Postdoctoral Scholars, Gender, and the Academic Career Pipeline

A fact sheet

Developed as part of NPA ADVANCE,
From Postdoc to Faculty: Transition Issues for Women Scientists.

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The postdoctoral position – a temporary period of training and mentored research following the receipt of a doctoral degree – is a critical transition point in the academic career pipeline where the numbers of women scientists and engineers significantly decline. **While the relative fraction of women in academic science and engineering decreases at every successive step along the career pipeline, these decreases are greatest for the fields where the postdoctoral position is most common.**[1] Increasingly, the postdoctoral position has become a required step for continuing into the professoriate in these fields, creating an additional career hurdle and lengthening the total elapsed time until the first permanent position.[2]

Special Note:
The statistics presented herein are the best available; we do not have a truly comprehensive statistical picture of postdoctoral scholars, including postdoc women, and within that population, postdoc women who are members of underrepresented groups including racial and ethnic minorities and women with disabilities. Those women postdocs who are members of underrepresented groups may face unique challenges. There is little available information, anecdotal or otherwise, about these challenges.

UPostdoc Demographics

- **In 2008, 34% of all postdocs in the United States are women.**[3]
  - Agricultural sciences: 37%
  - Biological Sciences: 42%
  - Computer Science: 17%
  - Earth, Atmospheric, and Ocean Sciences: 35%
  - Engineering: 20%
  - Mathematics and Statistics: 20%
  - Physical Sciences: 21%
  - Psychology: 47%
  - Social Sciences: 48%

- **In 2005, the fraction of women among postdoctoral visa holders in the United States is lower than for postdocs who are U.S. citizens and permanent residents.**[4]

- Visa holders: 35%
- U.S. citizens and permanent residents: 51%

- **The percentage of underrepresented minorities who held Ph.D.s in science and engineering and were in postdoctoral positions increased from 2.4% in 1973 to 7.5% in 2006; the percentage of Asian doctorate recipients in postdoctoral positions increased from 11.9% to 35.4%.[5]**

- **In 2005, approximately 10% of postdocs indicated they were underrepresented minorities.[6] Of those who reported themselves as underrepresented minorities, 62% were women.[7]**
  - White: 74.5%
  - Asian: 16.1%
  - Hispanic/Latino: 4.0%
  - Black/African-American: 3.7%
  - Other: 2.6%

- **Less than 1% of all postdocs reported having a disability.[8] Of those indicating they had a disability, there is some indication that the fraction of women was slightly higher than the fraction of men.[9]**

- **Most postdocs, 58% of men and women, are between the ages of 30 and 35, and are partnered or married.[10]**
  - Women who are partnered or married: 64.9%
  - Men who are partnered or married: 70.1%

- **Postdoc women are more likely than men to have a spouse that is employed, especially if the couple has children.**

  - Among married or partnered postdocs, 87.1% of women and 57.6% of men have employed spouses. [11]

  - Among married or partnered postdocs *with children*, 88% of women and only 44% of men have an employed spouse.[12]

- **Of those postdocs with employed partners or spouses, almost a third are employed at the same institution. This fraction is slightly higher for men than women.[13]**
  - Women who have partners or spouses employed at the same institution: 28.6%
  - Men who have partners or spouses employed at the same institution: 30.6%

- **About a third of postdocs in 2005 have children and the fraction for women is lower than for men.[14]**
  - Women with children: 28.6%
  - Men with children: 37.3%

Postdocs and Families

- **Children significantly impact the early career advancement of postdocs, often causing more women than men to leave the academic pipeline.**
    - Children significantly decrease the likelihood of women postdocs getting their first tenure-track job by 8 to 10%.[15]
    - Having children later in their careers increases the chances for women to receive tenure.[16]
    - In 2005, 48.7% of women postdocs reported that being a postdoc has impacted their plans to have children.[17]
    - More than twice as many biomedical postdoc women than men indicate that children are an extremely important consideration in career planning.[18]
    - Married postdoc women with children are more likely than other postdocs to cite children as a reason for choosing a non-academic career path.[19]
    - Postdoc women who have had children since becoming postdocs are twice as likely as men who also have had children to change their career goal away from professor with a research emphasis. These women are also twice as likely to change their career goal from the professoriate as women who have not had children and have no future plans to have children.[20]
- **Women's choices of postdoc positions are more influenced by family formation and geographic location than similar choices for men.**
    - Women's motivation for taking a postdoc position was often connected with a desire to live in the same place as their partner.[21]
    - More women than men report that geographic location and family considerations were very important in choosing their current postdoc position.[22]
        - Geographic location: Women: 53%; Men: 37%
        - Family considerations: Women: 45%; Men: 39%
    - More male postdocs than female postdocs expect their spouse to make career concessions, and more female postdocs would make career concessions themselves.[23]
- **Access to paid maternity leave for postdocs typically has limitations, such as eligibility requirements, dependence on sick/vacation leave accruals, entitlements of less than six weeks, or partial salary. This is in comparison to**

faculty, who typically are guaranteed six weeks of paid maternity leave without such limitations.[24]

- 23% of Association of American Universities (AAU) member institutions offer postdocs guaranteed six weeks maternity leave (compared to 58% of institutions that offer this to faculty)
- 37% offer postdocs paid leave with limitations (e.g., only for particular groups, partial pay, less than six weeks, requirements for previous service time, etc.)
- 13% offer postdocs paid leave that depends upon sick and/or vacation leave accruals
- 13% require a delay in the availability of paid leave due to policies such as Family and Medical Leave Act (FMLA)
- 15% have less, ad hoc or no paid leave for postdocs.

