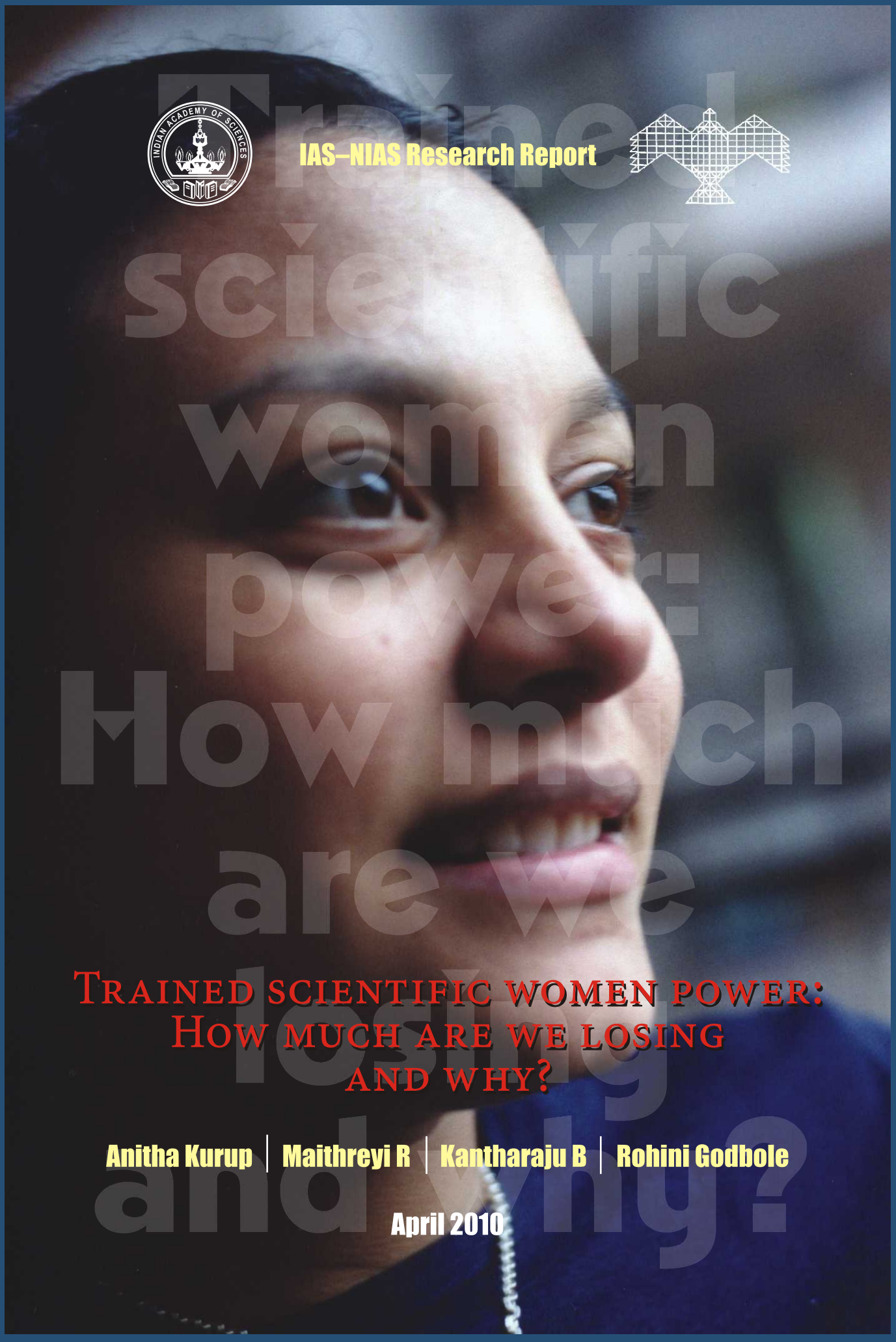

IAS–NIAS Research Report

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TRAINED SCIENTIFIC WOMEN POWER: HOW MUCH ARE WE LOSING AND WHY?

Anitha Kurup[2]*, Maithreyi R[1,2], Kantharaju B[1,2] and Rohini Godbole[1]

April 2010

IAS–NIAS Research Report

Indian Academy of Sciences

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This study on **"Trained Scientific Women Power: How Much are we Losing and Why?"** is a unique initiative in terms of the nature of the study and the persons involved. The study is the collaborative effort of a team of social scientists and natural scientists employing both quantitative and qualitative methods. The survey was the outcome of discussions of a group of scientists consisting of Prof. Vineeta Bal (National Institute of Immunology, New Delhi), Prof. Rohini Godbole (Indian Institute of Science, Bangalore), Dr Anitha Kurup (National Institute of Advanced Studies, Bangalore), Prof. Shobona Sharma (Tata Institute of Fundamental Research, Mumbai) and Prof. Pratima Sinha (Bose Institute, Kolkata). In discussions with the then Academy President and NIAS Director, Dr K. Kasturirangan, it was envisaged that this could be a collaborative project. Further, when presented to the Council of Indian Academy of Sciences, the Council of the Academy, under the presidentship of Prof. T. V. Ramakrishnan, supported the idea that the survey be taken up as an initiative of the WiS Panel of the Academy. From its initial conceptualization till the final stages of completion, valuable contributions were made by several people in different roles and capacities. We hereby sincerely acknowledge all their contributions.

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The actual survey was preceded by the creation of a large database of men and women scientists. The subjects for the survey were chosen from among this database. The creation and management of this database would have been impossible without the help of Mr. Poobalan D, who designed it, and Ms. Anitha M.K., who was responsible for the efficient management of the database. We extend our heartfelt thanks to them for their help. We would also like to acknowledge Mr. Janardhan's contribution towards the development of an online version of the questionnaire. Our many thanks to Mr. Raja P.K. for the creation of an online PDF version of the men's questionnaires which was a useful tool in obtaining responses from several men scientists who were unable to spare time for a 45 minute telephonic or personal interview.

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The crux of the survey is based on the analysis of the vast amount of data collected for approximately 100 questions from each of over 700 participants. Handling and understanding of such data required expert advice which we readily received from Dr. Lalitha Sundaresan, Visiting Professor (NIAS) and Prof. N. V. Joshi (IISc). Dr. Lalitha has constantly given us her time, suggestions and feedback and provided us with fresh perspectives to look at the data.

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CONTENTS

EXECUTIVE SUMMARY

The study "Trained Scientific Women Power: How Much Are We Losing and Why?" was conducted to understand the reasons for the loss of trained women scientists and to identify strategies and provisions to retain them in Science.

The survey was conducted across India with 568 women scientists and 226 men scientists who had a PhD in Science, Engineering or Medicine. The survey covered women and men who were currently engaged in scientific research and teaching, engaged in jobs other than scientific research and teaching and even those who were currently not employed. The survey covered over 100 questions on personal and family characteristics, educational background, employment details, organizational atmosphere and research and productivity factors. The main findings of the study and the recommendations drawn from it are given below:

SUMMARY AND RECOMMENDATIONS

Women Scientists: Women in Science Research(WIR), Women not in Science Research (WNR), and Women not Working (WNW)

The complexity of developing interventions to retain women in Science stems from the diversity in the characteristics of women scientists across the different sub-groups of women in Science. The differences also, perhaps, stem from the different priorities the groups have because even with several commonalities among demographic profiles of the women, differences on important aspects such as professional prospects vs. childcare or family responsibilities are seen.

- An analysis of sample details reveals that while a majority of all the three sub-groups of women were married, the highest percentage of WIR were 'never married' (14.1 per cent). Women who were 'never married' are distributed across all age cohorts. A majority of the three sub-groups also reported having children who were over 15 years. However more WNW across all age groups had younger children (between 0-5 years) compared to the other two groups.
- A majority of the women also reported living in nuclear families. A significantly higher percentage of WNW reported having received no help with childcare. Thus for WNW, the absence of support either by choice or compulsion could perhaps be an important reason for their dropping out of Science. In contrast, WIR and WNR reported receiving help from a combination of agencies like their parental family, marital family and professional help.
- Interestingly, a significantly higher proportion of WNW also have had spouses in the same field or organization, and this could have been another major factor contributing to their dropping out.
- With respect to organizational details, professional advantages and opportunities and getting jobs have been the main factors influencing job selection. A majority of the responses from all groups indicated **not getting jobs as the primary reason for not taking up posts applied to**. While more WIR and WNR have indicated **better professional prospects** as reasons for not taking up the posts, none of the responses from WNW indicated this reason.
- With regard to leaving previous jobs, **better professional prospects have been the most important consideration for WIR and WNR, while the temporary nature of the post has been the reason most often stated by the WNW**. Family reasons have also been reported as the an important factor by WNW for leaving jobs.
- WIR and WNR also significantly differed with respect to reasons for accepting present post. **A greater proportion of WIR have reported professional advantages as reason for taking up the post, while for other reasons such as lack of other suitable options, freedom and autonomy in work, permanency of position, etc has figured as an important reason.**
- **In terms of working hours, both WIR and WNR have reported working between 40-60 hours per week on an average.** However, a higher per cent of WIR have reported working for 60 hours or more per week compared to WNR, while a greater per cent of WNR have reported working between 20-40 hours per week compared to WIR.

- With respect to breaks in career, there is a significant difference in the reasons reported by the sub-groups. While childcare and elder care have been important reasons for all three groups, **more WIR have reported other family factors such as marriage, husband's or father's transfer as significant reasons; more WNR have reported further studies, health reasons or non-availability of fellowship due to age limits; while WNW have reported difficulties in finding jobs and institutions as a significant factors for breaks in career.**
- Having noted that there are differences between the three groups of women scientists with respect to reasons for not taking up jobs, or leaving jobs, as well as reasons for breaks, it is hardly surprising to note the significant differences between the groups with respect to the provisions considered important by them to retain women in Science careers. **While all three groups have considered flexibility in timings to be the most important provision, they differ with respect to other useful provisions. For WIR, who continue to juggle between scientific research and teaching careers on the one hand, and family responsibilities on the other, provisions for transportation and accommodation are important. For WNR, better HR policies have been reported as important provisions to retain women in Science. For the third group of WNW, childcare facilities at the workplace are reported as important.**

Summary of Women in Science Research(WIR) and Men in Science Research (MIR) :

The analysis of the educational, work and research profiles of women and men in research is important to identify factors that differentiate between women and men differ, and subsequently contribute to their advancement or dropping out from Science.

The data analysis reveals the following:

- Sample details have shown that while 14 per cent of WIR were 'never married', only 2.5 per cent MIR report being 'never married'. In comparison to 39 per cent women who reported that their spouses were doctorates and 40 per cent who reported that their spouses were in Science, only 16 per cent men reported that their spouses were doctorates and 19 per cent reported that their spouses were in Science.
- 86 per cent men scientists compared to 74 per cent women scientists reported having children. **A higher proportion of WIR spent between 40-60 hours per week at work compared to MIR; while a higher percentage of MIR reported spending less than 40 hours per week at work compared to WIR when their children were growing up.**
- With respect to employment and organizational factors, it was observed that a significantly higher proportion of **women (46.8 per cent)** compared to **men (33.5 per cent)** reported working between **40-60 hours per week**. **More men reported working less than 40 hours per week compared to women.**
- For both women and men, getting jobs and professional advantages and opportunities have been important reasons in determining present and previous jobs. More men compared to women have reported leaving previous posts for better prospects. For men and women approximately equal proportion of responses were reported indicating family as an important factor in taking up present posts. However, the proportion of responses reported by women indicating organizational factors such as flexible timings, day care facilities, transportation and accommodation, etc for taking present posts is higher compared to the responses from they men scientists. The importance of organizational provisions to help women balance careers and domestic responsibilities have been highlighted by this data.
- Men and women differ significantly with respect to breaks in career also. A significantly lower proportion of men have reported breaks in career compared to women. While personal factors such as health, further studies and voluntary retirement have led to breaks for men, for women, domestic responsibilities of childcare and care for elders have been the primary reason for the breaks in career.
- Perceptions regarding why women drop out of Science also differed between the groups. While higher responses from men have indicated family and socio-cultural factors, women have perceived organizational factors such as lack of flexibility in timings, lack of role models and mentors, discouraging and uncongenial atmosphere, etc to be responsible for women dropping out from Science.
- Men and women differed with respect to the provisions that have been considered important to retain women in Science. **While a majority of**

WIR and MIR have reported flexibility in timings as an important provision, a larger percentage of responses by MIR indicated the need for refresher courses, fellowships, awareness and sensitization campaigns to retain women in Science. In contrast, women perceive provisions such as accommodation and transportation as provisions that would help them balance their career and family. Since most scientific organizations have a greater proportion of men compared to women, especially on decision-making posts, the differences in understanding of the problem between men and women could have important implications. Provisions that are designed without taking into account the experiences of both, women and men, who are part of this work space will not yield the desired results. **Thus, it may be important to consider the view points of gender sensitive men scientists along with gender sensitive women scientists who have a nuanced understanding of the complex functioning of S&T organizations.** It must be emphasized that the S&T organizations in our country are varied and hence experiences of one organization cannot represent the other. **Sociological studies of S&T organizations with a democratic multi disciplinary team will go a long way to provide useful insights that will help the country frame policies that can retain the talent pool of both women and men.** Excluding the experiences of women in Science can lead to inadequate provisions. Thus, it is important that **more women are represented on committees and decision making posts to influence the policies that can be conducive to women.**

RECOMMENDATIONS

The primary purpose of the study was to develop a comprehensive set of recommendations and policy directions that are evidence-based and that would motivate and retain women in Science research. Various bodies have dealt with this issue and formulated recommendations based on data and/or group discussions, meetings and suggestions as well as feedback from various women scientists. Some of these recommendations are available in reports such as:

(1) *'Science career for Indian women: An examination of Indian women's access to and retention in scientific careers'* (October 2004) by Indian National Science Academy (INSA). **(2)** *'Women in Physics in India'* by Rohini Godbole, Neelima Gupte, Pratibha Jolly, Shobhana Narasimhan and Sumathi Rao presented at the Second IUPAP Conference on Women in Physics held at Rio de Janeiro, Brazil between May 23-25, 2005. **(3)** *'Evaluating and enhancing women's participation in scientific and technological research: The Indian Initiatives'* (January 2010) by National Task Force for Women, Department of Science & Technology, Government of India.

Interestingly many of the recommendations mentioned in the above reports find resonance with the recommendations of this report. However, since this study for the first time has included sub- groups of women scientists and men scientists that were not covered by the earlier reports, several different and nuanced recommendations have emerged from this study.

The recommendations have been developed through interactions with a wide range of women and men scientists from different parts of the country. While the purview of the survey covered only those with a PhD in Science, Engineering or Medicine, adequate care was taken to represent members from a range of scientific organizational settings like autonomous institutions, research organizations, universities and colleges, industries that are government owned and private sectors. For the first time, this study has covered women scientists who may not be currently employed as well as men scientists. The data convincingly revealed that the groups were not homogenous and the diverse experiences of the sub-groups of women scientists and men scientists has vitally informed our recommendations. Thus, **the myth of 'one size fits all' accepted by Science policy makers has been questioned through this study** and an attempt was made to represent the many different voices and needs that Science policy makers have to respond to if there is to be a serious engagement with the central question of attracting and retaining women in Science.

Integral to retaining women in Science is acquiring information on the number of women PhDs in Science. An important move in this direction will be to build on the existing database created by the IAS on a mission mode by assigning dedicated staff and targeting completion of a comprehensive database within one year's time. It will also be important to

dedicate resources to the continual maintenance and up-gradation of the database to reflect current information and trends. Since women and also men who have dropped out of Science are difficult to locate, media drives and campaigns through television and newspapers will have to be undertaken.

Important headway can be made by addressing organizational and infrastructural facilities as well as undertaking policy changes that may be critical to attract and retain women in Science research. Such changes need to move beyond the traditional framework that locates societal and family responsibilities as singular factors responsible for women dropping out of Science.

The data has importantly revealed **close to 85 per cent of the women who are pursuing active careers in research have competently and in very different ways balanced families and careers. Among those in scientific research approximately 14% per cent have reported being 'never married' and are distributed across all disciplines.** Among the largest majority of those married, never married, with or without children, **family and societal pressures have been a small but significant factor reported for not taking up the job .** Even among those who are currently not working, the corresponding figure is only 3.3% indicating that **family and societal pressures cannot explain completely why women drop out of Science.**

These facts are important indicators of women's commitment to pursue scientific research. Institutional support through 'gender-neutral' facilities and policies will be vital in attracting and retaining women in Science. These policies in turn will have a spin-off effect in redefining 'gender roles' at home that could maximize the productivity of women and men scientists. In essence, this will lead to maximizing the productivity of the organization on the whole.

Gender neutral facilities and policies are also important to prevent, on the one hand, the stereotyping of gender roles and on the other, the stigmatization of women for privileged or special treatment. In the West there has already been a recognition of the importance of having such gender-neutral facilities and interestingly many men have availed its benefits. A caution in this regard would be however useful**. Periodic reviews of the new policies are essential to make sure that they do not work against the interest of women in particular and Science practice in general.**

ORGANIZATIONAL / INFRASTRUCTURAL PROVISIONS

A. Provisions to manage career and home: Provisions of on campus housing, transportation[1], state of art child care and facilities for care of elderly as well as professionalized domestic help should be provided for both women and men faculty at all S&T organizations. This should include universities, research organizations and autonomous organizations. These provisions are important for scientists to manage their family responsibilities. This will release their time and energy that can be utilized for their scientific research activities. Priority accommodation and childcare and eldercare facilities for those with young children and elders would be important.

B. Flexibility in timings: The data revealed that despite multiple responsibilities, a higher proportion of women scientists in research reported working between 40-60 hours per week than men scientists. However flexibility in timings will benefit both women and men scientists.

It is important to evolve a gender neutral policy of flexible timings in all S&T organizations that allows one to manage multiple responsibilities. This is not to be construed to mean that scientists would want to work from home and not spend time in the laboratories. Rather, it is an indication that organizations are willing to introduce policies that will allow a greater participation of scientists to engage with research. The policy will have extended office hours which will give a margin of three hours for starting and closing work officially. This will mean that scientists will start their office hours between 7 and 10 am and close it respectively between 4-7 pm in the evening. Work can be organized by the scientists so as to use the official timings to interface with the administration if necessary and to hold official meetings at a time when convenient for all team members. The quorum required for departmental meetings should have an acceptable representation of both genders. The extra time margin provided could be used productively on research.

C. Opportunities for networking and collaboration: Increasing opportunities for networking and collaboration through increased

number of travel grants; organizing workshops and conferences dedicated to facilitate collaborations; integrating sessions in conferences and workshops for honing networking skills is important and such measures to provide greater opportunities for women scientists needs attention. In considering applications for conferences and workshops, it is important to ensure that there are adequate number of applications from both women and men through active pursuit[2]. The selection must take care of representing members of both groups, even while specifying the merit criteria. It would be important to have a transparent, publicly displayed checklist indicating the requirements for merit based selection, both to encourage more women to apply through knowledge of these criteria as well to ensure transparency in the selection procedure.

Mentoring: Mentoring mechanisms and integrating sessions during workshops and conferences to enhance capabilities of women scientists are important factors in attracting and retaining women in Science. As adopted by some corporate, mentoring can also be encouraged by instituting official policies that pair senior and junior colleagues to provide for guidance. Providing incentives for mentoring of women scientists and linking it as an assessment criteria on annual reviews and promotional reviews should be mandatory.

