An Overview of the Pipeline

1. **Women in the Academic Pipeline for Science, Technology, Engineering and Math: Nationally and at AAUDE Institutions**
   This study combines different data sets from the Association of American Universities Data Exchange (AAUDE) including: IPEDS Human Resources for faculty headcounts at all degree-granting institutions, Faculty Profile by CIP for 35 AAUDE institutions, doctoral degrees at all doctoral-research institutions, and 67 additional institutions. These data sets are used to analyze the changes in proportions of women from degree completion to faculty positions. The number and proportion of PhD degrees has increased over time. Women now comprise half of the total number of assistant professors, but are still underrepresented in full professor positions.
   http://aaude.org/system/files/documents/public/reports/report-2013-pipeline.pdf

2. **The More Things Change, the More They Stay the Same? Prior Achievement Fails to Explain Gender Inequality in Entry Into STEM College Majors Over Time**
   This study uses data collected from students' scores in math and science in high school and one year of college in order to find how the gender differences of test score distribution and the level of engagement of female and male students between math/science versus English/reading relate to gender inequalities in the STEM fields of postsecondary education. However, the results fail to explain whether prior achievement of students leads to the gender inequality in STEM. The study recommends that we should focus on how STEM fits within this inequality structure rather than focusing on these fields themselves.
   http://aer.sagepub.com/content/49/6/1048.full.pdf+html

3. **Survival Analysis of Faculty Retention in Science and Engineering by Gender**
   The retention rate for faculty in the US has been consistent for several decades. Although the number of women recipients of doctoral degrees has increased, the number of women in academic faculty positions has remained low. The study uses data collected from 2966 science and engineering faculties from 14 universities to measure the retention rate by following them from the time of hire to the time they leave their institutions. The percentage of women that are hired is lower than that of men; however, women have the same retention rate as men. The results found that it would take about 36 years in general academic departments and 100 years in STEM departments to balance gender in academia.
   http://www.sciencemag.org/content/335/6070/864.full?sid=12782c4f-b62d-499d-a399-eed4ab7520f8

Barriers and Challenges

4. **Women of Color Faculty in Science Technology Engineering and Mathematics (STEM): Experiences in Academia**
   This report examines experiences of women of color in postsecondary education and work environments to suggest recommendations in order to retain women in STEM fields. By

addressing the reasons as to why women leave STEM fields, a number of solutions are recognized such as: implementing zero tolerance policies for dealing with sexual harassment in the workplace, providing supportive work environments, funding for workshops and intellectual collaborations, promoting salary equity, etc.
http://www.heri.ucla.edu/nih/downloads/AERA-2013-WOC-STEM.pdf

5. **Psychological Barriers to STEM Participation for Women Over the Course of Development**
   This study identifies social psychological barriers of women from early childhood to adulthood that impede them from entering STEM fields. The influences and beliefs of parents, teachers, media, peers, social normality's, and other stereotypes all contribute to the lack of women in STEM fields. Although the influences are unintentional, they have built a belief in girls that girls are not as naturally talented as boys are in math and science. The study found that parents, educators, and employers can help to shape this negative belief into a positive one by addressing the factors and corresponding actions. Increasing the number of women entering STEM fields will not only benefit society, but will also help to decrease the gender wage gap.
   http://onlinelibrary.wiley.com/doi/10.1002/j.2161-0029.2014.00025.x/full

6. **Gender Differences in Fear of Failure Amongst Engineering Students**
   This study evaluated the level of fear of failure in undergraduate engineering students. Female students tend to have a higher fear level because of their lack of confidence in the field, a fear of shame and embarrassment, and they more frequently experience humiliation and discomfort in this environment than male students. This higher fear of failure in female engineering students provides an explanation as to why women often leave engineering fields.
   http://www.ijhssnet.com/journals/Vol_3_No_16_Special_Issue_August_2013/2.pdf

Exploring Bias

7. **Why They Leave: the Impact of Stereotype Threat on the Attrition of Women and Minorities From Science, Math, and Engineering Majors**
   This study defines stereotype threat as a social-psychological threat, which has negative effects. The study uses data collected from around 4,000 students in the National Longitudinal Survey of Freshmen which indicates that minority students experience stereotype threat more strongly than white students and that women do not experience it any more than men. The study also suggests having more women and minority role models will help to reduce the stereotypes and increase STEM participants.
   http://link.springer.com/article/10.1007/s11218-012-9185-3

8. **Using Implicit Bias Training to Improve Attitudes Toward Women in STEM**
   This study examines the impact of diversity training on male and female faculty members from 251 diverse universities in order to improve the implicit associations of women in STEM. Stereotypes have a negative effect on education, hiring, promotion, and prevention. Although 42% of women have earned PHD degrees, only 28% of women professors are in tenure track

positions. The study indicates that implicit associations help reduce the stereotypes because they can affect behavior outcomes.
http://link.springer.com/article/10.1007/s11218-014-9259-5#page-1