- **Postdoc women with children report spending more on childcare than men and a larger share of their time on childrearing duties.**[25]

Postdoc Career Paths

- **The postdoctoral years are a time of great attrition from the academic pipeline for women scientists.**

  - Women are lost in greater proportion than men from the academic pipeline, but these losses are greatest in those fields where most Ph.D. holders take postdoctoral positions: life sciences and physical sciences.[26]

  - Among biomedical postdocs, women are less likely than men to choose the principal investigator (PI) career path[27] and less likely to continue applying for PI positions after an unsuccessful job search.[28]

  - Of those postdocs who indicated a career goal of professor with a research emphasis at the start of their postdoc, a greater fraction of women than men have since changed their goal.[29]

  - Although a majority of both men and women biomedical postdocs feel their professional preparation is adequate, women are less confident they will obtain a PI position and tenure.[30]

  - The likelihood of attaining a tenure-track faculty position for both men and women who have done at least one postdoc is 31%.[31]

- **Women, especially those with children, tend to spend more time as postdocs than men, leading to a delayed entrance into the tenure-track.**

- Compared with those fields where the postdoc position is not as common, biochemistry postdocs spent the longest time as postdocs, and biochemistry women were postdocs longer than the men.[32]

- Postdocs with children (both men and women) are more likely than those without children to take multiple postdoc positions.[33]

- **Postdoc women in most science fields get their first tenure track jobs in lower proportion than men.**

  - Women are less likely than men to get their first tenure track job within five years of Ph.D. receipt.[34]

  - Married math postdocs who are women are much less likely than men to be in tenure-track jobs ten years after receiving their Ph.D.[35]

- **Female postdocs publish less and are overall less successful than male postdocs; this may be compounded by having children.**

  - Postdoc men have higher levels of subjective success than women.[36]

  - Postdoc women tend to publish less than men.[37]

  - Postdoc women who are married and have children spend less time in the lab and attend fewer conferences.[38]

- **Postdoc women, especially those that are married with children, are more likely than men to consider jobs outside academia.** [39]

  - Among postdocs currently looking for a job, women were less interested than men in jobs at research universities, undergraduate institutions, industry or government, but more interested than men in jobs in communications/media and non-profits.[40]

<u>Postdoc Work Environment</u>

- **Postdoc women are less satisfied than men with the mentoring they receive.**[41]

- **Most female postdocs have male postdoctoral advisors.**[42]

- **Biomedical postdoc women seem to have less access to dedicated technical help in support of their research productivity.**[43]

[1] Committee on Science, Engineering, and Public Policy [COSEPUP]. 2007. *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.* Washington, DC: The National Academies Press. The report cites data from the National Science Foundation's Survey of Doctoral Recipients.

[2] National Science Board. 2010. *Science and Engineering Indicators 2010*. Arlington, VA: National Science Foundation (NSB 10-01); also discussed in Davis, G. 2009. "Improving the Postdoctoral Experience: An Empirical Approach." In R. Freeman and D. Goroff (Eds.), *Science and Engineering Careers in the United States*, Chicago, IL: NBER/University of Chicago Press, 100-101

[3] National Science Foundation, Division of Science Resources Statistics, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2011*, NSF 11-309 (Arlington, VA; February 2011). Available from http://www.nsf.gov/statistics/wmpd/ (Postdoc data source: NSF Survey of Graduate Students and Postdoctorates in Science and Engineering 2008)

[4] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009); note that Sigma Xi's finds 42% of all respondents are women

[5] National Science Board. 2010. *Science and Engineering Indicators 2010*. (Chap. 5, p. 24).

[6] Sigma Xi Postdoc Survey by all results, all institutions: http://www.sigmaxi.org/postdoc/all/about_you_short.html (accessed February 17, 2010)

[7] Sigma Xi Postdoc Survey by underrepresented minority status, all institutions: http://www.sigmaxi.org/postdoc/by_minority/about_you_short.html (accessed February 17, 2010)

[8] Sigma Xi Postdoc Survey by all results, all institutions: http://www.sigmaxi.org/postdoc/all/about_you_short.html (accessed March 5, 2010); This also is roughly consistent with the National Science Foundation's data from the Survey of Earned Doctorates (2006) which describes the disability status of doctoral degree holders who indicated their definite postgraduate degree plan was postdoctoral study; 1.4% of these individuals planning on postdoctoral study reported they had a disability. See Table G-4 from National Science Foundation, *Women, Minorities, and Persons with Disabilities*.