POLICY CHANGES

D. Policy on transparency in selection and evaluation procedures: All institutions must make available the criteria for selection and promotion of all faculty. According to literature the availability of actual selection criteria helps increase the pool of women applicants and builds confidence among those who contemplate whether to apply or not because of the low success rate for women. Studies on the hiring practices of institutions can provide vital clues to the evaluation procedures and qualities perceived as desirable for a good candidate. Such studies would also help institutions develop a ready checklist to be made available to all candidates during selection.

E. Policy on Time Bound Target Recruiting System (TRS): For institutions that do not have adequate representation of women at all levels starting from students to faculty (including Assistant Professors, Associate Professors, Professors, Deans, etc), develop a time bound recruitment target system(TRS). This should be based on the current representation of women in the institution as well as age and the size of the institution. **Make it mandatory for institutions to review TRS based on outcomes[3] rather than restricting the policy to mean just providing opportunities or setting up processes.**

F. Increase in recruitment of women to premier research institutions: The government must proactively increase the number of women scientists in premier institutions to break the stereotype that women scientists are best as college or university teachers. Increasing the number of women in premier institutions that gets greater visibility; that have comparatively higher resources and better infrastructural facilities, will have a far reaching impact on women wanting to choose a scientific career.

G. Mandatory disclosure of gender break-up of faculty and students across departments and levels: It must be mandatory that every S&T organization, within a time frame, puts up gender disaggregated data of their employees at every level starting from students to the professors and deans. The data must be presented department wise.

H. Mandatory composition of one-third women members in committees: It must be mandatory that all decision-making committees, like the search/ selection/hiring committees, committees that decide on promotions at all levels as well as other decision-making committees have at least one third women representation (or work towards it within a specific time frame). Efforts to get women representatives from outside the institution, city and state must be explored. It would also be important to make mandatory a rotational system of selection of women representatives to different institutional as well as national committees based on merit. This will give opportunities to all women to be a part of the decision making process. It will broad base the participation of women scientists and hence become more representative.

Further as the study data has shown, perceptions and experiences of different age cohorts of women in Science are very different. **More importantly, the differences in perception of useful provisions among the different age groups indicates the need to balance policy making and decision making committees with younger women since they could have important inputs to contribute. The trend of appointing only senior and retired faculty to such important decision making groups needs to be revisited in this context. In other words**

membership to these committees should not be monopolized.

I. Introduction of Long-term schemes for re-entry: There is a need for modification of existing re-entry schemes to cater to long term working opportunities for women and men who return to scientific career after a break. Provisions for short term schemes, temporary positions and post doc positions limit the potential attracting and retaining them in scientific research careers. It would be important to ensure complete autonomy for these scientists by making it mandatory for all government supported institutions or labs to take them on independent projects. To optimize the use of lab facilities supported by the government, incentives can be given to these institutions for having taken more independent researchers on government schemes. These scientists can be subjected to a review processes once in five years as done in the case of scientists who are in tenure track positions. Facilities for these scientists like travel grants, PF, transport facilities, and child care/care of elders must be extended. It would be important to ensure to the autonomy of these women (or men) scientists. This can be achieved through the constitution of a local advisory committee that can guide and review their work, rather than linking the fellowship to the identification of a faculty member at a particular institute.

J. Increase in job opportunities: The study has highlighted the lack of job opportunities in formal spaces in S&T organizations as a significant factor for women dropping out of Science. While efforts to increase job opportunities in S&T organizations must be made, it may be useful to create entrepreneurial opportunities in S&T fields that require training at the highest level through the creation of venture capital. A support mechanism at the national and state level needs to be created for such an enterprise.

K. Creation of scientific infrastructure through venture capital: Alternatively, additional infrastructure and lab facilities to increase job opportunities in basic Sciences through the creation of venture capital could be explored. This could increase the capacity of the formal workspace related to S&T.

L. Policy on employment of spouses in the same organization: The study has revealed that the largest proportion of women who were unemployed had spouses who worked in the same field or organizations. A higher proportion of this group also reported that they had difficulty in finding jobs as reasons for their breaks. Together, this data highlights the importance of ensuring the continuation or accommodation of spouses in the same organization or at least within different organizations in the same city or town to prevent the loss of trained scientific women power. It should be made mandatory for all S&T organizations to state it upfront and bring into practice employing couples when found qualified. This is particularly relevant with respect to small cities and towns where opportunities for Science research are limited to one or two institutions. The government agencies must play a proactive role in facilitating employment of the spouse when the other is transferred to prevent the loss of trained scientific human power. Alternatively, provisions to carry the jobs to other mutually agreed upon institutions at other parts of the country, when the spouse is transferred should also be introduced to help women continue their career without breaks. Such a provision can be gender neutral as it would be helpful for men also to relocate while continuing on the job, when their wives are transferred.

M. All recommendations need to be reviewed periodically to make sure that steps taken to attract and retain scientific human power (including men) are not detrimental to the interest of promoting equality.

The recommendations developed here are the first step towards understanding and addressing the issues of the diverse groups of women in Science research. Several more research studies is required to understand the complex process of women's choices with respect to careers in Science.

Endnotes:

[1] In view of security concerns, it is not just enough for organizations to compensate for travel but provide assured transportation facilities for late working hours for both women and men. This provision has already been adopted by the private sector, particularly IT and ITES services which has enabled more women also to work in these sectors.

[2] Subject specific databases developed by IAS and NIAS as well as the database of DST can be used to send out mails calling for papers/abstracts since information by and large is restricted to premier and well known institutions. Women from smaller institutions may thus not get such opportunities.

[3] Outcomes refer to the actual increase in the number of women employee across all levels and departments.

INTRODUCTION

"....to be liberated woman should feel free to be herself not in rivalry to man but in the context of her own capacity. Women should be more interested, more alive and more active in the affairs of society, not because they are women but because they comprise half of the human race."

-Indira Gandhi, Former Prime Minister of India

Science and technology are key inputs to the economy. The peculiar problem for Science and technology in India, as elsewhere, remains the optimal performance of women in Science. Women who form half of humanity have for long been kept on the fringes of Science and treated as passive recipients of knowledge rather than generators of knowledge, innovation and economic change[1].

While there has (no doubt) been a growth in the number of women entering Science, the gender gap still remains large, especially with respect to participation at higher levels in academic careers, across the world; this phenomena of attrition of women at progressively higher levels has been described as the 'leaky pipeline'.

For example, as of 2001 women comprised 37 per cent of the total number of doctorate holders in the US, but only 26 per cent of the total PhD holders employed in Science and Engineering. Women outnumber men in educational institutions with lower salaries and prestige such as K-12 schools, 2-year colleges, junior colleges, and technical institutes but comprise only 27 per cent of other Science and Engineering jobs (NSF 2007a). In Europe, the Higher Education Statistics Agency (HESA, 1998) showed that women are still not succeeding in academic careers, especially in Science. The percentage of women declines to between 15-20 per cent at the full professor level (Nature Medicine, 2004). Data collected by the Working group on Women in Physics of the International Union of Pure and Applied Physics (IUPAP) from 1990 -2002 shows an attrition of women across countries from the graduate to the professional level. (Refer table 1 given below)

Table 1: Country-wise Attrition of Women in Physics from Under-graduate to Professional Level

Country	Under-Graduate Level	Graduate Level	Professional Level
India	32 %	20%	11%
UK	20%	19%	9%
France	38%	20%	19%
USA	20%	15%	10%

Source: Adapted from data by Working group on Women in Physics (IUPAP). http://wgwip.df.uba.ar/

In the Indian context, while there has been a rise in the numbers of women entering Science and Engineering education there is a steady attrition of women at the progressively higher levels.

Even though one of every four scientists in India is a woman (Sur, 2001)[2], the largest pool of them remain at the lower rungs of Science. Even in the Biological Sciences, which have a higher proportion of women, they are limited at junior faculty positions, where their proportion ranges from 18-33 % (Bal, 2005).

Assumptions and beliefs that women's growing access to education would lead to gender equity in scientific careers have thus proven to be unfounded.

Absence of women in critical numbers in decision making roles and positions continues to be a large concern. Even on other measures of awards and recognition that are considered hallmarks for a successful scientific career, women remain highly under-represented. Internationally, only 16 of the total number of Nobel prizes in Science have been awarded to women until 2009. The number of women who have been elected as Fellows of the Royal Society, the Royal Academy of Engineering and the Institute of Biology in UK are well below 10%. Women comprise 10 per cent of the National Academy of Sciences, USA (Sengers, 2009). The Inter Academy Council (IAC) in its report submitted in 2006 also noted that women typically make up less than 5 per cent of any Academy's members. Only 10 women have received prestigious national awards in Science in India such as the Bhatnagar Award or the Young Scientist Award. Similarly, women's representation on different advisory committees has been less than 15 per cent in India (Bal, 2004).

Thus, across the world large numbers of women with the highest qualifications are under-utilized in Science research and academia while only 10% of them enter senior scientific posts. (Greenfield Report, 2002)[3]. These trends indicate poverty in Science research due to lost talent.

Women's poor participation in academic Science careers has commonly been associated with women's inherent characteristics and domestic responsibilities. However, in recent times studies such as those by Lemoine (1992), Kumar (2001), Basu (1997, as cited in Kumar 2009) and others have revealed no statistical difference in the productivity of women and men scientists, in terms of the number of books and articles published by women and men scientists and have even shown women's publications to be in more prestigious journals when compared with Indian scientists in general. Family studies of men and women scientists have shown many women choosing alternate paths to career and family in order to keep their scientific career on track. Despite the lack of flexibility in timing family life in the Indian context for women, several studies have shown women to perform competently with respect to their careers. Studies such as those by Subrahmanyan (as cited in Kumar, 2009), Gupta and Sharma (2002), etc have shown productivity in Science to be the highest among married women with children, and also a higher number of publications and rate of participation in conferences for married women.

An interesting finding by Kumar (2009) has shown that while there was no statistically significant correlation found between gender and productivity, there was a statistically significant correlation ($r=0.22$, $p=0.01$) between rank and gender indicating that the number of women is lower when one moves into higher positions in organisations. This perhaps then is a result of the organizational practices and the culture of Science. Several studies have pointed to the role of unfair practices and discrimination, inadequate provisions and salaries that could be potential deterrents for women's continuation in Science. Studies at MIT as well as a study by Gupta and Sharma (2009) in four institutions of national importance in India have shown poorer supportive facilities for women such as child care facilities on campus, administrative apathy, lack of organizational provisions such as separate and sufficient number of washrooms, their poor maintenance and lack of security for women on campus. Differential salaries for men and women have been reported across the world, including for women in India (Duraisamy & Duraisamy, 2009).

Formal and informal barriers in the work place such as unequal standards imposed on women during selection (Wenneras and Wold, 1997), gender biases which include open admission by professors of not wanting women students due to fear of marriage and their dropping out; lack of social mobility attributed to them due to social norms; maintenance of hierarchies through disregard for women's authority, etc (Subrahmanyan, as cited in Kumar 2009) affect women's participation in Science. Thus, the culture of Science dominated by patrifocal ideas get translated into 'micro-inequities' for women in day-to-day functioning adding to their frustration and demoralization (Gupta & Sharma, 2009).

Developing Gender-sensitive Policies:

As noted above, there is a conspicuous absence of women from the higher rungs of Science and Science research, despite the increase in their participation in Science education. Addressing the issue of absence of women from Science, their higher attrition and methods for retention, is crucial for any country. Adequate representation of women in Science is important to ensure scientific productivity and adequate human resource for scientific enterprise as well as from the perspective of diversity, to encourage creativity and innovation through the amalgamation of different modes of thinking.

Inclusiveness in Science can only be achieved when there is a politically unbiased governance system set in place that acknowledges these disadvantages imposed on women while recognizing their contributions. Institutional awareness and awareness among Science-managers, Science publishers and reviewers, and other scientific personnel of the unique challenges for women in Science is essential. Leadership that is sensitive to these underlying biases that operate in Science, and is committed to bringing diversity in Science research and practice can go a long way in addressing this situation.

An important consideration should be the heterogeneity among women and development of nuanced policies, programmes and interventions that do not treat women as a homogenous group. (Anitha and Kasturirangan, 2007).

The present study **'Trained Scientific Women Power: How Much are we Losing and Why?"** is an attempt to bring visibility to the unique challenges faced by different groups of women in Science and to understand their experiences and needs in order to develop meaningful mechanisms of intervention.

METHODOLOGY

The aim of the present study, **"Trained Scientific Women Power: How Much are we Losing and Why?"** jointly conducted by the National Institute of Advanced Studies (NIAS) and the Panel for Women in Science of the Indian Academy of Sciences was to investigate the reasons for poor participation of women with doctorates in Science, Engineering or Medicine, in careers in Science. Specifically, the objective of the study was to examine the reasons for the loss entailed when women who have received the highest level of scientific training gained at the doctoral level are not engaged in careers that utilize that training and experience, thus indicating a mismatch between their qualification and employment at lower levels of Science. The objective was to develop a comprehensive set of recommendations, policies, interventions and strategies in order to check the loss of trained scientific women power.

A unique strength of the project has been the involvement of a team of scientists and social scientists in order to analyze this problem to develop more holistic and comprehensive policies. This collaboration has ensured that a deeper understanding of the processes and milieu of scientific research and scientific careers can be obtained with the help of the scientists, while simultaneously applying the expertise of sociological perspectives and wide-range of methodology available to the social scientists who bring their unique training and perspective to problems related to human behaviour and functioning.

Objectives of the Research Study

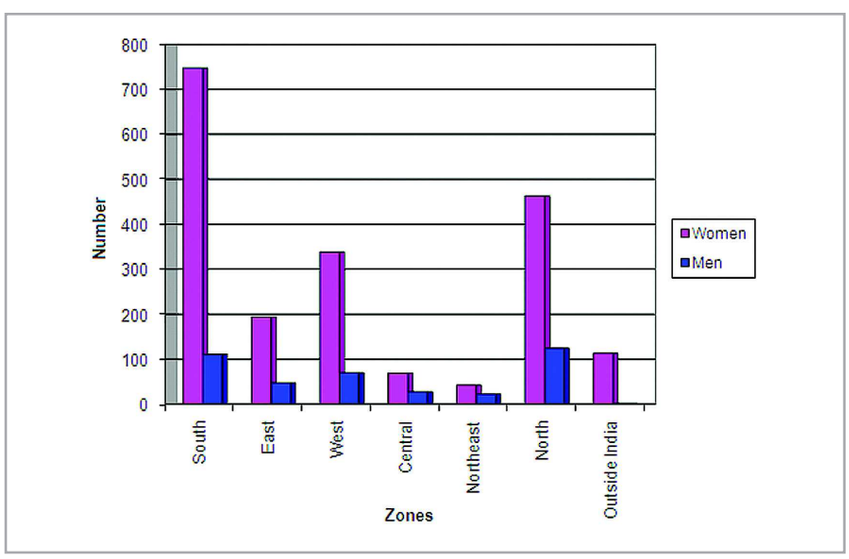
The specific objectives of the research study were as follows:

1. To create a database of women scientists with a PhD in Science, Engineering or Medicine;
2. To analyze trends and reasons for the drop-out among women scientists from a research based career; and
3. To develop a set of comprehensive recommendations to retain women in Science.

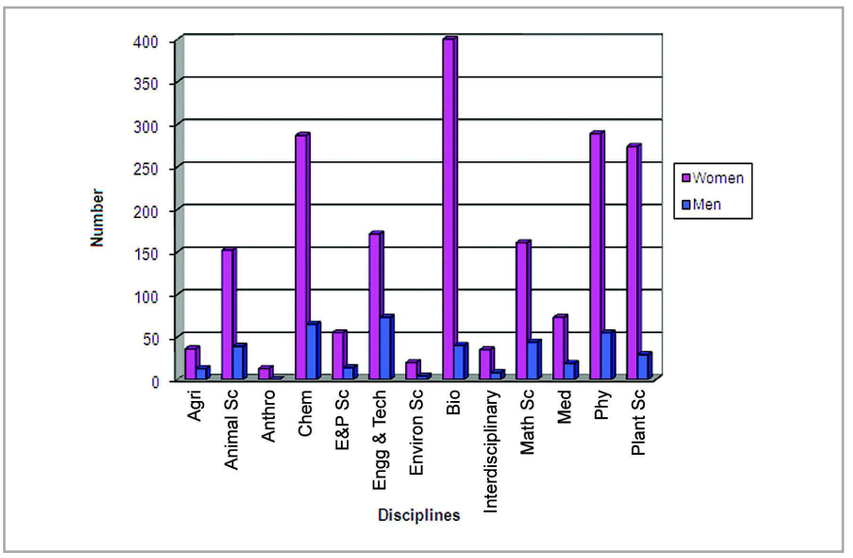
Methodology

Sample: The aim of the project was to obtain a picture of the nation-wide loss of trained scientific women power, by sampling a representative number of scientists and documenting reasons for this loss of human power, so that appropriate interventions, policies and strategies may be framed to check this loss. It was also planned to sample a proportionate number of men scientists on a nation wide basis to allow for a comparative study of the reasons for the loss of scientific personnel.

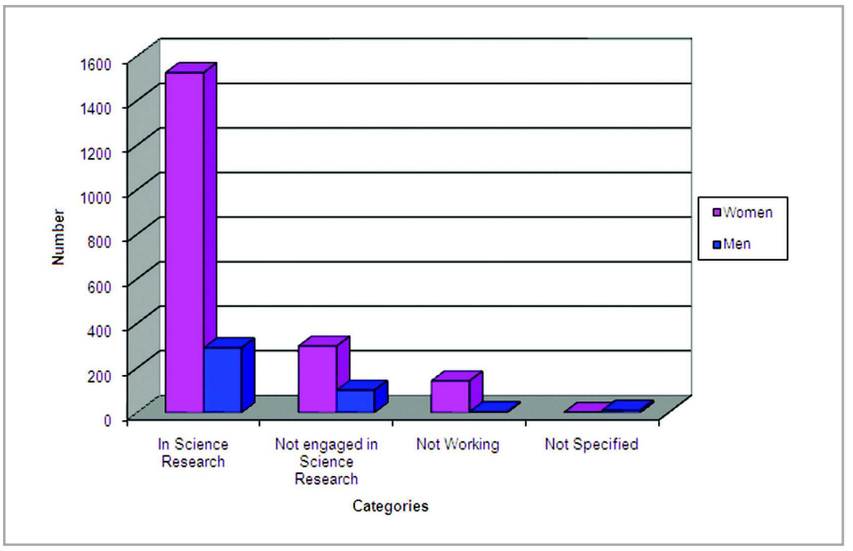
Based on the objectives of the study, a total of **2369** scientists who had completed a PhD in Science, Engineering or Medicine were registered. Of these, **1966** were women and **403** were men. Zone-wise, discipline-wise, and category-wise break-up of the scientists registered on the database is given below.



