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Staying Competitive

Patching America's Leaky Pipeline in the Sciences

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Introduction and summary

Premier science largely depends on the quality of the pool of future scientists. For this reason the United States has made a major effort over the past 30 years to attract more outstanding U.S. students, particularly women, into research science.¹ Women have risen to the challenge with significant increases in all physical sciences and engineering, and they have made a huge advance in the life sciences, where they now receive more than 50 percent of all Ph.D.s.²

Women represent a large part of the talent pool for research science, but many data sources indicate that they are more likely than men to “leak” out of the pipeline in the sciences before obtaining a tenured position at a college or university.³ The loss of these women, together with serious increases in European and Asian nations’ capacity for research, means the long-term dependability of a highly trained U.S. workforce and global preeminence in the sciences may be in question.⁴

The Obama administration has made scientific research a major priority, with the 2009 stimulus package, or American Recovery and Reinvestment Act, including billions of dollars to the federal granting agencies, most prominently the National Institutes of Health, the National Science Foundation, and the Department of Energy.⁵ This investment was made to create jobs, to maintain America’s scientific competitiveness in the global market, and to balance a recent decline in real dollars provided by federal granting agencies to support basic and applied research at universities and colleges.⁶ This initiative depends on an innovative, highly trained scientific workforce.

A recent report by the National Research Council of the National Academy of Sciences confirmed that women who receive Ph.D.s in the sciences were less likely than men to seek academic research positions—the path to cutting-edge discovery—and they were more likely to drop out before attaining tenure if they did take on a faculty post.⁷ However, the NRC report stated that their surveys did not shed light on many of the potential reasons why women were more likely to drop out: “The report does not explore the impact of children and family obligations (including elder care) on women’s willingness to pursue faculty positions in R1 institutions or the duration of postdoctoral positions.”⁸

This report, based on extensive original research, addresses this impact and identifies both when and why women and men with caregiving plans or responsibilities drop or opt out of the academic science career path. It provides an extensive examination of the experi-

ences of researchers as well as the role that institutions of higher education and federal granting agencies play in regard to the leaky pipeline in the sciences.

The report is based on data from a number of sources: A national longitudinal survey, the Survey of Doctorate Recipients;⁹ surveys of four academic researcher populations in the University of California system, including doctoral students, postdoctoral scholars, academic researchers, and faculty; a survey of the 62 member institutions of the Association of American Universities, a nonprofit organization of leading public and private research universities in the United States and Canada;¹⁰ and a survey of 10 of the major federal granting agencies.¹¹

Key findings

This report makes an important contribution to understanding how family affects women's ability to make it to the top of the scientific community. First, we examine the role of family formation (marriage and children) on leaks from the academic pipeline to tenure, the experiences of doctoral students and postdoctoral scholars in career path decision making, and the reputation of careers in academic settings. Next, we focus on family responsive benefits, such as paid maternity and parental leave, for researchers at major universities around the country, and the role of the federal granting agencies in regard to these issues. We then examine the structure of academia particularly in relation to time pressures, and finally make clear recommendations on further steps that research universities and federal agencies can take to fully address leaks in the academic pipeline.

Family formation—most importantly marriage and childbirth—accounts for the largest leaks in the pipeline between Ph.D. receipt and the acquisition of tenure for women in the sciences.

