important in a sense that if there are children in developing countries who are damaged from the start because of the conditions they're exposed to *in utero*, or in early childhood, then that would definitely be a drag on development.

And conversely, another thing I was thinking about is that you can have this kind of perverse selection effect. Suppose conditions get better and children who would have died now survive; if those children are nevertheless unhealthy, then you could have mean health decline over the short term with development.

**Region:** The human capital and health care costs associated with that would be enormous.

**Currie:** Right. So I think these are really important issues in developing countries, and they're starting to be addressed. So, tomorrow, we have a number of papers looking at Indonesia, Colombia and India as well as one looking at the relationship between family size and children's education across a large number of developing countries.

Another of tomorrow's papers that's directly relevant to the discussion we have been having is by Bruce Meyer and Laura Wherry about Medicaid expansions to teenagers. As I was saying, there were Medicaid expansions in the '90s. Their study shows that black children who gained insurance coverage as pre-



teens has lower future mortality rates.

And there is more work on Head Start. Marianne Bitler, Thurston Domina and Hillary Hoynes are presenting a paper looking at distributional impacts of Head Start. Interestingly, they find larger effects for Hispanic children than other groups,

which is something I had also found.

**Region:** It'll clearly be a very interesting program tomorrow. Thank you so much.

—*Douglas Clement*  
July 25, 2012

## More About Janet Currie

### Current Positions

Henry Putnam Professor of Economics and Public Affairs, Princeton University, since 2011

Director, Center for Health and Wellbeing, Princeton University, since 2011

Director, Program on Families and Children, National Bureau of Economic Research, since 2002; Research Associate since 1995

### Previous Positions

Sami Mnaymneh Professor of Economics, Columbia University, 2009-11; Economics Department Chair, 2006-09; Professor of Economics, 2006-11

Charles E. Davidson Professor of Economics, University of California at Los Angeles, 2005-06; Professor of Economics, 1996-2005; Associate Professor, 1993; Assistant Professor, 1988

Assistant Professor, Massachusetts Institute of Technology, 1991

### Professional Affiliations

Editor, *Journal of Economic Literature*, since 2010; Associate Editor, *Journal of Population Economics*, since 2010; Associate Editor, *Journal of Public Economics*, since 2002; Member, Editorial Board, *Quarterly Journal of Economics*, since 1995

Senior Research Affiliate, National Poverty Center, Gerald R. Ford School of Public Policy, University of Michigan, since 2002

Member, Board on Children, Youth and Families, Institute of Medicine, since January 2012

Member, Advisory Committee on Labor and Income Statistics, Statistics Canada, since 2011

Chair, Committee on Disclosure for Working Papers, National Bureau of Economic Research, 2011

Member, Health Researcher of the Year Committee, Canadian Institutes of Health Research, 2011

Member, Advisory Panel, National Children's Study, 2001-11

### Honors and Awards

Second Vice President, Society of Labor Economists, since May 2012; Fellow, elected 2006

Ely Lecturer, American Economic Association Meetings, January 2011

Vice President, American Economic Association, 2010; Past Chair and Member, Honors and Awards Committee and Meetings Program Committee

Fellow, Center for Health and Wellbeing, UCLA, 2009-10, 2003-04

Research Fellow, Institute for the Study of Labor (IZA), 2003-14

Fellow, Society of Labor Economics, elected May 2006

Fellow, Canadian Institute for Advanced Research, 1997-99

Fellow, UCLA Center for American Politics and Public Policy, 1994-95

Alfred P. Sloan Foundation Research Fellowship, 1993-95

### Publications

Co-editor (with Robert Kahn) of *The Future of Children: Children with Disabilities* and author of *The Invisible Safety Net: Protecting the Nation's Poor Children and Families* and other books and articles focused on the health and well-being of children. Extensive research on early intervention programs, health insurance programs, environmental hazards and infant health, intergenerational transmission of health, education and economic status, medical practice and health care systems, and labor negotiations.

### Education

Princeton University, Ph.D., economics, 1988

University of Toronto, M.A., economics, 1983

University of Toronto, B.A., economics, Lorne T. Morgan Gold Medal in Economics, 1982