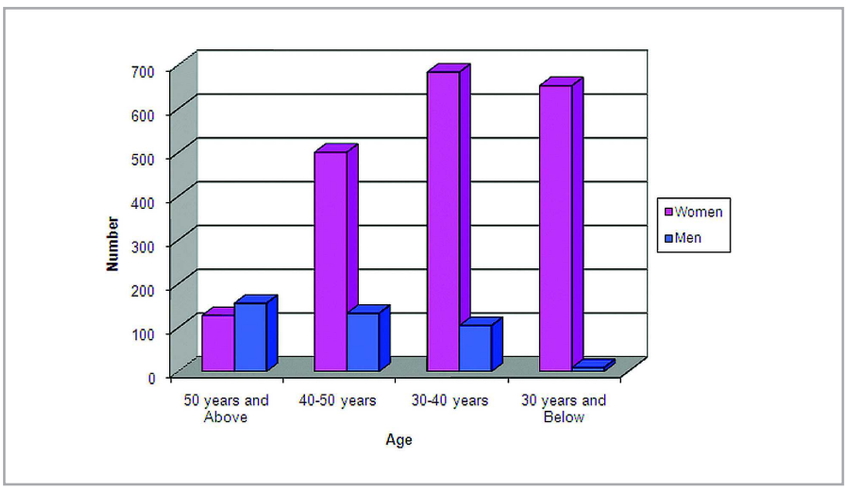
Graph I: Zone-wise Distribution of Database Registrants (Refer Appendix I for the table)



Graph II: Discipline-wise Distribution of Database Registrants (Refer Appendix I for the table)



Graph III: Category wise Distribution of Database Registrants (Refer Appendix I for the table)



Graph IV: Age Wise Distribution of Database Registrants (Refer Appendix I for the table)

A survey was conducted with a total of **794** of the registered members (**568** women and **226** men) based on voluntary participation and availability of respondents. Table 1 gives a break-up of the survey respondents by category.

Category	Women		Men	
	Frequency	Percent	Frequency	Percent
In Science Research	312	54.93	161	71.24
Not in Science Research	182	32.04	64	28.32
Not Working	74	13.03	1	0.44
Total	**568**	**100**	**226**	**100**

Research Design:

The project was divided into three phases spread over 3 years (2007-2009). In the first phase, a database of women scientists with a PhD in Science, Engineering or Medicine was created with a conscious effort to represent women scientists from different cohorts starting from the year 1960 to the present. In order to obtain information about women scientists several institutions, universities and colleges across the four zones were contacted. Other contacts were also obtained by Google searching for students and faculty from different institutions of India. An attempt was made to contact at least 10 organizations per zone to ensure that each zone was adequately represented. However due to practical restrictions such as low number of PhDs and institutes in certain regions, unavailability of records of students and contact details at many institutions, and non-willingness of some scientists to participate in the study, the actual numbers from each zone and across each decade vary.

Members were registered through multiple modes, i.e. personal visits to institutions, over phone or through email.

A request was also sent out to registered members repeatedly to inform us of their friends or acquaintances with a PhD in Engineering, Science or Medicine, particularly to trace women who were currently not working, as their details were not available in the public domain.

A questionnaire consisting of approximately 100 questions (the actual numbers vary for each of the sub-groups of the study) was developed through a review of literature, and through discussions and inputs from various members of the core group. The questionnaire was designed to collect both quantitative as well as qualitative information with respect to six main topics:

a. Employment details which included present as well as prior engagements, breaks in career, balance of professional and personal time, and desire to work in fields related to Science.

b. Educational details including Doctoral and post-graduate courses, supervisor details, educational environment, role models , etc.

c. Organizational climate details for past and present jobs.

d. Perceived reasons for women and men leaving Science and useful policies to retain them in Science.

e. Research and Productivity factors related to participation, collaboration and networking in research.

f. Personal details relating to spouse, children and family.

The questionnaire was circulated among the core group for suggestions. Discussions were held with statisticians to ensure that the questionnaire would be amenable to analysis and the questions incorporated were valid. Based on the inputs a pilot questionnaire was prepared and administered to a small number of women scientists. Inputs received from respondents were then incorporated into the questionnaire and it was finalized and sent for print.

After the creation of a database of women scientists and development of the questionnaire, the second phase of the study was begun, while the registration process was simultaneously kept open. In the second phase, members on the database were contacted and requested to participate in the survey. Members were contacted over phone or email and requested to give appointments as per their convenience. The

survey was conducted using one of two modes – personal interview or telephonic interview.

In order to ensure collection of quantitative as well as qualitative data, the survey was conducted in an open-ended interview format with a reference set of pre-coded options developed through a review of literature, as well as from inputs from pilot study respondents, for every question. Responses to each question were first recorded in the respondent's own words. Then a check was made to see if the responses fell into the pre-existing codes. If there was a match, then the appropriate code was noted; else the code for 'Any other' was indicated. Respondents were also given the option of responding with 'Not Applicable' for all questions. Additional information obtained during the conversation with the respondent was also noted verbatim. Each interview approximately took 45 minutes to 1 hour.

In the second phase, men scientists were also contacted to participate in the study. Registered men scientists were requested to participate in the study, and appointments for the survey were fixed based on their convenience. Survey with men scientists were also conducted through the two modes indicated earlier- personal interviews or phone interviews. In addition a modifiable PDF version of the questionnaire was created and sent to few members who requested an online version of the questionnaire.

In the third phase of the study, the data obtained was entered, checked, cleaned and was analyzed. A comparison of the frequencies and percentages between the three sub-groups of women - in Science Research(WIR) , Women - not in Science Research (WNR) and Women not Working (WNW) as well as comparison between men and women scientists were made.

Operational Definitions:

Women in Science Research (WIR)[4]: An integral condition for classification of women scientists in this category was their involvement in long-term, tenured research activities which may also include teaching either at the postgraduate or undergraduate level. These women scientists may also be engaged in research only (including technology based research in research labs/institutes at universities or in industries).

Women not in Science Research (WNR): The classification of women in this group was developed to understand the unique experiences of women employed in Science, or outside Science, in careers that may not require or utilize their training at the doctoral level. Women in teaching only at the undergraduate level, in administrative or managerial positions, and those on temporary research or teaching positions have been classified under this category.

Women not Working (WNW): Women scientists classified under this category are currently unemployed, though they may be engaged in activities and interests of non-occupational nature.

Men in Science Research (MIR): As for Women in Science Research, men scientists in this category were categorized based on their involvement in long-term, tenured research activities which may also include teaching either at the postgraduate or undergraduate level. These men scientists may be engaged only in research (including technology based research in research labs/institutes at universities or in industries).

ANALYSIS

The study **'Trained Scientific Women Power: How Much are we Losing and Why?'** was conducted in order to obtain numerical data regarding the number of women with a PhD. in Science across the decades from 1960s-2009, to analyze the dropping-out of women from Science and to understand the factors responsible for this. The aim was also to see if the reasons for this have differed over the decades.

The analysis plan was as follows:

1. Calculating frequencies, percentages and cross-tabs for significant variables.
2. Identifying significant differences between sub-groups of women (i.e., In Research, Not in Research and Not Working) using Chi-square tests.
3. Analyzing differences between Women in Science Research and Men in Science Research.

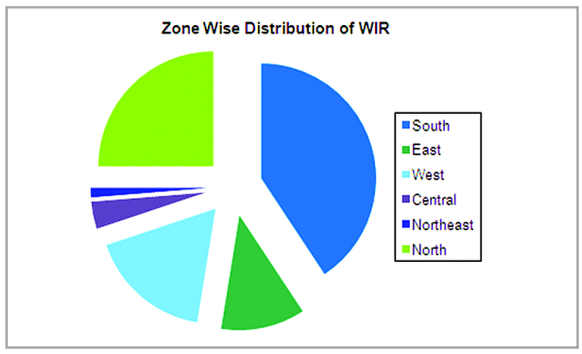
PROFILES OF PARTICIPANTS SURVEYED

Category I: Women in Science Research (WIR)

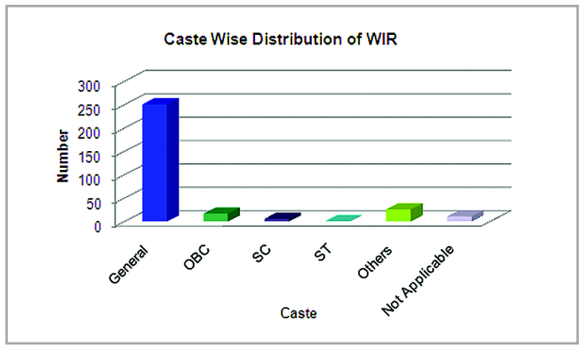
An integral condition for classification of women scientists surveyed into Category I was their involvement in long-term activities in research which may also include teaching either at the postgraduate or undergraduate level. A few women scientists in this group were engaged in research only in labs/ institutes within the industry or in scientific laboratories in the country (including technology based research). Another important criteria that defined this group was that these women scientists who had completed their PhDs were in tenured positions as against temporary positions indicating a greater stability in their occupation. Delineation of this group from the other two groups was necessary to understand the unique experiences of women with doctoral level training who have had career opportunities to apply the rigorous skills and knowledge developed at the highest level of educational training appropriately. Thus 'Women in Science Research' was formed to distinguish them from other groups of women who, with similar skill sets obtained during the course of doctoral training, were engaged in careers (either due to lack of opportunity, or by voluntary choice) that did not demand training at the doctoral level.

Personal and Family Profile

A total of 312 women were surveyed under the 'Women in Science Research' category. They composed **54.9 per cent** of the total women surveyed.



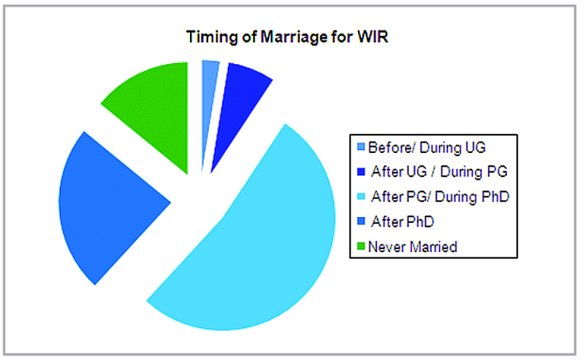
A majority of women in these groups belonged to the **South zone** followed by the **North Zone**. The highest majority in this group (**65.4 per cent**) reported living currently in **cities**.



A majority of the group reported belonging to the **'Forward' castes**. The mean age for the WIR group was between **40-50 years (Refer Appendix II, table 8 for details)**.

57.1 per cent of women scientists of this group have reported annual family incomes of rupees **six lakhs and above (which included spouse's, if married)**. **The percentage of WIR reporting this is higher compared to the other two sub groups, WNR and WNW. (Refer Appendix II, table 10 for details.)**

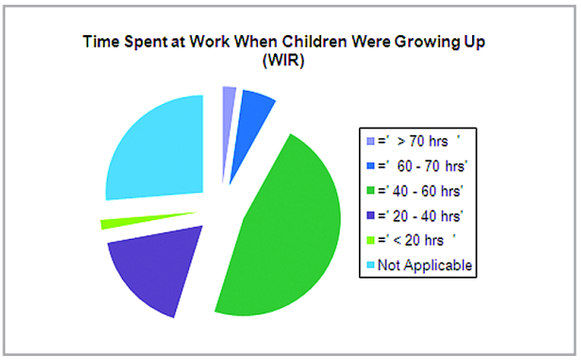
While **85.9 per cent** of WIR (268 women) reported being married, the proportion of women who have reported **'never being married' is also higher in this sub group ((14.1 per cent) when compared to the other two sub groups namely WNR and WNW**.



Note: Slices in shades of blue indicates women who were married (incluing those who may be divorced, separated or widowed. The Slice in green indicates women who were 'never married'.

With respect to those who were married **52.6 per cent** of them reported getting married **after post-graduation but before or during doctoral studies;** while **24 per cent** reported marriage **after completion of doctoral studies**. However a higher proportion of WIR have also reported marriage **before completion of post-graduation** (**9.3 per cent**) compared to the other two groups. These responses need to be analyzed further to understand the nature of support and encouragement that a majority women in this category have received with respect to taking up further studies from either or both parents and families into which they were married. It may also be important to explore if alternative support structures beyond the family was accessed to enable them to pursue a career in Science. Thus, the findings go against the usual understanding that women drop out of Science mainly due to marriage and family responsibilities. Selection of spouse for **32.7 per cent** of the group was **completely parents' choice**, while an approximately equal number (**32.4 per cent**) also reported it having been a **personal choice (Refer Appendix II, table 12 for details)**.

A majority of women in the group reported **having children** (**74.4 per cent**). **However the proportion of WIR with children was lesser compared to the other two sub groups (WNR & WNW) (Refer Appendix II, table 13 for details). 48.3 per cent*** of the responses indicated that the group on an average had children **over 15 years**. **42.4 per cent*** of the responses by WIR indicate that the group had children after **completion of PhD**. **76.4 per cent** of the responses from WIR who had children indicated that they had taken a **minimum maternity break*** during child birth; and the proportion of WIR reporting this is higher compared to the other two sub groups (WNR & WNW).



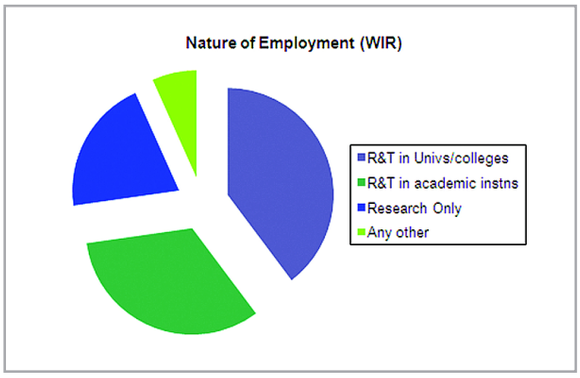
Note: the percentage of responses indicating not applicable include women both who do not have children, as well as those who may have taken breaks while their children were growing up.

46.8 per cent of WIR reported that they continued to work between **40-60 hours per week (Refer Appendix II, table 15 for details)** when their children were growing up (i.e. time spent at office). With respect to help with childcare*, one in every four of the responses by WIR (**25.8 per cent)** showed them receiving help from their own family. Almost an equal number of responses (**23.6 per cent**) showed them having taken help from **paid professionals** and help from **husband's family (Refer Appendix II, table 16 for details)**. Although the highest proportion of responses reporting receiving help with childcare has come from this group, it is interesting to note that the nature of assistance is spread almost equally among the above three groups namely, parental family, husband's family and paid professionals indicating that there are interesting ways that women cope with balancing their work and home and hence experiences are varied and cannot be generalized. It is interesting to note that the majority of the women with children (**72.7 per cent**) reported living in **nuclear families**. (Majority of the group of 312 women also reported living in nuclear families. **Details in Appendix II, table 17**). Another point to be noted is that while help is sought from different quarters, they operate as a nuclear family indicating

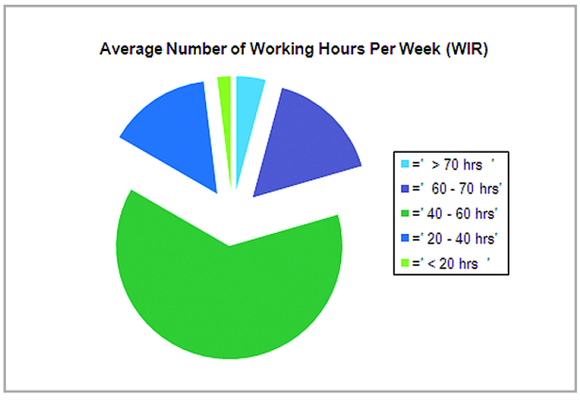
that living away from the child may not be an option that they are comfortable with and hence parents or in-laws move into their house to play the supportive role.

With respect to qualification of the spouse, **38.8 per cent** reported that their spouses were doctorate holders and **40.1 per cent** reported that their spouses were engaged in Science research, teaching or consultancy. (**Refer Appendix II, tables 18, 19 for details**)

Employment & Organizational Profile

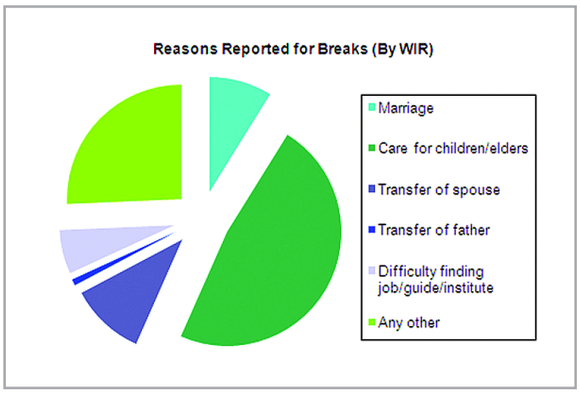


Of 312 women surveyed, the largest majority (**39.7 per cent**) have reported doing **research and teaching at the undergraduate or post-graduate level in universities or colleges**. The second largest proportion of women were engaged in **research and teaching at academic research institutions** (**33 per cent**).



With respect to working hours, a majority of **62.8 per cent** (196) reported working between **40-60 hours per week (Refer Appendix II, table 20 for details). The proportion of WIR who reported working between 40-60 hours per week is significantly higher than the proportion of WNR reporting the same.**

Better professional prospects, professional advantages as well as availability of jobs are important determinants for selection of jobs for WIR (**Refer Appendix II, tables 19-21 for details**).



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents

Sixty-two members of the WIR group (**19.9 per cent**) have had breaks. For those with breaks, **47.8 per cent** of the responses indicate child care and elder care responsibilities as reasons for the break.

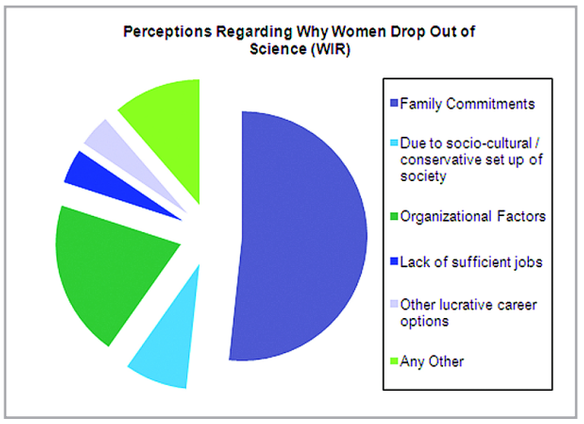
Research Productivity and Networking profile

Three hundred and six women scientists **(98.1 per cent)** of the groups have reported **authoring papers or filing patents in their student or professional lives.** The highest proportion of the group (**86.2 per cent**) has reported publishing **joint/multi-author research papers in refereed journals** (**Mean = 18.2; SD = 25.6**). The second largest proportion (**51.9 per cent**) of the group has reported publishing **individual research papers in refereed journals** (**Mean = 7.8; SD = 15.8**). Publications that have been reported by the least number of women in the groups include other individual and collaborative publications such as CDs, training manuals, etc, collaboratively edited books and individual patents. A significantly higher proportion of WIR have also reported being **members of Professional Organizations** (**76 per cent**) compared to the other two groups namely WNR and WNW.