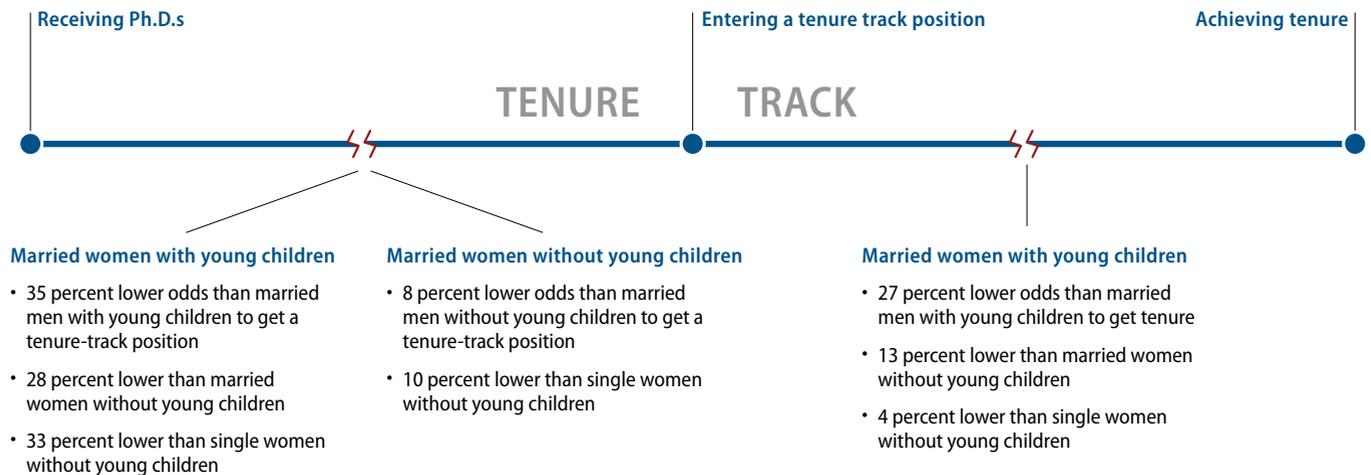
Our findings indicate that women in the sciences who are married with children are 35 percent less likely to enter a tenure track position after receiving a Ph.D. than married men with children (see Figure 1). And they are 27 percent less likely than their male counterparts to achieve tenure upon entering a tenure-track job.¹² By contrast, single women without young children are roughly as successful as married men with children in attaining a tenure-track job, and a little more successful than married women with children in achieving tenure. Married women without children also do not fare quite as well as men.

Scientists often make decisions about their career path while still in training.

In unparalleled surveys of doctoral students and postdoctoral scholars at the University of California,¹³ we found that both men and women report a shifting away from the career goal of research professor, with women's move being more pronounced. Among doctoral

FIGURE 1
Leaks in the pipeline to tenure for women Ph.D.s in the sciences*

Married women with young children are less likely to enter a tenured-track position or become tenured



*Results are based on survival analysis of the Survey of Doctorate Recipients (a national biennial longitudinal data set funded by the National Science Foundation and others, 1981 to 2003) in all sciences, including social sciences. The analysis takes into account discipline, age, ethnicity, PhD calendar year, time-to-PhD degree, and National Research Council academic reputation rankings of PhD program effects. For each event (PhD to TT job procurement, or TT job to tenure), data are limited to a maximum of 16 years. The waterline is an artistic rendering of the statistical effects of family and gender. Note: The use of NSF Data does not imply the endorsement of research methods or conclusions contained in this report. Person-year N for entering tenure track=140,275. Person-year N for achieving tenure=46,883.

students, career-life issues populate four of the top-five most commonly cited reasons why students changed their minds, with women more likely than men to cite these issues as very important, and more than twice as likely as men to cite issues related to children.

In contrast, for postdoctoral scholars career issues populated four of the top-five most commonly cited issues. “Issues related to children” was the only career-life issue in the top five and the only one that the majority of women who shifted their career goal away from research professor cited as very important. Women postdoctoral scholars who had a child while a postdoctoral scholar were twice as likely to change their career goal as men and twice as likely to do so as women with no children and no future plans to have them.

Research-intensive careers in university settings have a bad reputation with both men and women.

The majority of doctoral students and postdoctoral scholars indicated that they were concerned about the family friendliness of possible career paths, but research-intensive universities were considered the least family friendly of a range of possible career choices including tenure-track careers at teaching-intensive institutions, non-tenure track faculty positions, policy and managerial careers inside and outside academia, and research careers

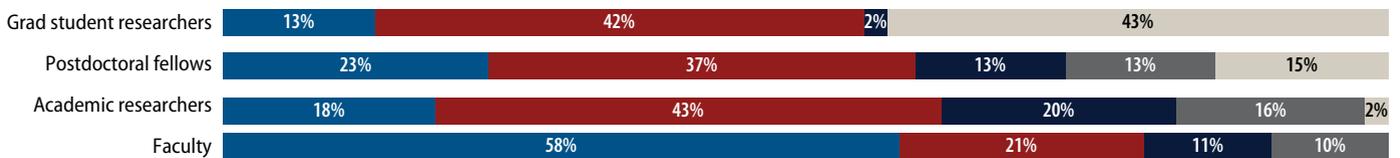
within and outside academia. Only 36 percent of postdoctoral women and 52 percent of postdoctoral men, and 28 percent of doctoral student women and 44 percent of doctoral student men viewed tenure-track careers at research-intensive institutions as family friendly.