[9] Sigma Xi Postdoc Survey results by gender, inferred from the number of male and female respondents who reported they had a disability and subsequently responded to a question about their type of disability in AY20: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed March 6, 2009)

[10] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)

[11] Ibid.

[12] Sigma Xi Postdoc Survey Table 6: Postdoc Family Structure (children): http://postdoc.sigmaxi.org/results/tables/table6 (accessed July 9, 2009).

[13] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed March 6, 2009)

[14] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)

[15] Ginther, D.K. and Kahn, S. 2005 (updated 2006). *Does Science Promote Women? Evidence from Academia 1973-2001*. Mimeo, University of Kansas.

[16] National Science Foundation. 2004. *Gender Differences in Careers of Academic Scientists and Engineers*. Arlington, VA (NSF 04-323)

[17] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)

[18] Martinez E.D., Botos J., Dohoney K.M., Geiman T.M., Kolla S.S., Olivera A., Qiu Y., Rayasam G.V., Stavreva D.A. & Cohen-Fix O. 2007. *EMBO reports* 8 (11), 977

[19] Mason, M.A. & Goulden, M. 2002. *Academe*, 88(6): 21

[20] Goulden, M., Frasch, K., and Mason, M.A. 2008. "UC Postdoctoral Scholar Career and Life Survey." (http://ucfamilyedge.berkeley.edu/UC%20Postdoctoral%20Survey.html) as cited in Goulden, M., Frasch, K., and Mason, M.A. and the Center for American Progress. 2009. *Staying Competitive: Patching America's Leaky Pipeline in the Sciences.* Berkeley Center on Health, Economic & Family Security. 16 http://www.americanprogress.org/issues/2009/11/women_and_sciences.html (accessed March 6, 2010)

[21] Nerad, M. and Cerny, J. 1999. *Science* 285, 1533

[22] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)
[23] Martinez, *EMBO*, 977
[24] Goulden, M., Frasch, K., and Mason, M.A. 2008. "University Family Accommodations Policies and Programs for Researchers Survey" (http://ucfamilyedge.berkeley.edu/AAU%20Family%20Friendly%20Policies%20Survey.html) as cited in Goulden,. *Staying Competitive*. 18
[25] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)
[26] COSEPUP. 2007. *Beyond Bias*, 14. The report, using 2003 NSF Survey of Doctoral Recipients data, sees the greatest declines between PhD receipt and the first tenure-track position for life sciences, chemistry and math.; Nelson, D.J. 2007. *A National Analysis of Diversity in Science and Engineering Faculties at Research Universities*. Nelson sees the greatest declines between PhD and first tenure-track position in biology, chemistry and psychology; Committee on National Statistics. National Research Council. 2009. *Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty*. Washington, DC: The National Academies Press. The study reports the biggest declines between the fraction of women in the PhD pool and the fraction amongst applicants for tenure-track positions at research intensive universities in biology and chemistry.
[27] Ley, TJ & Hamilton, BH 2008 *Science*, 322, 1472; Martinez, *EMBO*, 977
[28] Martinez, *EMBO*, 977
[29] Goulden, M., Frasch, K., and Mason, M.A. 2008. "UC Postdoctoral Scholar Career and Life Survey." (http://ucfamilyedge.berkeley.edu/UC%20Postdoctoral%20Survey.html) as cited in Goulden, *Staying Competitive*, 14
[30] Martinez, *EMBO*, 977
[31] National Science Board. 2008. *Science and Engineering Indicators 2008*. Two volumes. (volume 1, NSB 08-01; volume 2, NSB 08-01A) [Figure 3-41, taken from Survey of Doctoral Recipients 2006]
[32] Nerad, *Science*, 1533; finding is for biochemistry postdocs, which, of the six disciplines they studied, had the largest share of postdocs.
[33] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)
[34] Ginther, D.K. and Kahn, S. 2005 (updated 2006). *Does Science Promote Women? Evidence from Academia 1973-2001*. Mimeo, University of Kansas.
[35] Nerad, *Science*, 1533
[36] Davis, *Careers*, 118
[37] Ibid.; Xie, Y and Shauman, KA 2003. *Women in Science: Career Processes and Outcomes*, Harvard University, Press, Cambridge, MA
[38] Mason, *Academe*, 21
[39] Ibid.; Martinez, *EMBO*, 977
[40] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)
[41] Mason, *Academe*, 21; Nolan SA, Buckner JP, Marzabadi CH & Kuck VJ (2008) *Sex Roles*, 58, 235
[42] Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed June 1, 2009)
[43] Martinez, *EMBO*, 977