With respect to conferences and workshops, **64.1 per cent** of WIR have reported participating in conferences at least two or more times per year. The highest responses received indicated that the reason for attending conferences and workshops* by the WIR group was to **keep themselves**

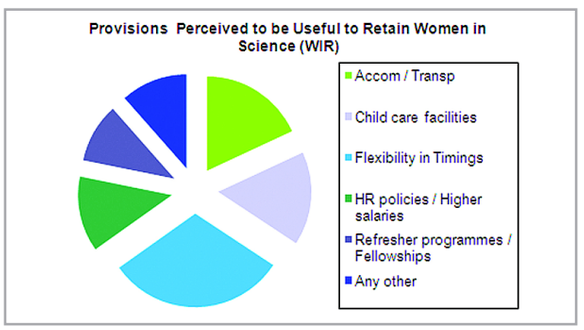
updated and learn more (**31.3 per cent**). The proportion of women who have reported this is comparatively lower than for the other two groups namely WNR and WNW. The second highest stated response for the group was for **Networking** (**23.1 per cent).**

Perceptions Regarding Drop-out from Science and Provisions to Retain Women in Science



Note: The question was a multiple response question and the number of responses received exceeds the total number of respondents

A majority of the WIR have reported that more women drop out of Science compared to men. The most frequently stated reason for drop-out* given by them was for **family responsibilities** (**51.6 per cent** of the responses). The second highest stated response by the group was due to **disenabling organizational factors** such as lack of flexibility in timings, discriminatory work practices, lack of women colleagues, mentors and role models, restricted chances for participation, too few women in decision making posts, harassment, etc. With respect to men dropping out of Science*, the largest majority of responses indicate **more lucrative careers to be the reason**, followed by **family responsibilities**.



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents

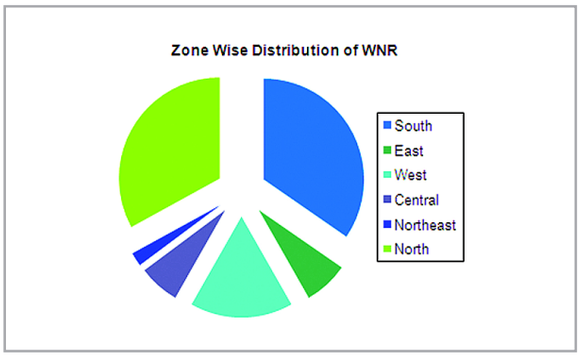
The provision* that has received highest number of responses by the group, thereby considering it most useful to retain women in Science was **'Flexibility in timings'**[5] (**30.9 per cent**). While this provision has been commonly reported by all three groups of women scientists, the provision that has received the second highest number of responses from this group is **'Provisions of accommodation and transportation'** (**18.1 per cent** of the responses), and this is reported by the WIR in contrast to the other two groups of women scientists.

Category II: Women Not in Science Research (WNR)

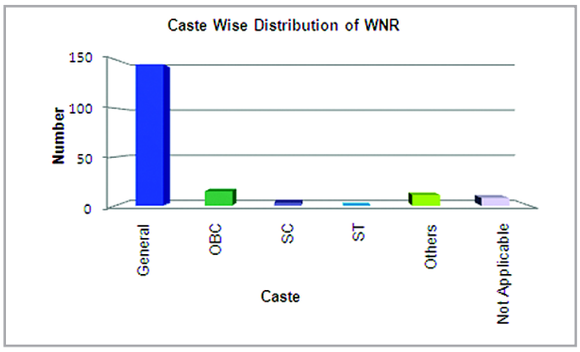
The classification of Category II was developed to understand the unique experiences of women employed in Science, or outside Science, in careers that may not require training at the doctoral level. Women in teaching only at the under-graduate level, in administrative or managerial positions, and those on temporary research or teaching positions were surveyed and their responses were analyzed under this category. While it may be rightly argued that for certain positions such as under-graduate level teaching, a PhD has become the mandatory requirement imposed by the UGC (with the 6th pay commission), the categorization has been made with the realization that women who have opted for teaching only, despite having the skills for engaging in research also may have made such choices due to special considerations, unique to this group and which may have not been so for the WIR group. Similarly, women on temporary research positions such as DST women scientists' schemes were included in this category to understand the reasons for their engagement with research of a temporary nature only. **As the findings in this study have shown, several of the considerations for women in this group and for those who are not working currently, reasons may be more structural and institutional rather than personal only.**

Personal and Family Profile

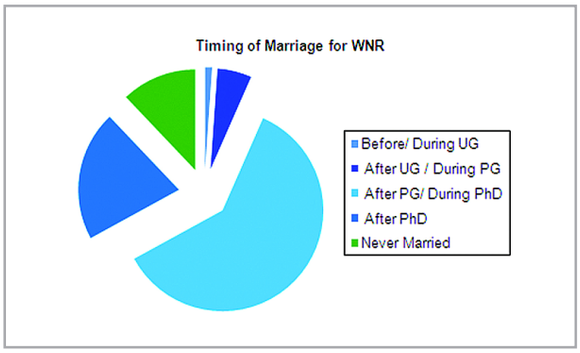
A total of 182 women (**32.0** per cent of the total number of women surveyed) were interviewed in this category.



The highest proportion of the group belongs to the **South**, while the second highest proportion belongs to the **North**.



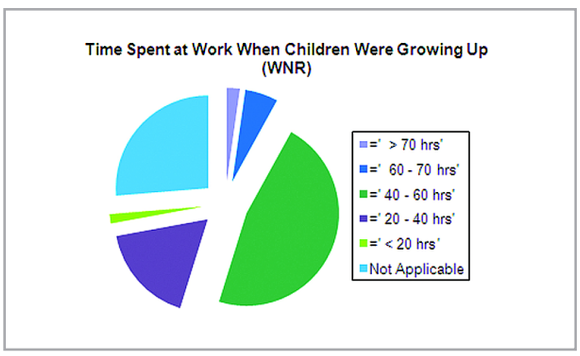
A majority of the group also reported belonging to the **'Forward' castes**. However a higher proportion of this group (**8.2 per cent**) have also reported belonging to '**Other Backward Castes'** (OBCs). The mean age for women in this groups lies between **40-50 years** (mean age = **43.9 years**; SD = 9.3). The highest proportion of the group (**40.1 per cent**) has also reported annual family incomes of **rupees six lakhs and above. (Refer Appendix II, tables 9 and 10 for details).**



Note: Slices in shades of blue indicates women who were married (including those who may be divorced, separated or widowed). The slice in green indicates women who were 'never married'.

With respect to family details, **87.9 per cent** of the women scientists in this group (160 women scientists) reported being **married**. (**12.1 per cent** or 22 women reported '**never being married'**). Among those who were married, the highest proportion of women reported being married after **post-graduate studies, but before or during PhD** (**60.4 per cent**), followed by the second largest majority that reported marriage after **doctoral studies** (**20.9 per cent**). Thus, it appears that majority of the married women in this group also have received the support of parents and in-laws to continue further education. The largest proportion of responses by the group (**37.9 per cent**) has also shown selection of spouse to be by **parental choice**. The second largest proportion of the group (**27.5 per cent**) reported selection of spouse to be with **parental consultation**, while the least proportion of the groups reported personal choice in spouse selection (the proportion of women who reported personal selection was lesser compared to the other groups of women). **(Refer Appendix II, table 12 for details)**

A majority of the women have reported also **having children** (147, **80.8 per cent**). The proportion of women with children is higher in this group compared to the other two groups. A majority of **46 per cent** of the responses by women with children in the group indicate that their children were **over 15 years*** and **49.3 per cent** of them indicate having children **after completion of PhD***. A majority of **64 per cent** of them have reported taking **only minimum maternity breaks*** during child-birth.



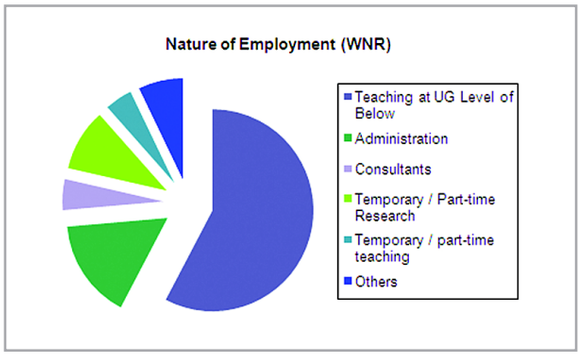
Interestingly, approximately equal proportions of women with children in the group have reported working between **60-70 hours (24.7 per cent)** and **20-40 hours per week (23.6 per cent)** while their children were growing up (i.e. the amount of time spent at office or official work)

A majority of responses from the WNR group (**34.2 per cent**) indicate that help was received for childcare* from **Husband's family**, while the second

largest majority of responses show help received from **paid professionals** (**23.3 per cent**). **60.7 per cent** of women with children have also reported living in **nuclear families**; overall among all women in the group, 118 (**63.7 per cent**) reported living in **nuclear families**. **(Refer to Appendix II, tables 16 and 17 for details).**

The largest proportion of women in the group (**36.8 per cent**) reported their spouses' qualification to be **Post-graduation** and the highest proportion of them (**44.0 per cent**) also reported that their spouses were **not engaged in Science research, teaching or consultancy**. **(Refer Appendix II, tables 18 and 19 for details).**

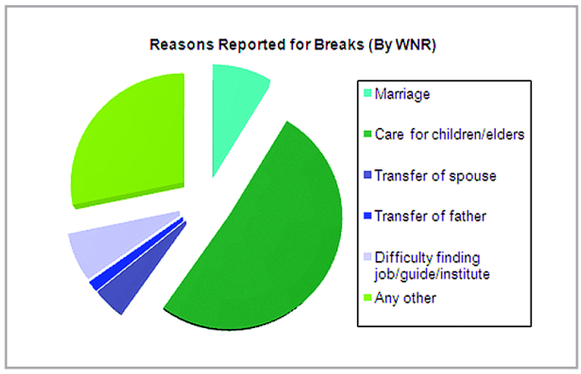
Employment and Organizational Profile



A majority of WNR (102, **57.7 per cent**) were employed in **under-graduate teaching.** A majority of the group (**45.1 per cent**) have also reported working between **40-60 hours per week** on an average. However a significantly higher proportion of WNR have also reported working between **20-40 hours per week** (**37.4 per cent**) and below **20 hours a week** (**11 per cent**), compared to WIR. **(Refer Appendix II, table 20 for details).**

59.1 per cent of the group has reported having **50 per cent or more women co-workers at the departmental level**; at the **organizational level, 44.2 per cent** reported having **50 per cent or more women co-workers**.

The two main factors that have influenced job selection, including those previously applied to and not taken up, previously held, as well as present posts, among members of this group, are not having got the jobs, and reasons of better professional prospects and advantages. **(Refer Appendix II, tables 21, 22 and 23 for details).**



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents

With respect to breaks, the most frequently stated response for breaks* by the WNR group was due to **care for children and elders** (**51.1 per cent**).

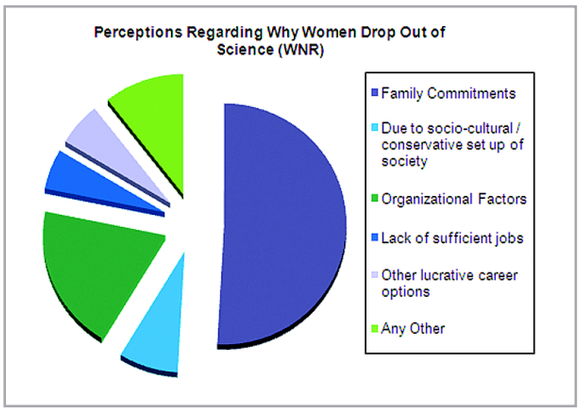
Research Productivity and Networking Profile

Hundred and seventy-three women (**95.1 per cent**) of the group have reported **authoring papers or filing patents during their student or professional lives.** The highest proportion of the group has reported publishing **joint/multi-author research papers in refereed journal** (153, **84.1 per cent**). The second highest proportion of the group has reported authoring **joint/multi-author conference articles, proceedings or abstracts** (**38.5 per cent**, with **mean = 3 and SD = 6.1**). Publications that have been least reported include individually and collaboratively edited books and patents, collaborative popular articles and other articles.

A significantly higher proportion of women in this group (**47.3 per cent**) have also reported **not being part of professional organizations**. Access to professional organization for the WNR group may be restricted since they do not belong to the close knit Science community. It could also indicate that membership of professional organizations operates as an exclusive club where networks become extremely important. This perhaps indicates lesser opportunities to be part of networks within scientific research and teaching communities that may be of use in obtaining jobs, fellowships and projects in Science research and teaching above the post-graduate level. Further, it may also be true that WNR are not interested in the activities of prestigious scientific organizations.

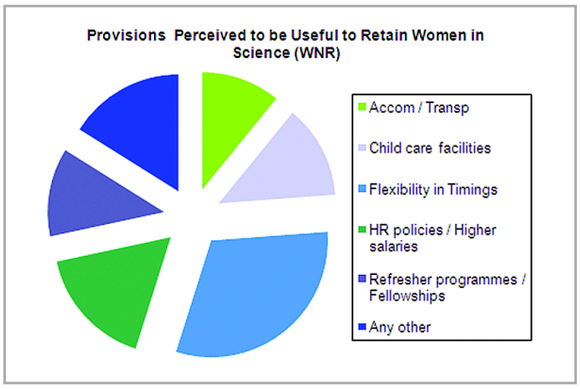
A majority of the group has reported attending conferences and workshops **twice or more than twice a year** (**50.0 per cent**). Among those who attended it, the highest stated reason for attending* was to **keep themselves updated and gain more knowledge (35.9 per cent)**. The second most stated response was due to **interest in the topic covered in the conference** (**19.5 per cent**). Approximately similar number of responses has also been obtained for **Networking** (**19.2 per cent**). **(Refer Appendix II, table 26 for more details).**

Perceptions Regarding Drop- out from Science and Provisions to Retain Women in Science



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents

52.7 per cent of WNR reported that **women drop out of Science** more frequently. A higher proportion of this group (**13.7 per cent**) compared to the other two groups has also reported that **men drop out of Science** more often. With respect to reasons why women drop out of Science*, a majority of **50.9 responses** indicate **family responsibilities** to be a significant reason, followed by **disenabling organizational factors**[6] (**19.4 per cent**). Given the fact, that existing literature particularly in the Indian context has always upheld that societal and family reasons are responsible for women leaving Science, the study has brought to the fore the role of disenabling organizational factors. Recent sociological studies in India corroborate this finding (Gupta and Sharma 2003; Subramanian, 2007; Kumar, 2009; etc.). A majority of responses by women in the group also indicate that men drop out of Science* for **other lucrative career options** (**47.5 per cent**) followed by the reason of **lack of dedication and patience** for careers in Science (**16.9 per cent**). **(Refer Appendix II, table 28 for details).**



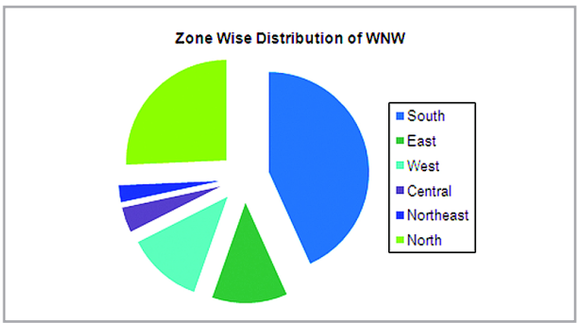
Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents

With respect to provisions to retain women in Science*, as with other groups, the majority of responses given by the group indicate **flexibility in timings**[7] to be the most useful provision (**31.1 per cent responses**). However, the second most frequently stated response differs from the other groups, it being **better HR policies** (**16.8 per cent responses**).

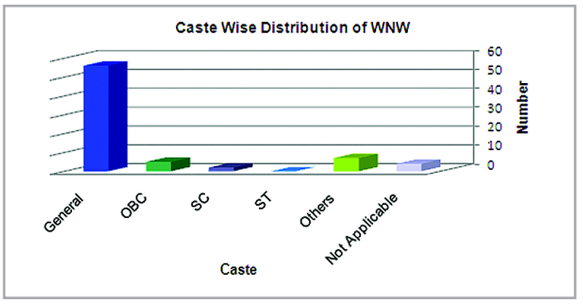
Category III: Women Not Working (WNW)

Women scientists classified under Category III are currently unemployed, though they may be engaged in activities and interests of non-occupational nature. It is important to note that women in category III belonged to two different views: on the one hand women who had voluntarily chosen to leave their professions with the desire to spend more time with family and children. On the other hand, this group also comprised those who had given up their careers involuntarily due to organizational or personal hurdles. A total of 74 women scientists (13.0 per cent of the total women interviewed) were surveyed. **While the total registered number of women scientists who were not employed at the time of registration was much higher (144), many had obtained temporary posts (such as on DST women scientist schemes) by the time of the survey, and several others were unwilling to participate in the survey.**

Personal and Family Profile

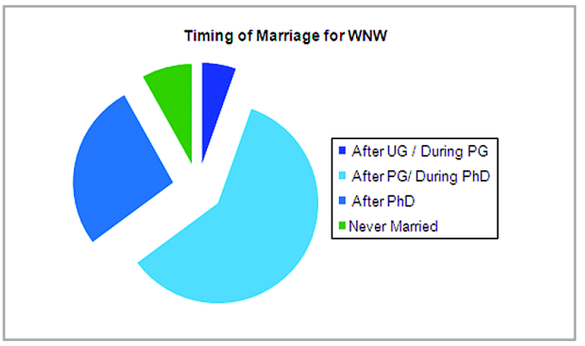


Of the 74 women scientists surveyed, a majority of **43.2 per cent** belonged to the **South** zone, while the second highest proportion belonged to the **North** zone. Equal proportions of women were represented from the **East** and **West**.



A majority of women scientists surveyed under this category (56, **75.7 per cent** of the group) reported that they belonged to the **'Forward' castes**. A larger proportion of the group (**2.7 per cent**) was also composed of women from '**Scheduled Castes**' compared to WIR and WNR. The mean age of the group was between **40 and 50 years** (**mean age = 45.5 years**; **SD = 12.9**).

A majority of the WNW group (**39.2 per cent**) reported having an annual family income of **rupees six lakhs and above**, though the proportion reporting this was smaller than that of the other two groups. The second highest majority of the group (**28.4 per cent**) reported an annual family income of **rupees four-six lakhs**. **(Refer Appendix II, table 10 for details).**



Note: Slices in shades of blue indicates women who were married (including those who may be divorced, separated or widowed). The slice in green indicates women who were 'never married'.