America’s researchers receive limited benefits when it comes to family-responsive policies such as paid maternity and parental leave. Young scientists early in the pipeline are the least likely to have these benefits.

Faculty are the only population where a majority of the 62 AAU universities (58 percent)¹⁴ provide a baseline family-responsive maternity leave policy of at least six weeks of guaranteed paid leave following childbirth, *without limitations that prohibit access to it* (see Figure 2). Only a fraction of research universities offer this level of paid maternity leave to graduate students, postdoctoral scholars, and academic researchers, with only 13 percent of universities making this baseline policy available to graduate students (43 percent of them offer only ad hoc paid leave, or no paid leave at all). The level of paid parental leave is even less encouraging—only a tiny number of institutions provide a baseline of at least one week of guaranteed paid parental leave *without limitations* to any of the four populations.

Many universities do provide some maternity and parental leave, but the limitations associated with these policies significantly affect contingent classes of researchers such as graduate students, postdoctoral scholars, and academic researchers. These limitations include requirements that limit the number of individuals who qualify for the policy, limitations on the length of the policy or the percentage of salary paid, and limitations focused on the accrual of sick and/or vacation leave.

FIGURE 2
Provision of paid maternity leave for academic populations at Association of American Universities member institutions
 Faculty are the only population who enjoy paid maternity leave from a majority of AAU institutions



- Entitlement to at least 6 weeks of paid leave.
- Limitations to paid leave (e.g. only for particular groups, partial pay, less than 6 weeks, requirements for previous service time, etc.).
- Paid leave depends on sick and/or vacation leave accruals.
- Delay in availability of sick and/or vacation leave accruals, ie., FMLA.
- Less, ad hoc, or no paid leave available.

Source: Frasch, Karie, Marc Goulden, and Mary Ann Mason. 2008. "University Family Accommodations Policies and Programs for Researchers Survey." (<http://ucfamilyedge.berkeley.edu/AAU%20Family%20Friendly%20Policies%20Survey.html>).

Federal agencies have a shared responsibility with universities in providing adequate family responsive benefits for America's researchers.

Federal agencies that fund the lion's share of research at universities across the nation defer to the family responsive policies of the institutions.¹⁵ However, three specific aspects of the role of federal agencies suggest a shared responsibility with universities in these issues: the existence of research fellows under the direct employment of federal agencies and associated institutions;¹⁶ the public commitment of federal agencies to assuring gender equity in the science pipeline; and the role of federal agencies in assuring Title IX compliance by federal grant-contract recipients, including research universities.¹⁷

Some universities may be out of compliance with Title IX requirements.

According to findings from our survey, some universities may not be complying with Title IX, which requires that research universities receiving federal funds 1) treat pregnancy as a temporary disability for purposes of calculating job-related benefits, including any employer-provided leave, and 2) provide unpaid, job-protected leave for "a reasonable period of time" if the institution does not maintain a leave policy for employees.¹⁸

When asked about the provision of unpaid leave to postdoctoral scholar birth mothers, one university respondent indicated that they do not provide it, and six indicated that they did not know whether or not it was provided. All universities and colleges should have in place a clear policy regarding unpaid leave for birth mothers. And Title IX reviews should look at these policies to ensure that universities are in compliance.

The lock-step structure of academia is unforgiving. Parents, but particularly women, experience significant caregiving responsibilities up through age 50, making it hard for them to keep up with academic career pressures.

Federal grants play a critical role in achieving promotion and tenure in academia. However, tenure-track faculty women who are married with young children are 21 percent less likely than tenure-track men who are married with young children to have their work partially or fully supported by federal grants or contracts, and 26 percent less likely than tenure-track women who are married without young children.¹⁹

The time pressures of academia are unrelenting for most faculty in the sciences, who work on average about 50 hours a week up through age 62. When combined with caregiving hours and house work, UC women faculty with children, ages 30 to 50, report a weekly average of over 100 hours of combined activities (—compared to 86 hours for men with children).²⁰ And women faculty with children provide an average of more than 30 hours a week of caregiving up through age 50, while family responsive policies rarely address this long-term career-life issue.

Evidence indicates that the collision course between career timing and family timing may be worsening—the average age for tenure receipt among tenure-track faculty in the sciences was 36 in 1985, and extended out past age 39 by 2003.

Both research universities and federal agencies have taken some initial but uncoordinated steps toward breaking up the lock-step academic structure.