9. **The Role of Attributions in Stereotype Threat Effects: Female Achievements in STEM Domains**
   This study randomly selected 72 female undergraduates from DePaul University to explain how attribution and stereotype integration affect women pursuing STEM fields. Participants are randomly placed in one of the four conditions: a stereotype implying and internal, controllable attrition; a stereotype implying an internal, uncontrollable attribution; a stereotype implying an external, uncontrollable attribution; and a nullified stereotype condition. Theoretically, participants under three attribution combinations have more negative effects. However, the results also show they have greater level of performance under the three attribution combinations.
   http://via.library.depaul.edu/csh_etd/14/

Legal Efforts and Benefits of Broadening Participation

10. **Hierarchical Mentoring: A Transformative Strategy for Improving Diversity and Retention in Undergraduate STEM Disciplines.**
    In the US, more than half of the undergraduate students who declare a STEM major in their freshmen year do not graduate with a STEM degree. This phenomenon is higher for underrepresented minorities; about 75% of undergraduate minority students leave their STEM major for a different field of study. In order to retain students in these disciplines, the Howard Hughes Medical Institute Professors Program at Louisiana State University was implemented to identify the key factors that impact students' decision to leave a STEM major. The program mentors students to encourage them to continue to study in their chosen STEM fields.
    http://link.springer.com/article/10.1007/s10956-011-9292-5

11. **Religion as a Support Factor for Women of Color Pursuing Science Degrees: Implications for Science Teacher Educators.**
    This study examined how religion influenced the perseverance of underrepresented women studying STEM. The theme of religion emerged in a larger study that researched persistence factors for underrepresented women in STEM fields. This study highlights the importance of recognizing and considering how factors unrelated to science may influence women and underrepresented minorities to continue their studies or careers in STEM fields.
    http://link.springer.com/article/10.1007/s10972-012-9286-z#page-2

12. **Women's Empowerment through Education-Advancing in STEM**
    In this report, the author focuses on exploring ways to help empower women through education in STEM fields from local to global levels. Based on the study and research of several organizations and institutions, the author gives suggestions on how to target young women into pursuing STEM fields, such as providing opportunities for young women to interact with

successful women scientists, creating programs for girls to experience STEM fields, and offering outreach counseling for female students in schools and communities.
http://www.womennc.org/wp/wp-content/uploads/2014/04/WomenNC2014-Research_WomenEmpowermentThruEduc_AdvanceInSTEM_FellowAlexPolk_022014.pdf

Recommendations and Policy Implications

13. **Why So Few Students Do Maths and Science. CEPS Policy Brief No. 313, 10 January 2014**
This report argues that instead of attempting to encourage students to study STEM fields through providing information and campaigns about STEM career prospects and wages, actual incentives should be provided, such as special scholarships or reduced fees, because it may be more timely and/or expensive to pursue a STEM major.
http://aei.pitt.edu/46886/

14. **Accelerating Change for Women Faculty of Color in STEM: Policy, Action, and Collaboration**
This article focuses on a convention that brought together 50 experts from organizations, institutions, and government agencies to address the barriers that women of color have to face in STEM fields. The convention also discussed policy shifts that would better promote the success of women of color in STEM fields. Some of the recommendations were creating more convention opportunities for women of color to share their experiences, knowledge, and network-support formation; providing mentors for women of color in STEM, and increasing cross-institutional collaboration among organizations, institutions and government agencies.
http://www.iwpr.org/publications/pubs/accelerating-change-for-women-faculty-of-color-in-stem-policy-action-and-collaboration

15. **Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics**
The President's Council of Advisors on Science and Technology advised President Obama on recommendations and strategies to improve STEM education. Three main goals of the report are improving the first two years of STEM education, providing students with tools to excel, and diversifying pathways to STEM degrees. In order to achieve those goals, the Council also suggested actions to implement the recommended policies such as: creating a competitive grants program at the National Science Foundation (NSF), expanding NSF funding in scientific research and engineering design courses, encouraging pathways from 2-to 4-year institutions through an NSF program, etc.
http://files.eric.ed.gov/fulltext/ED541511.pdf

The Academic Experience for Women of Color

16. **Female Physicist Doctoral Experiences**
This study examines the experiences of eleven females in physics doctoral programs. The physicists stated lack of time outside of school, lack of time for family, guilt over enjoying free time as their work-life conflicts. In order to ensure their success in the field, the female

physicists received support in their career choices from parents, peers, mentors, and advisors. This support helped the physicists to find balance in their work-life conflicts.
http://journals.aps.org/prstper/abstract/10.1103/PhysRevSTPER.9.010115

17. **Family Matters: Family Support and Science Identity Formation For African American Female STEM Majors**
This study uses data collected from interviewing 10 successful African-American female undergraduates in STEM to identify how the role of family and other factors impact the formation of African-American women's science identities. The author concludes that family, religion, community, and friendships are common factors that led the 10 African-American females to their success. By interviewing them, the author hopes that young girls can be open-minded about science and pursue a degree in a STEM field.
http://search.proquest.com/docview/1439141550/fulltextPDF/7AF1994B68744FBAPQ/1?accountid=152665