A majority of the WNW group (**91.9 per cent**) have also reported being **married**. Among the three categories, the lowest proportion of respondents from this group reported being '**never married'** (**8.1 per cent**). The largest majority of those who were married reported being married after post-graduation or during **doctoral studies** (**59.4 per cent**), followed by the second largest proportion that have reported **after doctoral studies** (**27.0 per cent**). The largest proportion of those who were married reported that selection of spouse was by **parental choice** (**41.9 per cent**). A majority of the women in the group reported having **children** (**83.8 per cent**), and **54.9 per cent** of the responses from those with children* reported having children **over 15 years.** (Compared to the other two groups, the highest proportion of women in this group has reported having children over 15 years). With respect to timing of child birth*, **39.1 per cent of the responses** indicated having children **after completion of PhD**. Of those who had children, **50.7 per cent responses** showed that the women had taken **minimum maternity break***, though the lowest proportion of this group has reported this compared to the other two groups. The highest majority of the women in the group (**44.6 per cent**) have reported that the question regarding time spent at work while children were growing up was not applicable to them. This may be due to the fact that a large number of WNW group were in fact not working after childbirth. Also for the women scientists in the WNW group who reported not being married, the question would not have been applicable. The largest majority of responses by the women (**28.0 per cent**) show that no help was received for **childcare***. The second highest proportion of the responses from the group (**17.3 per cent**) have shown help received from **paid professionals**. Of those with children, **82.3 per cent** have reported

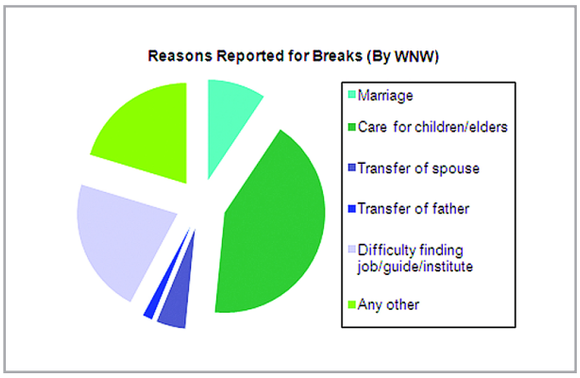
living in **nuclear families**. 78.4 per cent of the total group has also reported living in nuclear families. **(For details regarding marriage and children and family, refer Appendix II, tables 11 -17).**

The highest majority of the group (**45.9 per cent**) reported that their husbands were **doctorates** and **43.2 per cent** reported that their husbands were **engaged in Science research, teaching or consultancy**. The highest proportion of this group reported having spouses with doctorate degrees as well as working in Science, compared to the other two groups. (**Refer Appendix II, tables 18 and 19 for details).** Interestingly the highest proportion of this group (**32.4 per cent**) has also reported that their husbands were **engaged in the same field / organization as themselves**. With many institutes having informal policies disallowing couples to work in the same institution, the higher proportion of women in this group having spouses in the same field or organization perhaps affected their continuation in Science, since it is the women who usually sacrifice their careers for the sake of their husbands or families.

Employment and Organizational Profile

Questions regarding employment and organization asked refer to the previous jobs held or applied to.

Of 74 women, 31 (**41.9 per cent**) have reported **applying to jobs** previously. Interestingly, the highest proportion of this group has applied to jobs previously. The largest proportion of the responses from those who applied for jobs (**66.7 per cent**) showed **not having got** the jobs as reason for their not taking up the job*, while **15 per cent** of the responses showed **disenabling organizational factors** (which include long/inflexible hours, no room for professional growth and lack of daycare facilities at the workplace) as the reason. Scientists in general perceive reporting disenabling organizational factors as making a case for special treatment and overlooking merit. This results in women scientists carrying the burden of protecting merit and thus underplaying organizational factors that may impede their entry/ upward mobility in formal S&T work spaces. The percentage of women who have reported not having got the jobs is significantly higher compared to the other two groups. **(Refer Appendix II, table 21 for details).**



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

With respect to breaks* in career, the highest majority of responses (**42.2 per cent**) indicated **care of children / elders** as reason for the breaks. The proportion of responses received from this group with respect to the above mentioned reason is lower than the proportion of responses received from the other two groups for the same reason. A significantly higher proportion of responses from this group (**21.9 per cent**) also show breaks due to **difficulty in finding appropriate jobs, advisors or institutions**, compared to the other two groups.

Research Productivity and Networking Profile

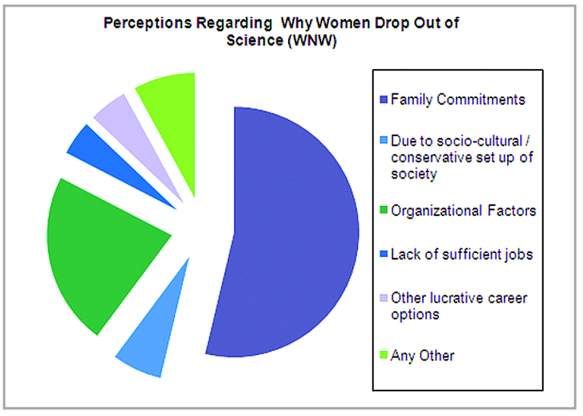
Seventy women from the group (**94.6 per cent**) reported having **authored papers or filing patents**. The highest proportion of the group reported publishing **joint/multi-author research papers in refereed journals** (**59, 79.7 per cent**; **mean = 14.0**, **SD = 32.9**). The second highest proportion of the group reported publishing **individual research papers in refereed journals** (**35.1 per cent**, **mean = 5.85**, **SD = 15.9**).

Majority of the women from the group reported being members of professional organizations, and only **41 per cent** reported **not being members of professional organizations**.

Fifty per cent of the group also reported attending conferences and workshops **twice or more per year.** The highest proportion of the responses (**33.1 per cent**) indicate that the reason for attending conferences or workshops* was to **keep themselves updated or increase their knowledge base.** The second highest proportion of responses (**24.8 per cent**) indicate attending

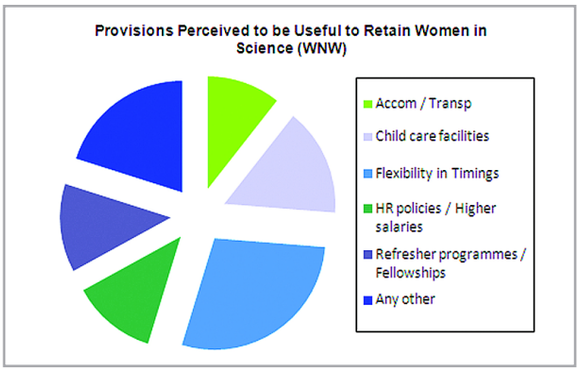
conferences and workshops for **networking**. **(Refer appendix II, table 23 for details).**

Perceptions Regarding Drop-out from Science and Provisions to Retain Women in Science



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

A majority of the group (**62.2 per cent**, higher than other groups) have reported that **women drop out of Science. Family responsibilities** have been reported as the reason for women dropping out by majority of the group (**53.7 per cent**).



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

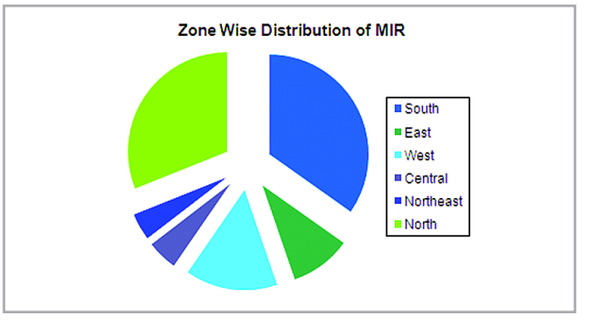
The largest proportion of responses from the group (**28.5 per cent**) indicates **flexible timings**[8] as an important provision for retaining women in Science, while the second highest proportion of responses (**15.6 per cent**) indicate the need for **better child care facilities**.

MEN

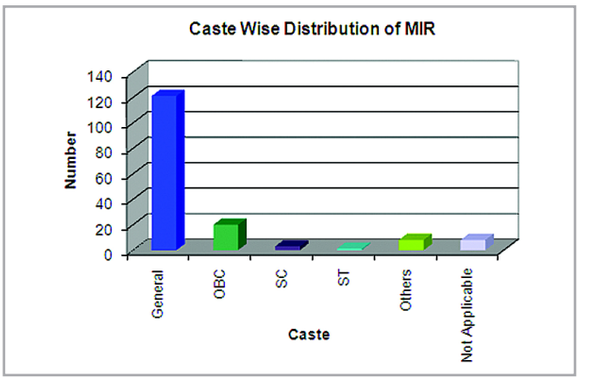
Category I: Men in Science Research (MIR)

Definition of 'men in Science research' is similar to 'women in Science research', that is, those involved in long-term activities in research which may also include teaching at the postgraduate and/or undergraduate level. Men scientists belonging to MIR may be engaged in research only (including technology based research), which may include the research labs/institutes within industries or the other scientific laboratories. It primarily included men who were engaged in research in some form or the other. Another important criteria that defined this group was that these men scientists who have completed their PhDs were in tenured positions as against temporary position indicating a greater stability in their occupation. A total of 161 men scientists have been interviewed as part of this category.

Personal and Family Profile



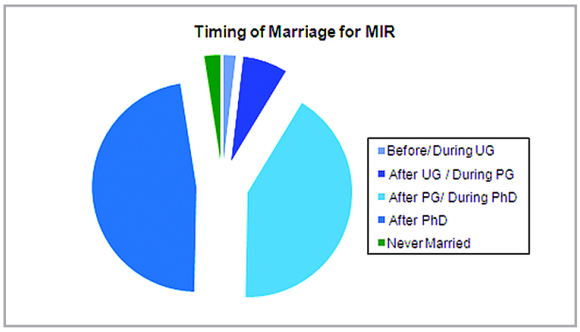
Highest proportion of men surveyed in this category belonged to the **South** zone (**34.8 per cent**) followed by the second highest proportion from the **North** (**31.1 per cent**).



Majority of the men belonged to **'Forward' castes**. Significantly higher proportion of MIR (**12.4 per cent**) belonged to '**Other Backward Castes'** compared to women. The mean age for the group lies between **40-50 years (mean age = 45.2**

years; SD = 8.7). (**Refer Appendix III, table 32 for details).**

Compared to WIR, highest majority of MIR have reported annual family incomes between **rupees 4 -6 lakhs (39.8 per cent)**, while the second highest per cent (**31.1 per cent**) have reported **rupees 6 lakhs and above**. **(Refer Appendix III, table 33 for details).**

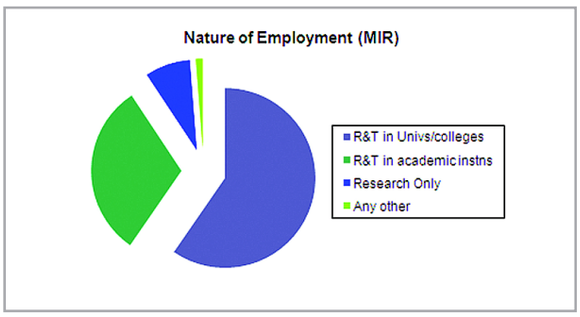


Note: Slices in shades of blue indicates women who were married (including those who may be divorced, separated or widowed). The slice in green indicates women who were 'never married'.

97.5 per cent have reported being **married. Thus, a significantly** higher per cent compared to WIR have reported being married. **47.2 per cent** have reported being married **after doctoral studies (which is significantly higher than the proportion of WIR who have reported being married after doctoral studies. For details refer Appendix III, table 34). 44.7 per cent** reported choice of spouse was with **parental consultation**. A majority of the group (**49.7 per cent**) also reported spouse's qualification to be **post-graduation** and only **16.1 per cent** reported spouse's qualification to be **doctorate**. While one can see that in a majority of the cases there is no status incongruence, the presence of this in 16 per cent of the sample shows that there is a changing trend. A small proportion of the group (**18.6 per cent**) have reported that their spouses were **working in Science research, teaching or consultancy**. **(For details regarding spouse, refer Appendix III, tables 35-37).**

86.3 per cent of the group also reported having **children. 44.6 per cent** of the responses from the group indicated that their children were **over 15 years***. **57.8 per cent** of the responses by MIR were indicative of having children **after PhD***. **33.5 per cent** have reported working between **40-60 hours per week** when their children were growing up (though the proportion of men reporting this is lower than the proportion of WIR). A higher proportion of MIR (**28.6 per cent**) have also reported working **lesser than 40 hours per week** compared to WIR. **(Details regarding children are available in Appendix III, tables 38-40).**

Employment and Organizational Profile



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

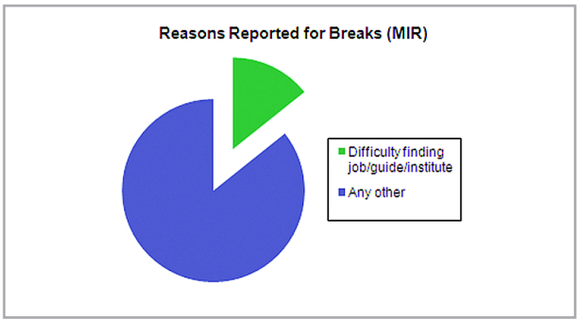
96 MIR, (**59.6 per cent**) have reported doing **research and teaching at the postgraduate and/or undergraduate level at universities or colleges**, followed by 50 MIR, **31.1 per cent** who have reported doing **research and teaching at an academic research institute.**

With respect to number of hours at work, 74 (**46.0 per cent**) men reported working between **40-60 hours per week**. The proportion of MIR who reported working more than **60 hours per week** and **less than 40 hours per week** is greater than the proportion of WIR who reported work hours in the above two categories. **(Refer Appendix III, table 41 for details).**

With respect to reasons for not taking up previous jobs applied to* and for leaving previous jobs*, the most frequently stated responses by the MIR group were **non-availability of job** or for better **professional prospects.** The proportion of responses received from men with respect to better professional prospects for both questions is higher than the proportion of responses from women. **(Refer Appendix III, tables 42 – 43 for details).**

33.5 per cent of the responses by MIR indicate reasons of **professional advantages and better prospects for taking up present posts***. **21.6 per cent** of the responses by MIR indicate **personal satisfaction or enjoyment** as the reason for taking

up the present job. **(Refer Appendix III, table 44 for details).**



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

Only 7 men (**4.3 per cent**) have reported having breaks in career, with majority responses indicating reasons such as **completion of studies, health reasons, voluntary retirement, etc.** for the break*.

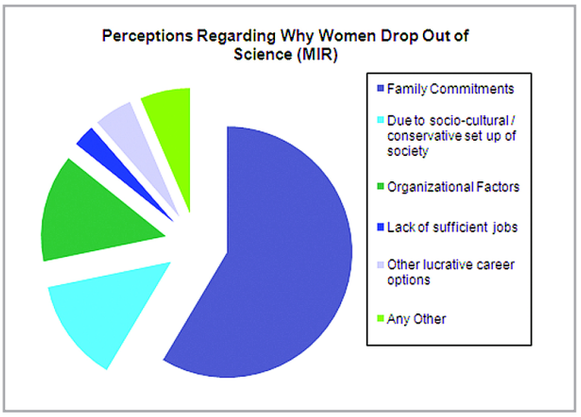
Research Productivity and Networking Profile

All members of the group (**161**) have reported **authoring papers or publishing patents during their doctoral or professional life.** MIR on an average have the highest number of **collaborative conferences articles, proceedings or abstracts** (**mean= 30.4**, **SD = 48.8**), followed by **Collaborative research papers in Refereed journals** (**mean = 30.03**, **SD = 42.9**). On an average they have few books and individual patents.

With respect to membership of professional organizations, a majority have reported being members of professional organizations. Only **25.5 per cent** men reported **not being members of professional organizations.**

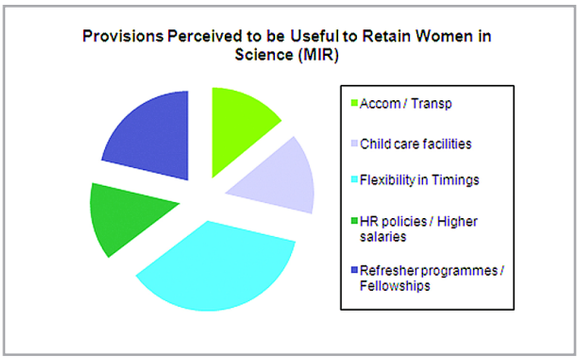
72 per cent of MIR have reported attending **two or more conferences per year.** 31.8 per cent of the responses by MIR indicate that the reason for attending conferences and workshops* was **to keep themselves updated and learn more** while **27.1 per cent** MIR indicate **networking** as the important reason. **(Refer Appendix III, table 47 for details).**

Perceptions Regarding Drop-out from Science and Provisions to Retain Women in Science



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

A majority of the men surveyed (**47.2 per cent**) reported that **women drop out of Science** more often than men. **58.5 per cent** indicate that women drop out of Science due to **family responsibilities**. With respect to reasons given for men dropping out of Science*, **53.2 per cent** of the responses indicate **other lucrative career options** as the reason. **(Refer Appendix III, table 49 for details).**



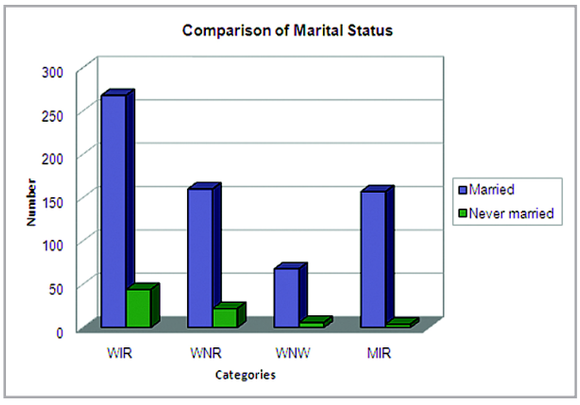
Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

With respect to provisions to retain women in Science*, one in every four responses by MIR(**29.6 per cent)** report **flexibility in timings**[9] as an important provision. About **17.8 per cent** of responses by MIR indicate the need **to conduct awareness and motivation campaigns and programmes, sensitize family and society, ensure jobs for women, allow couples to work at the same institute, create a safe and free work atmosphere and so on, to retain women in Science.**

I. SAMPLE DETAILS

The data has been collected from women and men respondents covering all zones. Care was taken to ensure that the three sub-groups of women scientists and the group of men scientists were represented from each of these zones. The survey indicates that by and large the formal spaces in Science are dominated by the general category. The distribution of the scientists surveyed reflected by and large the religious and caste distribution of the general population. The mean age of the surveyed scientists, both women and men was 40-50 years. **(Sample details are available in Appendices II and III).**

Information was collected from the respondents with respect to several questions such as family and marital details, educational details, employment and organizational details as well as research and productivity factors. More than 100 questions covering these various areas were asked of each respondent.



A majority of the women (**87 per cent**) and men (**98 per cent**) surveyed reported being **married**. The marital status of the three groups of women scientists reveals, approximately 85 per cent of WIR and WNR were married while a higher percentage of WNW (**92 per cent**) were **married**. It is the WIR group that has a relatively lower per cent of women married. Consequentially, it is this group that has the highest per cent of women being **never married**, i.e., **14.1 per cent** (44 out of the total 312 women in research). The proportion of 'never married' WIR is distributed across all the age groups and does not vary significantly. Twenty two WNR, representing **12.1 per cent** of this sub-group reported being **never married**. **However, the chi square value was not significant either at .05 or .01 level.**

When one compares the sub-groups of married women and men in research (**85.9 per cent** and **97.5 per cent** respectively), they **significantly vary at .01 level.** The findings are similar to findings on the Campion and Shrum (2004) study which also reports that more women than men in Science stay unmarried.

Significant difference is seen among the proportion of women in science research and men in science research who are married. A higher percentage of MIR are married compared to WIR.

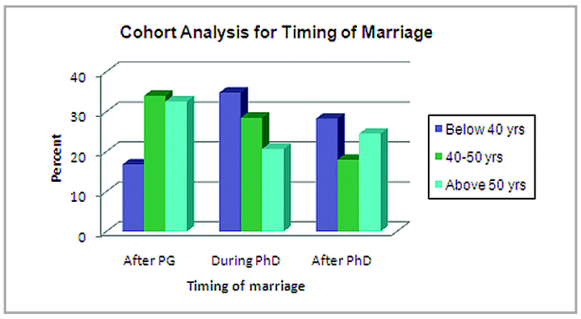
No significant variation was seen among the proportion of WIR who were married in relation to age.

One in two men reported marriage after doctoral studies while only one in four women reported the same. This is indicative of the winding paths for women and the straight roads for men in academic careers.