Although much remains to be done, some AAU institutions have put in place family responsive policies, benefits, and resources, including time-based policies and benefits such as stopping the clock (i.e., tenure-clock extension), various child care supports such as on- and off-campus centers, monetary supplements such as tuition remissions, and other resources such as lactation rooms.

Federal agencies have made similar efforts, with some agencies—particularly NIH and NSF—standing above the rest. Some of the efforts include the provision of no-cost extensions for caregiving purposes (typically providing an additional year to complete the project, with no additional funds), grant supplements to support family responsive policies or needs, gender equity workshops, formalized agency policies or statements supporting women in the academic pipeline, allowing part-time effort on fellowships or grants, and extending the fellowship period for caregiving.

However, the lack of coordination between research universities and federal agencies creates inconsistent and inadequate coverage.

Recommendations for federal agencies and universities

Promote clear, well-communicated, baseline family responsive policies for all classes of researchers.

As described at length in this report, America’s researchers do not receive enough family responsive benefits, particularly the more junior researchers. Together, federal agencies and universities can make headway in solving this systemic problem.

Federal agencies, particularly the National Institutes of Health, the National Science Foundation, and the nonprofit organization The American Association for the Advancement of Science, which oversees federally funded research fellows for many of the federal granting agencies, can help by setting equitable, clearly communicated baseline family responsive policies for their fellows. At the same time, universities need to adopt baseline family responsive policies for all of their classes of researchers—not just faculty. Graduate student researchers and postdoctoral scholars receive the most limited benefits and are arguably the most important in affecting the future of U.S. science.

Provide federal agency or university supplements to offset family event productivity loss.

Without providing additional financial supplements in association with family responsive policies, faculty principal investigators, or PIs—those with primary responsibility for the design, execution, and management of a research project—will continue to bear the brunt of supporting family-related absences from their research dollars. This dynamic is unfair to PIs and may create a situation where they will find it to their advantage to avoid hiring researchers who might eventually need family responsive policies. This becomes an unintended form of discrimination against women. To avoid this structural difficulty, supplementary funding needs to be provided when researchers paid off of grants take necessary leaves/modifications.

Collaboratively move toward a full package of family friendly policies that take into account the career-family life course.

All major research universities should look to build a family-friendly package of policies and resources, and federal agencies can provide much more than they already do. Sharing and wide-scale adoption of proven practices are necessary.

Remove time-based criteria for fellowships and productivity assessments that do not acknowledge family events and their impact on career timing.

The lock-step timing of academia needs to be more flexible. Time caps and barriers to entry—such as those that require a postdoctoral scholar position to begin within a certain number of years following receipt of the Ph.D.—that set rigid sequential deadlines should be removed. Universities and federal agencies need to examine all of their policies in this regard and look for ways to encourage reentry into the pipeline for academic researchers who take time off for giving birth or caring for children and promote a more holistic concept of career patterns that honors the larger needs of individuals.

Collect and analyze the necessary data to make sure existing and future policy initiatives are effective in meeting researchers' needs and comply with Title IX.

The lack of necessary data and multiyear commitments to these efforts continues to hamper our delivery of truly effective initiatives. Decisions about family responsive policies, programs, and benefits will continue to be made on intuition and anecdote if they are not tracked by systematic longitudinal data. Both federal agencies and universities need to build and maintain the necessary datasets to assess whether our efforts are yielding posi-

tive results and whether Title IX requirements are being met. Federal agencies can provide more grant programs to help determine whether our efforts are working, and Title IX compliance reviews should include questions on family responsive policies.

Our current inadequate family responsive benefits for America's researchers makes no economic sense. In the world of federal grants individuals who drop out of science after years of training represent a huge economic loss and are a detriment to our nation's future excellence. Given the Obama administration's interest in maintaining America's competitive advantage, future federal investments should be focused on patching the leaky pipeline in the sciences. Doing so will help us preserve our competitive edge.

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The mission of the Berkeley Center on Health, Economic & Family Security (Berkeley CHEFS) is to address the increasing insecurity faced by American workers and families through the development of integrated and interdisciplinary policy solutions. The economic security of American families is a growing national concern, but policy proposals to address the needs of working families with regard to health security, economic security, and work-family security are too often advanced separately. With faculty experts in law, social welfare, public health, political science, public policy, medicine, and economics, Berkeley CHEFS initiates robust dialogue and research aimed at developing policy recommendations to assist the engineering of legislative, institutional, and regulatory reforms.

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