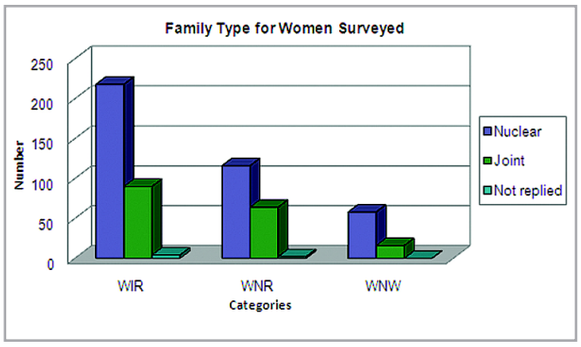
The earlier practice amongst most Indian families was to get girls married on completion of their education. However, this is not true in the case of those who take up a scientific career as reflected in the survey. Nearly half (**47.2 per cent**) of the men scientists married after completing their PhD. The corresponding per cent in the case of women scientists is less than one fourth (**23.4 per cent**). This may be also due to the fact that the age at marriage is lower for girls than boys in India. In other words, a majority of the women scientists have had to manage a career and family during their studies showing that they have had to follow winding paths rather than straight roads (Elgquist-Saltzman, 1992). In the case of men scientists who may have got married during their education, it is more likely that they derived support from their spouse, which may not be the case for the women scientists. **(Refer Appendix II, table 11 and Appendix III, table 34 for details).**

Interesting differences are seen when the timing of marriage is compared for the different cohorts of women scientists surveyed. While a larger majority of women below 40 years have reported marriage during or after PhD, the least proportion of women above 50 years reported marriage during PhD, and

a significantly lower proportion of women between 40-50 years reported marriage after PhD. (Refer graph given below).



While there is no conclusive evidence that women manage their homes before marriage, it is more likely that women are expected to manage a home after marriage and hence pursuing a PhD would not have been as easy as it would have been for women who got married after their doctoral studies.



Although there is a small difference between the sub-groups of women scientists who have reported living in nuclear families, close to two-thirds of them report living in nuclear families **(Refer Appendix III, table 17 for details).** While the nuclear family gives women a better opportunity to negotiate for the redefinition of power and consequently the distribution of roles and responsibilities, they also come with reduced support mechanisms within the family structure. While this has worked as an advantage for some career women, it has been a disadvantage in the case of some others. Exploring the advantages and disadvantages of this arrangement needs to be undertaken with reference to specific contexts for more conclusive evidences. Higher number of women in the WNW group living in family structures without additional members for support (i.e. parents, grand-parents, siblings, etc) who can share in family responsibilities such as cooking, cleaning, child care, etc, may be a crucial factor leading to their drop-out from Science. While our data did not contain information with respect to domestic help, it may be an important factor which could help women reorganize their responsibilities to achieve work-family balance.

An interesting observation drawn from our data is with respect to employment of the couple within the same field or organization. The data reveals that the largest per cent of WNW have **spouses in similar fields/ organizations** (**32.4 per cent**). This perhaps affected their continuation in Science careers, as many organizations have informal policies that discourage spouses working in the same institution. In the Indian context, since men are considered to be the primary bread winners of families, it would be women who would be expected to give up their careers in case of a conflict. **23.7 per cent** of WIR have reported that their spouses work in similar fields/organizations and a relatively lower per cent of WNR (**14.4 per cent**) reported that their **spouses worked in similar fields/ organizations as themselves**. **(Details regarding spouse's qualification and employment in Appendix II, tables 18 and 19).**

A higher proportion of WNW have reported that their spouses are / were in the same field or organization as themselves. In contrast a higher per cent of WIR and WNR have reported that their husbands are/were not in the same field /organization as themselves. With many institutes having informal policies that do not encourage couples to work in the same institution, women may more often have to sacrifice their careers to resolve these conflicts of interests. Perhaps, among the large number of women in the WNW category who have reported this overlap in field or organization with their spouses, this has been the cause for their current status.

Over 70 per cent of the women scientists from all three groups reported **having children**. **One of two** women scientists from all groups had children **over 15 years***. The highest proportion of the WNW have children over 15 years (**54.9 per cent**). One in every four women scientists in the sub-groups of WIR and WNR reported having young children between **5-15 years**. One in every 5 WNW reported having even younger children **less than 5 years**.

Given the fact that most of them live in nuclear families, the absence of organized support mechanisms especially when the children are younger could be one of the reasons for women not pursuing a career in Science. (Details regarding children is given in Appendix II, tables 13 and 14).

Interesting differences are seen with respect to age of children for women across the different cohorts. Among younger women (below 40 years), the highest proportion of the group have children between 0 – 5 years (**48.4 per cent**). The highest proportion of women between 40-50 years reported having children between 5 -15 years (**65 per cent**). More importantly, a significantly higher proportion of WNW have younger children between 0-5 years in both age groups, below 40 years (**57.1 per cent** WNW compared to **47.8 per cent** WIR and **45.3 per cent** WNR) as well as between 40-50 years (**17.6 per cent** compared to **5.2 per cent** WIR and **8.8 per cent** WNR). Data on help with childcare* also shows that highest majority of women in the WNW groups have reported that they **received no additional help with childcare/ did not work** when the child was growing up (**28 per cent**), compared to only **2.8 per cent** WIR and **4.5 per cent** of WNR who have reported the same. The largest majority of WIR have reported receiving help from **their family** for childcare (**25.8 per cent**) while the largest majority of WNR have reported help from **husband's family** for childcare (**34.2 per cent**). (Refer Appendix II, table 16 for details).

One in every five women scientists surveyed had their child/children* **during their studies**. Although the variation within the groups is not very large, the WIR sub-group reported the highest per cent (**23.6**), followed closely by WNR (**21.6 per cent**). Nearly 10 per cent of the women scientists had their child **during their jobs in junior positions**. An equal number of women scientists had their children **after a PhD before taking up a job**. It will be useful to analyze the experiences of women who have been able to balance their studies with marriage and children as much as those women who had their children when they were working. The need for this is not so much to undermine their success as scientists but to help women scientists who may believe that this balance is difficult or, for that matter, not possible. **When the comparison between WIR and MIR sub-groups with regard to timing of having children were made, there was a significant difference at 0.01 level** between these groups. **57.7 per cent** MIR reported having children **after PhD**, as against **42.2 per cent** WIR reporting the same.

A majority of the women in all three groups have also reported taking only minimum maternity break for children. The data revealed that the highest per cent of WIR (**76.4 per cent**) had minimum maternity breaks followed by the WNR (**64 per cent**). Only one in every two WNW reported having taken a minimum maternity break (**50.7 per cent**).

Finally, with respect to time spent on work, while children were growing up, the groups significantly differed. WIR reported spending between **40 – 60 hours per week** at work (**46.8 per cent**). Equal proportions of WNR have reported spending either between **60-70 hours or 20-40 hours per week at work** (**24.7 per cent and 23.7 per cent respectively**). Nearly two-fifths of the WNW groups have chosen the not applicable option. This may either indicate an unwillingness to respond to the question or having **not worked** when children were growing up. However, since a much higher number of women have used this option compared to the other two groups, it may perhaps indicate that many of them did not work while children were growing up. The second largest proportion of the group reported working for **40-60 hours per week** (**27.0 per cent**). (Refer Appendix II, table 15 for details). The sub-groups of women scientists significantly differed with respect to time spent at work when children were growing up. **The chi square value is significant at the 0.01 level (X^2 = 138.066, p = 0.000, p<0.01).**

Interesting differences are seen even with respect to the time spent at work when children were growing up among the women in research and men in research sub-groups. One in every five MIR have reported spending **over 60 hours per week at work** when children were growing as against one in ten WIR. On the other hand, **46.8 per cent** of WIR reported having worked on an average of **40-60 hours**. The corresponding figure for men scientists is **33.5 per cent**. One in every four men scientists also reported having worked **less than 40 hours a week** and in the case of women scientists the corresponding figure is one in every five (Refer Appendix III, table 40 for details). **The differences between the two sub-groups with respect to time spent at work when children were growing up is significant at 0.01 level. Contrary to popular perception that more**

women spend lesser time at work after childbirth, the data indicates that men spend lesser time at work after childbirth. The fact that women in research are aware that they would be watched more carefully could actually increase the pressure on them to put in more hours of work. It could also be due to the fact that they have less control over their time. Children when young need time that may not be planned for on account of illness or other associated reasons thus they compensate, so that their output is not affected. While these need to be validated through larger studies that are more qualitative in nature, suffice it to say that over-compensation is one mechanism that women use so that they are not viewed as taking advantage of their gender. The survey indicates that this is more pronounced among the WIR sub-group. However, there is a caveat that the number of hours of work does not in itself explain productivity and the quality is an important dimension.

There is a significant difference between the timing of child birth for women and men in research. More men compared to women reported having their children after PhD. However this may be because in general, men get married later than women. Early marriage and early timing of children for women is responsible for the winding paths that women have in scientific careers, as noted earlier.

Among the subgroups of women there is a significant difference with respect to the time spent at work while children were growing up. More women in the WNW group appear to have not worked when children were growing up.

Interestingly, a higher proportion of WIR compared to MIR have reported spending between 40-60 hours per week at work when children were growing up. This is an important finding in the light of the fact that the women are commonly perceived to spend less time at work after childbirth and encounter what has been termed the 'maternal wall'.

II. COMPARATIVE STUDY OF SUB-GROUPS OF WOMEN (WIR, WNR, WNW)

Of **568** women scientists surveyed, a total of **494** women scientists were employed, while **74** women scientists were not employed. Of the 494 women scientists who were employed, **312** women scientists belonged to the 'women in Science research' (WIR) category associated with tenured positions. These women scientists were either engaged in only research (including technology based research) or engaged in research along with teaching at the graduate and/or post-graduate level. A **hundred and eighty-two** women scientists belonged to the 'women not in Science research' (WNR) category, and these women were engaged in only teaching at undergraduate level and below, administrative or management positions, or temporary positions on research projects.

Among WIR, the highest proportion of the group (**124, 39.7 per cent**) were engaged in **'Research and Teaching' at the university or affiliated colleges (PG / UG level)**. The second highest proportion of the group **(103, 33 per cent)** was engaged in **'Research and Teaching in a research institution.'** (Refer Appendix II, table 5 for details)

Among WNR, a majority of them reported **teaching at the undergraduate or school level (105, 57.7 per cent)**. The second highest proportion of the group was engaged in **administrative positions** such as head of institutions, technical officers, etc. (**29, 15.9 per cent**). Eighteen women (**9.9 per cent**) were engaged in **temporary or part-time research positions** (Refer Appendix II, table 6 for details).

ORGANIZATIONAL FACTORS

Organizational factors play an important role in determining employees' satisfaction, performance and continuation in the organization. Work atmosphere, organizational policies and regulations, number of working hours, location, and nature of job all affect the choice of institution/ organization made by employees. Hence, it was considered an important area of analysis even in the study. Organizational factors related to the number of working hours, type of organization (e.g. government, private, aided, etc), nature of employment, how the present/current job was obtained, as well as information pertaining to

previous jobs were obtained. This section provides an analysis of all the above information.

Number of Working Hours

A significant factor determining the choice of organization for women scientists as well as for men scientists could be flexibility in working hours. An analysis of the number of hours put in at work by WIR and WNR is given below.

62.8 per cent of WIR have reported working on an average between **40-60 hours per week; 20.5 per cent of** this sub-group have reported working for **60 hours or more per week. The corresponding figures for WNR** are **45.1 per cent** and **6.5 per cent** respectively (Refer Appendix II, table 20 for details). **The differences in the number of hours spent on work by WIR and WNR is significant at 0.01 level. This indicates that there is a difference between the two sub-groups with respect to the number of hours spent at work. The WIR spent more hours at work on an average.** The perception of being unable to cope with the long hours that are required in research and teaching at post-graduate level and above may perhaps be a deterrent for women to take up research careers in Science. It is believed that longer hours, or/and late hours in the evenings are pre-requisites for a research career in Science. This may be both inconvenient due to the perception of safety at the workplace as well as long travel hours due to the distance of the research institutions from home, which are few and located at specific areas of the city/town. Residences around these areas may be expensive and hence cannot be explored as an option. This is coupled with family responsibilities, childcare and eldercare where women play predominant role in the Indian context. Balancing the family and a research career is a challenge that most women in academic careers face. Combined with other social and family factors such as caste, class, geographical location, etc, these factors play out in various permutations and combinations and result in several women opting out of research careers.

Therefore significant differences in the time spent at work for WIR and WNR.. A significantly higher proportion of WNR have reported less than 40 hours per week of work. Perceptions of long and inflexible hours may thus be a deterrent and flexibility in timings may be a useful strategy to attract more women to Science research.

While changes at the family and societal levels are slow and painstaking, a way forward for institutions in this scenario would be to offer flexibility in timings, as well as option to work from home through technological provisions such as access to internet and online journals and libraries at home; making more provisions for housing on campus or arranging for transportation; rescheduling meetings and other such events during the morning hours; making provisions for good quality childcare facilities at work, etc. In contrast to research institutions and universities, several corporates have already recognized the valuable contributions of women and have offered several of these provisions including flexibility in timings, work-from-home options, childcare facilities, transport, etc.

Two to 5 per cent of the women scientists report **organizational factors** as responsible for them quitting their earlier job (Refer Appendix II, table 22 for details). However, the low reporting of organizational factors by the women scientists could be due to various reasons. **The perception that Science, its practice and organization is always fair is one perception that most scientists believe; and the onus of carrying this image is perceived to rest on women scientists. Attempts to understand this black box has not received adequate attention. Drawing an analogy, in a slightly different but related contexts, this has also been the case in India with schools as an institution up to the 80s. There is a need for a greater volume of work raising questions beyond traditional frameworks that may allow one to have a peek into S&T organizations. At another level, given the closed organization of scientists and the in-built hierarchy amongst this group, getting scientists to report on organizational factors may be difficult due to fear of the possibility of tracing the response to the scientist. It may**

also be that the organizational culture is taken as given and has not by and large been a subject of enquiry.

The differences between the groups with respect to reasons for leaving previous posts* **are significant at the 0.01 level.** For WNW, it appears that a combination of non-availability of long-term jobs and family responsibilities affect their retention in Science research. Since both factors can be addressed through better organizational provisions (e.g., more number of tenured jobs, flexibility in working hours, childcare facilities, etc) greater effort is required at the organizational level to actively pursue women through such pro-active policies.

There appears to be a significant difference among the sub-groups of women scientists with respect to leaving previous posts. A combination of non-availability of jobs and family factors has affected WNW. For WIR and WNR, the highest reported reasons for leaving previous posts was for better professional prospects and the temporary nature of the jobs.

Career Breaks*

Breaks in career crucially affect professional growth for both women and men scientists. Breaks may be more common and frequent in the case of women scientists who have dual responsibilities of looking after the family as well as the work front. A comparison of the number of breaks and reasons for breaks was carried out between the sub-groups of women scientists. The question allowed for multiple responses up to a maximum of three.

47.8 per cent of the responses by WIR indicate that the reason for the break / breaks were for **childcare and care of elders. Nearly one in five responses by WIR show other family reasons such as father's or spouse's transfer, marriage, etc** for career breaks.

The highest proportion of responses by women from the WNR group (**51.1 per cent)** show the reason for breaks in career to be **care for children and elders.** Nearly one in four responses of WNR (**28.3 per cent**) show reasons ranging from further studies, health or non-availability of fellowship due to age limit as possible reasons.

Two of five responses by WNW show **childcare and elder care as the reason for breaks** (**42.2 per cent**). However, a comparatively lower proportion of responses by women from this group have shown this as a reason for the break/ breaks compared to the proportion of WIR and WNR. One-fifth of the responses by WNW (**21.9 per cent**) show that one of the reasons for break/breaks was **difficulty in finding jobs, advisors or institutions**. The corresponding figures for the sub-groups of WIR and WNR is about one tenth.

The differences in responses given by women of the three sub-groups is statistically significant at the 0.05 level, indicating that WIR, WNR and WNW have taken breaks for different reasons. Across all age-groups of women, childcare has been the most reported reason for breaks, though a comparatively lower percentage of responses for the same have been reported by women above 50 years (50 per cent) compared to women below 40 years (78.7 per cent) and women between 40-50 years (74.2 per cent). The difference is significant at the 0.01 level. Once more it can be seen that better organizational provisions such as adequate number of jobs, institutions, and childcare/eldercare facilities at the workplace can be important provisions in reducing breaks for women and preventing drop out (Refer Appendix II, table 24 for details).

There is a significant difference between the sub-groups with respect to reasons reported for breaks in career. Among the three, a higher percentage of WNR have reported childcare and eldercare as reasons, while a higher proportion of the WNW group has reported difficulty in finding institutions, jobs and advisors in comparison to the other groups. Once more organizational factors appear to be significant for women not continuing in Science.

Research and Networking

Research and Networking are important factors that increase visibility of scientists and help them gain prestige in the research milieu. Questions regarding participation in conferences and workshops, external projects, memberships to professional organizations,

etc were asked of women scientists to understand their research and networking profiles.

Special Schemes and Fellowships:

In the recent past, several notable efforts have been made by various agencies, institutes and organizations to increase participation of women in Science, through special schemes and fellowships (e.g., DST Women Scientist Scheme for research). The number of women scientists aware of these schemes and those who had availed such opportunities, were analyzed (Refer Appendix II, table 25 for details).

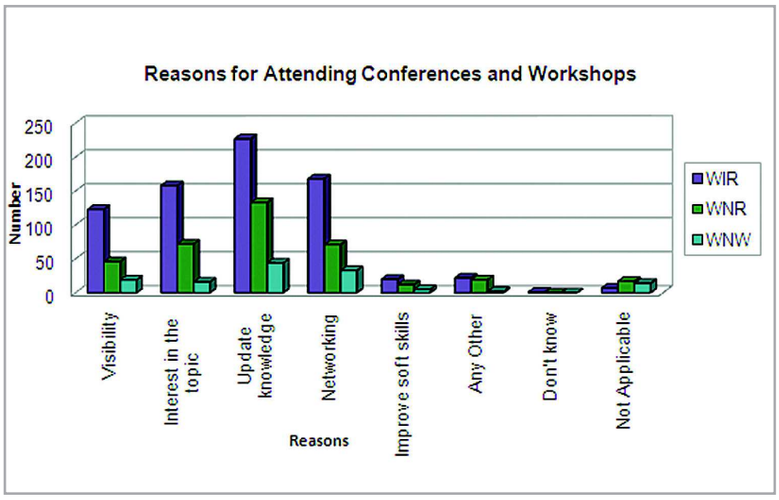
With respect to special schemes for women, a majority of WIR (**81.4 per cent**) have reported **being aware of these schemes for women in Science**. However, only **29.5 per cent** of them have reported accessing **such schemes**. A majority of the group (**84 per cent**) also reported that they **would like to access such special schemes for women in Science in the future.**

Among WNR, a comparatively lower proportion (**63.7 per cent**) reported **being aware of special schemes for women scientists**. Among them, only **28.6 per cent** reported **having taken benefit of these schemes**. A larger majority of them (**86.8 per cent**) however reported being **interested in accessing such schemes in the future**.

A majority of WNW also **were aware of special schemes for women in Science** (**78.4 per cent**), but only **27 per cent** of them **had accessed these schemes**. With respect to accessing such schemes in the future, **79.7 per cent** reported that they **would like to do so.**

The women scientists, irrespective of the sub-group they belong to, have reported that they would like to access the special schemes. This is indicative of the need for pro-active measures that will encourage the participation of women in Science research. Among the women scientists who reported not wanting to use such schemes, the most common reason was because such schemes would further increase the tokenism of women, making them stand out and be singled for special favours obtained.

Conferences and Workshops*



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

The proportion of WIR who reported **attending conferences and workshops more than two times a year** (**64.1 per cent**) is higher compared to the proportion of WNR and WNW. A majority WIR also perceived their participation in conferences and workshops to be **similar to men's** (**50.6 per cent**). With respect to reasons for attending the conferences and workshops, the highest proportion of the responses given by women in the group indicated **the need to learn more and to keep themselves updated on knowledge** (**31.3 per cent**). **Networking** as an important reason for attending the conferences and workshops (**23.1 per cent**) was also reported. A higher proportion of responses by women in this group (**16.9 per cent**) also showed attending these events to **showcase their work and for visibility**.

Among WNR, **50 per cent** reported **attending conferences and workshops twice or more than twice a year**. The most stated response for attending conferences and workshops by this group was to **keep themselves updated and learn more (35.9 per cent)**, followed by **interest in the topic (19.5 per cent)** and **networking (19.2**

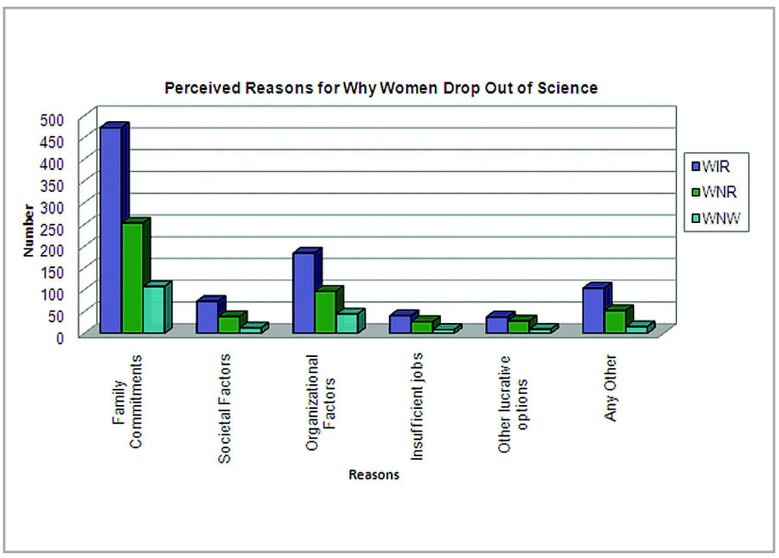
per cent). Fewer responses from the WNR group have been reported for **showcasing their work and visibility** (**12.4 per cent**) compared to the other two groups.

Fifty per cent of WNW have reported **attending two or more conferences or workshops a year.** The highest proportion of women in this group (**47.3 per cent**) has reported that their participation in conferences and workshops was **equal to that by men scientists**. The least proportion of women in this group also reported that their participation was **lower compared to men's** (**13.5 per cent**). The highest majority of responses from the group indicated that they attended conferences and workshops to **keep themselves updated and learn more** (**33.1 per cent**). The proportion of responses reported the WNW group indicated **networking** to be an important reason for attending conferences and workshops, which higher compared to the other groups (**24.8 per cent**).

Thus, the availability of opportunities for conferences and workshops fulfill an important function for the different sub-groups of women scientists. - allowing WIR to showcase their work and learn more about the work of colleagues and competitors; for WNR, it is also useful to help them keep in touch with Science and topics of their interest which they may have given up due to constraints; and for WNW, it provides an important mechanism to keep in touch with Science and with scientific networks, which can help them return to Science if they want to. (Refer Appendix II, table 23 for details).

PERCEIVED REASONS FOR DROPPING-OUT FROM SCIENCE*

There have been several theories advanced to explain low participation and low retention of women in Science. Further, the views on women's participation and retention differ from that of science administrators and policy makers. Most commonly advanced reasons cite the problem in terms of women's dual responsibilities that limit time for scientific activities. Other reasons such as lack of interest and motivation are also commonly reported. An attempt was made in this study to elicit reasons from the different sub-groups of women scientists and men scientists for women leaving Science research. Further, an attempt was also made to understand what provisions would be useful to retain women in Science through this survey.



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

The graph shows a comparison of the reasons reported by the sub-groups of women scientists. Respondents were given a choice of indicating up to four reasons for the poor retention of women in Science research. Among WIR, more than half of the responses (51.7 per cent) showed that they perceived family responsibilities as the reason for women dropping out of Science. Disenabling organizational factors such as lack of flexibility in timings, discriminatory work practices, lack of enough number of women colleagues, mentors and role models, restricted chances for participation, too few women in decision-making posts, harassment, etc, have been also perceived as reasons for women dropping out of Science. One in every five responses of WIR sub-group (20.2 per cent) report the above. Similar patterns of responses have been observed for the WNR and the WNW category with very small differences.

The responses across the group are similar and there is no significant difference between the sub-groups with respect to reasons for why women drop out of Science. It is interesting to see that more than half the responses from women in all the three sub-groups have indicated family factors as contributing to the drop out.

A similar question was asked with respect to men to find if the reasons for men dropping out of Science were different. Data reported by women scientists for why men drop out of Science shows that the sub-groups were largely similar in their responses. The highest proportion of responses by WIR showed that they perceived men to drop out from Science research for **other lucrative career options** (**49.6 per cent**). The second largest majority of responses by this sub-group indicated that they perceived family responsibilities such as **earning and providing for the family** to be a reason for men dropping out of Science (**12.6 per cent**). An approximately equal proportion of responses have also indicated **lack of patience and dedication for Science** among men as the reason for drop-out (**12.2 per cent**).

Among WNR, the highest proportion of responses indicated that this sub-group perceived **other lucrative careers** as reasons for men's drop out from Science (**47.5 per cent**). The second highest proportion of responses showed that they perceived **lack of patience and dedication for Science research** among men (**16.9 per cent**) to be the reason.

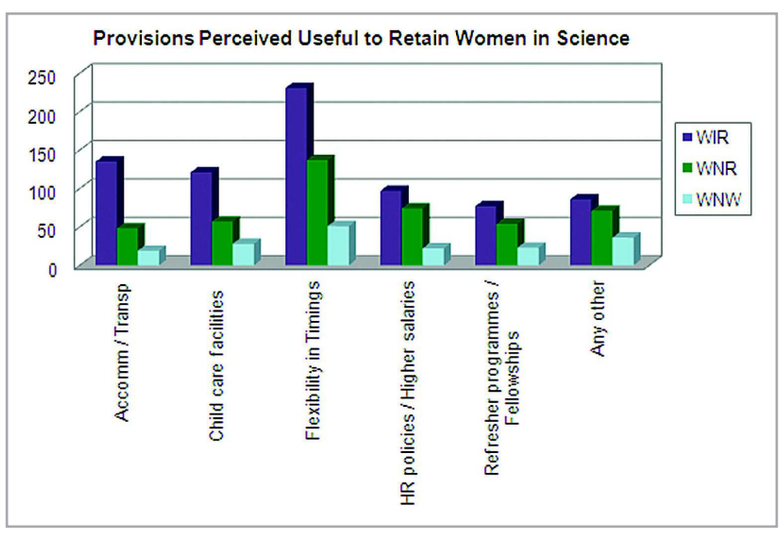
WNW also perceived **lucrative career options** as the reason for men's drop out from Science (**45.8 per cent**). The second highest proportion of responses showed that they perceived **family responsibilities** (**13.3 per cent**) followed by **lack of patience and dedication for Science** (**12.7 per cent**).

Two options for this question - 'lack of patience and dedication for Science' and 'peer pressure to do well in life' - were generated based on the large number of responses given by both women and men scientists in the 'any other category' indicating these reasons. It is interesting to note that men, and not women, have been perceived to lack patience and dedication for Science and as seeking opportunities for greener pastures. Despite this indirect implication of greater dedication on the part of women, organizations, policy makers and scientific personnel are often skeptical about hiring women for Science research careers citing factors such as family responsibilities and childcare.

Provisions Perceived to be Useful to Retain Women in Science Research*:

Institutionally initiated provisions have been recognized as important factors in retaining women and attracting girls to careers in Science. Many universities, scientific research institutes and professional organizations such as National Science Foundation, National Academy of Engineers in the USA and Indian professional organizations such as INSA, DST and DBT, Indian Academy of Sciences, etc have initiated schemes, fellowships, mentoring networks, career fairs, diversity policies, etc, to increase the representation of women in Science. Such schemes have been largely beneficial in increasing the numbers and opportunities for participation of women.

Provisions perceived to be useful for continuing in Science research reported by the three groups of women scientists is given below (Refer Appendix II, table 29 for details).



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

The provision that has received the highest proportion of responses from WIR is **flexibility in**

timings (**30.9 per cent**). Such policies that allows scientists a three hour bracket to chose from to start and close the day can increase efficiency and help them manage both house and office work. This will mean that scientists will start their office hours between 7 and 10 am and close it respectively between 4-7 pm in the evening. Such gender neutral facilities that will be useful to women as well as men have already been adopted in Western countries, corporate companies and in select elite Science research institutes in India.

The second highest number of responses have been reported for provisions of **accommodation close to workplace and transportation facilities** (**18.1 per cent**). Similarly **childcare facilities at workplace** were also considered important provisions by this sub-group (**16.2 per cent**).

Among WNR, the highest proportion of responses have also reported **flexibility in timings** as an important provision to retain women in Science research (**31.1 per cent**). This was followed by provisions of **better HR policies** (**16.8 per cent**). Other factors such as job security, reservations, congenial working atmosphere and age limit relaxations, have also been reported as useful to retain women in Science research (**16.1 per cent**).

The highest proportion of responses by WNW have shown that they too perceived **flexibility in timings** as the most important provision (**28.5 per cent**). A second largest proportion of the responses have indicated other factors such as job security, reservations, congenial working atmosphere and age limit relaxations to be important (**20.1 per cent**) while **15.6 per cent** of the responses have indicated the need for **childcare facilities at the workplace.**

The differences among the sub-groups with respect to perceived provisions are significant at the 0.01 level. The differences in the perception of provisions between the sub-groups is an important indicator of the heterogeneity of the groups, and the need to address their individual needs instead of forming blanket policies that may not suit all sub-groups.

More importantly the provisions perceived as useful also differed significantly across the different age groups. Among the younger women (below 40 years) childcare has been reported as an important provision by a higher percentage of the group (39.8 per cent)[10] while other considerations such as job security, age limit relaxation, etc, have been more important for the 40 years and above age groups. Lesser women in the 50 years and above have also considered provisions such as accommodation, transportation and flexibility in timings to be useful in retaining women in Science research.

This may perhaps be because of several reasons:

- **Women in the older age group may have older children and fewer domestic responsibilities, thus requiring lesser organizational provisions to balance career and family, if the reference point for their response has been themselves;**
- **It could also be that they may have had greater family support with domestic and household responsibilities, since the joint family system was largely prevalent up to the 1990s.**
- **Women in the older age group may also have accepted the system as it was given the fact that the relative representation of women in Science was much lower during their period of active Science research.**
- **Further, it is with the advent of the new corporate culture, particularly with the advent of Bio technology, Information Technology and software sectors that technological advancement and new provisions such as flexi-time, transport and work from home options gained currency. Hence, it is likely that these provisions, as indicated more by the younger groups, may be a reflection of the changing times. It would be important to analyze in depth the reasons for the differences in perceived provisions that would be useful for women to continue in Science research.**

More importantly, the differences in perception of useful provisions among the different age groups indicates the need to balance policy making and decision making committees with younger women since they could have important inputs to contribute. The trend of appointing only senior and retired faculty to such important decision making groups needs to be revisited in this context.

Significant differences were found in the provisions considered useful to retain women in Science research among the different sub-groups of women. While all three sub-groups perceived flexibility in timings to be useful, more WIR have perceived provisions of accommodation and transportation to be useful. More WNR have perceived HR policies to be useful, while more WNW have perceived provisions such as job security, age limit relaxations, congenial working atmosphere, etc to be useful. The differences in perception perhaps reflects the particular experiences of the individual sub-groups and the nature of difficulties they face in balancing careers with their other responsibilities.

The data importantly reveals the need for policies to refrain from developing blanket-provisions that do not meet the needs of all women scientists, but perhaps address the needs of those already in Science. Further, the differences seen with respect to the different age-cohorts importantly indicate the need to reorganize decision making/standing committees at National and State level to promote the participation of women in Science to have members also from the younger age groups so their views and experiences are also represented.

III. COMPARATIVE STUDY OF WOMEN AND MEN IN SCIENCE

A comparison was made between WIR and MIR. This group is operationally defined as those who are engaged in research in some form and are holding tenured positions. These women and men scientists are either engaged in only research(including technology based research), or engaged in research along with teaching at the graduate and/or postgraduate level. A comparison of these two groups was undertaken as a part of the survey to observe whether differences in research and work productivity, educational performances and the balance of work and family life, are responsible for the lower participation of women in scientific research and teaching when compared to men. Other factors such as organizational profiles were also studied to see whether organizational environment and organizational factors affect women's participation in Science research. The analysis has been conducted for the WIR and MIR groups only for two reasons: it terms of sampling, the number of men in the 'not in Science research' category and 'not working' category was comparatively lower and hence did not lend itself for comparison. Secondly, the comparison attempts to analyze whether within scientific organizations where women's representation is lower, individual characteristics of women and men influence women's participation, and if organizational characteristics play a significant role in creating situations that exclude women in scientific organizations.

ORGANIZATIONAL FACTORS

No. of Working Hours

Although the literature in this field does not indicate variation in the number of working hours between women and men scientists, the results of this study showed otherwise.. The commonly held perception that women are not able to put in the long hours of work required for scientific research was not validated by this study. This commonly held perception is not only among the men scientists but very often expressed by women scientists as well. Some studies also indicate that both men and women put in the same number of hours at work, with men reporting slightly higher number of hours on an average (Campion and Shrum, 2004).

A majority of the WIR in our study have reported working **40-60 hours** on an average per week **(62.8 per cent)**. This is higher than the percentage of men who have reported the same. Also, the percentage of women who have reported working **below 40 hours** is significantly lower compared to men (**16.6 per cent**) (Refer Appendix III, table 41 for details).

Forty-six per cent of MIR reported working between **40-60 hours on an average per week**. A higher proportion of MIR, compared to WIR, have reported working above **70 hours per week on an average** (**11.2 per cent)**. A higher per cent of

MIR have also reported working **below 40 hours** per week (**25.5 per cent**) compared to women.

The difference in working hours for MIR and WIR is statistically significant at the 0.01 level. It is however interesting to note that overall, more WIR have reported working 40 or more hours per week (**83.3 per cent**) compared to MIR (**74.5 per cent**). Contrary to the common understanding that women are able to spend less time at work due to multiple responsibilities the study shows otherwise. This finding is also contrary to the results of the Campion and Shrum (2004) study, who have stated that men spend marginally higher time at work than women, and that this was not statistically significant. **While this finding needs to be validated through a larger sample, one needs to take note of the fact that, women, even when they balance their work and home, do not compromise on the hours of work. However there is a caveat that the hours of work cannot alone be a measure of the output and quality needs to be examined alongside.**

Reasons for Taking the Present Job*

The question was asked to 312 WIR and 161 men who are currently employed. This was a multiple response question with a maximum of four responses per respondent.

One third (**34.5 per cent**) of the responses by WIR report **professional advantages and opportunities** to be the reason for accepting their present posts. Nearly one in five responses (**18.8 per cent**) by WIR reported **enjoyment and satisfaction** as the reason for taking the post. One in ten responses (**10.2 per cent**) by WIR reported **organizational factors** such as flexible timings, congenial atmosphere, provisions of daycare, transport, accommodation, etc. as reasons for taking the post. Organizational factors has once more figured as important with a higher percentage of responses from WIR compared to MIR **(10.8 per cent**) (Refer Appendix II, table 44 for details). It may be useful to note that while, the organizational studies of S&T institutions have not received the kind of attention it should, it could perhaps be an important area of research to throw light on ways of retaining women in Science. This is perhaps not the case in business or industries where organizational factors have been studied in depth and have provided useful insights to help them move forward.

One in every three responses (**33.5 per cent**) of MIR report **professional advantages and opportunities** as the reason for taking the current post. One in five responses of MIR (**21.6 per cent**) also report **enjoyment and personal satisfaction** as an important factor. Among other reasons for taking the current post, **15.9 per cent** of responses by MIR have reported **autonomy in research, previous association with the organization, etc, as the reasons.**

The reasons reported by MIR and WIR are significantly different at the 0.01 level. It seems that for women, flexibility and organizational provisions play an important role in choice of work, and this finding is important as it provides directions for the need to change at the organizational level in S&T institutions. The percentage of WIR (**15.4 per cent)** and MIR (**13 per cent**) reporting family factors as responsible for the choice of job, though comparatively lower than the factors discussed above, is important. Therefore together, organizations that provide special provisions for women and men, and also allow them to balance family with careers, can go a long way in increasing women's participation, retention and optimal performance in Science research.

There is a significant difference between WIR and MIR with respect to reasons for taking up present posts. A similar proportion of women and men have reported reasons such as professional advantages, enjoyment and satisfaction, and family factors. However, a significantly higher proportion of women have reported organizational factors compared to men.

The proportion of women and men who have reported family factors is not insignificant and hence needs attention. It is interesting to note that for almost equal proportion of men and women, family factors play an important role in selection of jobs. Hence gender neutral organizational policies and facilities can be useful provisions for both women and men.

Career Breaks*:

A comparison was made between women and men scientists to identify whether breaks were a factor responsible for the large number of women leaving scientific careers. A significantly higher number of women compared to men have reported breaks. With respect to reasons for breaks, more than one reason was given for the breaks by each respondent. There has been a clear variations in the reasons reported for breaks in career by WIR and MIR (Refer Appendix III, table 45 for details). A majority of responses by **WIR** have indicated **care for children and/or elders** as reasons for taking breaks. On the other hand, for **MIR** reasons such as health reasons, for further studies or temporary nature of jobs have been reported.

For WIR, **child and elder care** and other **family factors** such as marriage or father's / spouse's transfer have accounted for **56.6 per cent** of the responses as reasons for the break.

In contrast, a majority of the responses received from MIR (6, **85.7 per cent**) have indicated **other reasons** such as completing PhD, further study, health reasons, voluntary retirement, etc.

The difference between WIR and MIR with respect to reasons for taking breaks, is significant at the 0.01 level. Thus, while for men the choice of breaks has been largely voluntary and personal s, for women the breaks have been taken to fulfill family needs and responsibilities.

RESEARCH AND NETWORKING

Papers and Patents[11]

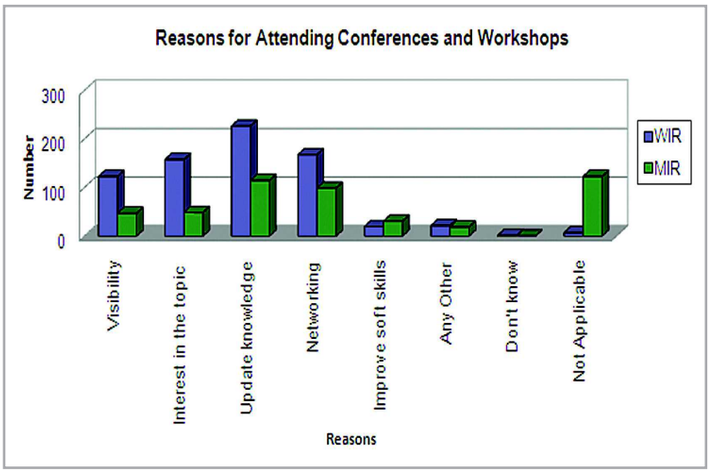
A majority of women scientists (**549**, **96.7 per cent**) and all men scientists (**226**) have reported having publications or patents.

Four hundred and eighty-one WIR, i.e., **84.7 per cent** have reported publishing **joint/multi-author research papers in refereed journals. 44.5 per cent** of WIR reported publishing **individual research papers in refereed journals.** A comparison of the WIR in terms of individual publications and joint / multi-author publications show that a higher number of women compared to men reported individual publications. (Refer Appendix III, table 46 for details)

Two hundred and ten men (**92.9 per cent**) have reported publishing **joint / multi-author research papers in refereed journals**. **38.1 per cent** of men report publishing **individual papers in refereed journals**. More than half (**56.6 per cent**) of MIR report publishing **joint/ multi-author conference articles / proceedings or abstracts** (**128**, **56.6 per cent**). A close look at the table reveals that men have more multi-author publications when compared to individual publications than women. It can also be see that MIR also have substantial number of multi-author publications in conference abstracts/proceedings that will possibly give them greater visibility. The ability to travel to attend these conferences, given the fact that family responsibilities are taken care of by the women, and having greater skills at networking may have helped them in undertaking multi-author work. This has worked as a advantage for men in comparison to women. The modus operandi of getting involved in joint work stems from meeting people, and conferences are a useful vehicle in this endeavour.

While the difference in the rate of individual and joint publications is noted above, it is important to analyze this data in relation to the disciplines in which the papers have been published, since there is a difference in the pattern of individual and joint publications across various disciplines. An analysis of the educational backgrounds of the surveyed respondents did not show large variations between women and men, except with respect to engineering and technology. Therefore, perhaps the differences noted in publications may still be valid.

Conferences and Workshops*



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

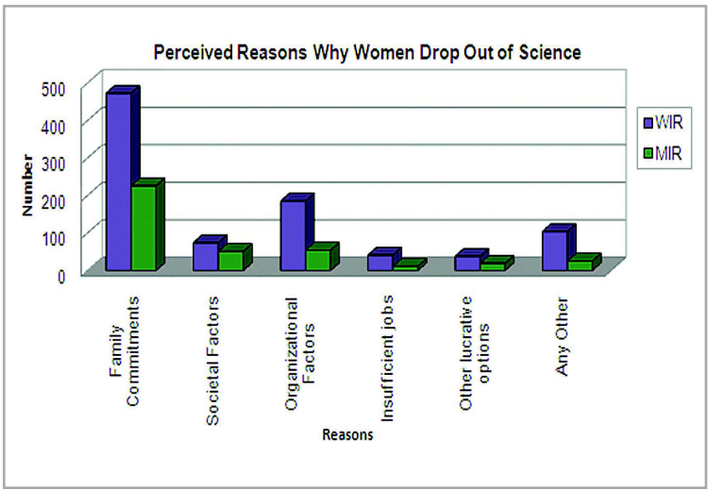
With respect to conferences and workshops, a majority of both women and men scientists reported attending at least more than two in a year.

A majority of WIR have reported attending conferences and workshops **twice or more a year** (200, **64.1 per cent**). With respect to reasons for attending conferences and workshops, **31.3 per cent** of the responses by WIR showed that they did so to **keep themselves updated or learn more. 23.1 per cent of the responses showed 'Networking'** to be another important reason. WIR also reported **interest in topic** (**21.8 per cent**) and **showcasing work or for visibility (16.9 per cent)** as reasons for attending conferences and workshops.

A majority of MIR reported attending conferences and workshops twice or more in a year (116, **72 per cent**). **31.8 per cent** of the responses by MIR reported attending conferences and workshops **to keep themselves updated or learn more.** One fourth of the responses by MIR (**27.1 per cent**) showed **Networking to be an important reason** and **8.5 per cent** of the responses by MIR indicated **gaining soft skills** as the reasons for attending conferences and workshops (Refer Appendix III, table 47 for details).

PERCEIVED REASONS FOR DROPPING-OUT FROM SCIENCE*

A majority of WIR **(59.3 per cent**) and MIR (**47.2 per cent**) surveyed have perceived **women to drop out of Science**. However, a relatively higher per cent of men than women scientists perceive that both **women and men drop out of Science.**



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

A majority of the responses by WIR have shown that they perceive **family commitments** as the reason for women dropping out of Science (**51.7 per cent**). The second highest proportion of responses have indicated **organizational factors** such as flexibility in timings, availability of women colleagues and mentors, chances for participation and promotion, few women in decision making posts, harassments, etc as reasons for women dropping out of Science (**20.2 per cent**).

A majority of the responses of MIR indicated that they also perceived **family commitments** as reasons for women dropping out of Science (**58.5 per cent**). The second highest number of responses by MIR also showed **organizational factors** as an important reason (**14 per cent**) for women dropping out of Science. A higher proportion of responses of

MIR, when compared to WIR, showed **socio-cultural factors and the conservative nature of society** as reason for women dropping out of Science (Refer Appendix III, table 48 for details).

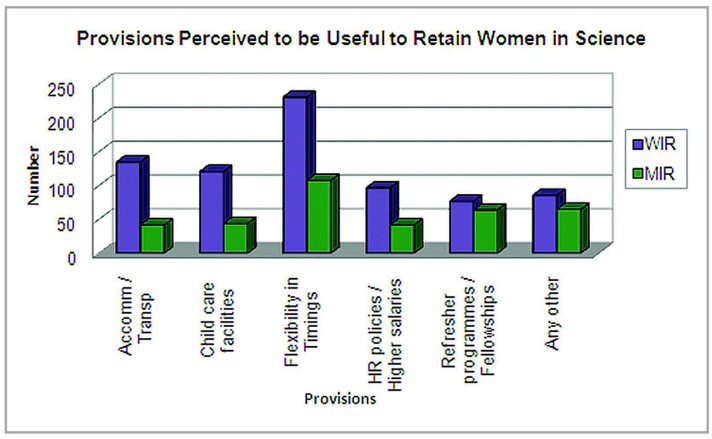
The study also explored reasons for why men drop out of Science. A majority of the responses of WIR showed that men drop out of Science in search of **other lucrative careers** (**49.6 per cent**). Among other reasons for men dropping out os Science WIR reported **family responsibilities** such as earning and providing for family (**12.6 per cent**) and **lack of patience and dedication** among men for Science (**12.2 per cent**) as reasons. A higher per cent of women compared to men have indicated family responsibilities as a reason.

The highest percentage of responses from MIR indicated **other lucrative career options** as the reason for men dropping out of Science (**53.2 per cent**). **Lack of dedication and patience in men for scientific careers** has received the second highest proportion of responses even from the men's group (**14.5 per cent**) (Refer Appendix III, table 49 for details).

WIR and MIR differ with respect to why women drop out of Science. These differences may be important as they have implications for policies developed to address the problems of women in science. With men forming the majority of most science organizations, and more men heading decision making committees, which can take significant actions and make significant efforts in increasing women's participation in science, lesser importance given to reasons such as organizational factors, or lack of sufficient jobs, and greater importance given to family responsibilities may lead to the formation of inadequate policies that did not address these women's concerns.

Provisions to Retain Women in Science Research*

The survey also collected information regarding useful provisions to retain women in Science research. Both WIR and MIR reported. **Flexibility in timings**[12] as an important provision to retain women in Science.



Note: The question was a multiple response question and the total number of responses received exceed the actual number of respondents.

Nearly one in every three responses of WIR (**30.9 per cent**) reported **flexibility in timings** to be an important provision to retain women in Science. One in five responses reported by WIR (**18.1 per cent**) indicated provisions of accommodation and transportation to be equally important. **Better childcare facilities at the workplace** have also been more frequently reported by WIR (**16.2 per cent** of the responses) compared to men.

An approximately equal proportion of responses of MIR have indicated **flexibility in timings** as an important provision to retain women in Science (**29.6 per cent**). **Other factors** such as awareness, motivation campaigns, sensitizing family and society, ensuring jobs for women, allowing couples to work at the same institute, safety in the workplace, etc, have been considered important provisions to retain women in Science by MIR (**17.8 per cent**). A higher proportion of MIR have also reported refresher programmes and fellowships as critical for retaining women in Science research compared to WIR (**17.5 per cent**).

Thus, the provisions considered important by WIR and MIR to retain women in Science differed significantly at the 0.01 level. While WIR indicated provisions that will helped them balance career and family, MIR indicated provisions that would increase opportunities for women, and would ensure fair play in the practice of Science. Provisions to retain women in Science must use a combination of the factors reported by both WIR and MIR. The difference in perception is important and is a clear pointer to prioritize organizational changes. This is not to undermine the attention to be paid to family and societal factors but more to make a point that changes can simultaneously occur in the sphere of the family, workplace and society. A multi-pronged approach would be extremely useful if one would want to address the complex question of retaining women in Science.

Note:

Questions marked with an asterix (*) were multiple response questions and the total number of responses received for those questions exceed the actual number of respondents.

SUMMARY AND RECOMMENDATIONS

Women Scientists: Women in Science Research(WIR), Women not in Science Research (WNR), and Women not Working (WNW)

The complexity of developing interventions to retain women in Science stems from the diversity in the characteristics of women scientists across the different sub-groups of women in Science. The differences also perhaps stem from the different priorities the groups have, because even with several commonalities among demographic profiles of the women, differences on important aspects such as professional prospects vs. childcare or family responsibilities are seen.

- An analysis of the sample details reveals that while a majority of all the three sub-groups of women were married, the highest percentage of WIR were 'never married' (14.1 per cent). Women who were 'never married' were distributed across all age cohorts. A majority of the three sub-groups also reported having children who were over 15 years. However, more WNW (across all age groups) had younger children (between 0-5 years) compared to the other two sub-groups.
- A majority of the women also reported living in nuclear families. A significantly higher percentage of WNW reported having received no help with childcare. Thus for WNW, the absence of support either by choice or compulsion could perhaps be an important reason for their dropping out of Science. In contrast, WIR and WNR reported receiving help from a combination of agencies like their parental family, marital family and professional help.
- Interestingly, a significantly higher proportion of WNW have also had spouses in the same field or organization, and this could have been another major factor contributing to their drop out.
- With respect to organizational details, professional advantages and opportunities and getting jobs have been the main factors influencing job selection. A majority of the responses from all groups indicated **not getting jobs as the primary reason for not taking up posts applied to**. While more WIR and WNR have indicated **better professional prospects** as reasons for not taking up the posts, none of the responses from WNW indicated this reason.
- With regard to leaving previous jobs, **better professional prospects have been the most important consideration for WIR and WNR, while the temporary nature of the post has been the reason most often stated by the WNW**. Family reasons have also been reported as the an important factor by WNW for leaving jobs.
- WIR and WNR also significantly differed with respect to reasons for accepting present post. **A greater proportion of WIR reported professional advantages as a reason for taking up the post, while for WNR other reasons such as lack of other suitable options, freedom and autonomy in work, permanency of position, etc, figured as an important reason.**
- **In terms of working hours, both WIR and WNR have reported working between 40-60 hours per week on an average.** However, a higher per cent of WIR have reported working for 60 hours or more per week compared to WNR, while a greater per cent of WNR have reported working between 20-40 hours per week compared to WIR.
- With respect to breaks in career, there is a significant difference in the reasons reported by the sub-groups. While childcare and elder care have been important reasons for all three groups, **more WIR have reported other family factors such as marriage, husband's or father's transfer as significant reasons; more WNR have reported further studies, health reasons or non-availability of fellowship due to age limits; while WNW have reported difficulties in finding jobs and institutions as a significant factors for breaks in career.**
- Having noted that there are differences between the three groups of women scientists with respect to reasons for not taking up jobs, or leaving jobs, as well as reasons for breaks, it is hardly surprising to note the significant differences between the groups with respect to the provisions considered

important by them to retain women in Science careers. **While all three groups have considered flexibility in timings to be the most important provision, they differ with respect to other useful provisions. For WIR, who continue to juggle between scientific research and teaching careers on the one hand, and family responsibilities on the other, provisions for transportation and accommodation are important. For WNR, better HR policies have been reported as important provisions to retain women in Science. For the third group of WNW, childcare facilities at the workplace are reported as important.**

Summary of Women in Science Research(WIR) and Men in Science Research (MIR) :

The analysis of the educational, work and research profiles of women and men in research is important to identify factors that differentiate between women and men differ, and subsequently contribute to their advancement or dropping out from Science.

The data analysis reveals the following:

- Sample details have shown that while 14 per cent of WIR were 'never married', only 2.5 per cent MIR report being 'never married'. In comparison to 39 per cent women who reported that their spouses were doctorates and 40 per cent who reported that their spouses were in Science, only 16 per cent men reported that their spouses were doctorates and 19 per cent reported that their spouses were in Science.
- 86 per cent men scientists compared to 74 per cent women scientists reported having children. **A higher proportion of WIR spent between 40-60 hours per week at work compared to MIR; while a higher percentage of MIR reported spending less than 40 hours per week at work compared to WIR when their children were growing up.**
- With respect to employment and organizational factors, it was observed that a significantly higher proportion of **women (46.8 per cent)** compared to **men (33.5 per cent)** reported working between **40-60 hours per week**. **More men reported working less than 40 hours per week compared to women.**
- For both women and men, getting jobs and professional advantages and opportunities have been important reasons in determining present and previous jobs. More men compared to women have reported leaving previous posts for better prospects. For men and women approximately equal proportion of responses were reported indicating family as an important factor in taking up present posts. However, the proportion of responses reported by women indicating organizational factors such as flexible timings, day care facilities, transportation and accommodation, etc for taking present posts is higher compared to the responses from they men scientists. The importance of organizational provisions to help women balance careers and domestic responsibilities have been highlighted by this data.
- Men and women differ significantly with respect to breaks in career also. A significantly lower proportion of men have reported breaks in career compared to women. While personal factors such as health, further studies and voluntary retirement have led to breaks for men, for women, domestic responsibilities of childcare and care for elders have been the primary reason for the breaks in career.
- Perceptions regarding why women drop out of Science also differed between the groups. While higher responses from men have indicated family and socio-cultural factors, women have perceived organizational factors such as lack of flexibility in timings, lack of role models and mentors, discouraging and uncongenial atmosphere, etc to be responsible for women dropping out from Science.
- Men and women differed with respect to the provisions that have been considered important to retain women in Science. **While a majority of WIR and MIR have reported flexibility in timings as an important provision, a larger percentage of responses by MIR indicated the need for refresher courses, fellowships, awareness and sensitization campaigns to retain women in Science. In contrast, women perceive provisions such as accommodation and transportation as provisions that would help them balance their career and family.** Since most scientific organizations have a greater proportion of men compared to women, especially on decision-making posts, the differences in understanding of the problem between men and women could have important implications. Provisions that are designed without taking into account the

experiences of both, women and men, who are part of this work space will not yield the desired results. **Thus, it may be important to consider the view points of gender sensitive men scientists along with gender sensitive women scientists who have a nuanced understanding of the complex functioning of S&T organizations.** It must be emphasized that the S&T organizations in our country are varied and hence experiences of one organization cannot represent the other. **Sociological studies of S&T organizations with a democratic multi disciplinary team will go a long way to provide useful insights that will help the country frame policies that can retain the talent pool of both women and men.** Excluding the experiences of women in Science can lead to inadequate provisions. Thus, it is important that **more women are represented on committees and decision making posts to influence the policies that can be conducive to women.**

RECOMMENDATIONS

The primary purpose of the study was to develop a comprehensive set of recommendations and policy directions that are evidence-based and that would motivate and retain women in Science research. Various bodies have dealt with this issue and formulated recommendations based on data and/or group discussions, meetings and suggestions as well as feedback from various women scientists. Some of these recommendations are available in reports such as:

(1) *'Science career for Indian women: An examination of Indian women's access to and retention in scientific careers'* (October 2004) by Indian National Science Academy (INSA). **(2)** *'Women in Physics in India'* by Rohini Godbole, Neelima Gupte, Pratibha Jolly, Shobhana Narasimhan and Sumathi Rao presented at the Second IUPAP Conference on Women in Physics held at Rio de Janeiro, Brazil between May 23-25, 2005. **(3)** *'Evaluating and enhancing women's participation in scientific and technological research: The Indian Initiatives'* (January 2010) by National Task Force for Women, Department of Science & Technology, Government of India.

Interestingly many of the recommendations mentioned in the above reports find resonance with the recommendations of this report. However, since this study for the first time has included sub- groups of women scientists and men scientists that were not covered by the earlier reports, several different and nuanced recommendations have emerged from this study.

The recommendations have been developed through interactions with a wide range of women and men scientists from different parts of the country. While the purview of the survey covered only those with a PhD in Science, Engineering or Medicine, adequate care was taken to represent members from a range of scientific organizational settings like autonomous institutions, research organizations, universities and colleges, industries that are government owned and private sectors. For the first time, this study has covered women scientists who may not be currently employed as well as men scientists. The data convincingly revealed that the groups were not homogenous and the diverse experiences of the sub-groups of women scientists and men scientists has vitally informed our recommendations. Thus, **the myth of 'one size fits all' accepted by Science policy makers has been questioned through this study** and an attempt was made to represent the many different voices and needs that Science policy makers have to respond to if there is to be a serious engagement with the central question of attracting and retaining women in Science.

Integral to retaining women in Science is acquiring information on the number of women PhDs in Science. An important move in this direction will be to build on the existing database created by the IAS on a mission mode by assigning dedicated staff and targeting completion of a comprehensive database within one year's time. It will also be important to dedicate resources to the continual maintenance and up-gradation of the database to reflect current information and trends. Since women and also men who have dropped out of Science are difficult to locate, media drives and campaigns through television and newspapers will have to be undertaken.

Important headway can be made by addressing organizational and infrastructural facilities as well as undertaking policy changes that may be critical to attract and retain women in Science research. Such changes need to move beyond the traditional framework that locates societal and family responsibilities as singular factors responsible for women dropping out of Science.

The data has importantly revealed **close to 85 per cent of the women who are pursuing active careers in research have competently and in very different ways balanced families and**

careers. Among those in scientific research approximately 14% per cent have reported being 'never married' and are distributed across all disciplines. Among the largest majority of those married, never married, with or without children, **family and societal pressures have been a small but significant factor reported for not taking up the job .** Even among those who are currently not working, the corresponding figure is only 3.3% indicating that **family and societal pressures cannot explain completely why women drop out of Science.**

These facts are important indicators of women's commitment to pursue scientific research. Institutional support through 'gender-neutral' facilities and policies will be vital in attracting and retaining women in Science. These policies in turn will have a spin-off effect in redefining 'gender roles' at home that could maximize the productivity of women and men scientists. In essence, this will lead to maximizing the productivity of the organization on the whole.

Gender neutral facilities and policies are also important to prevent, on the one hand, the stereotyping of gender roles and on the other, the stigmatization of women for privileged or special treatment. In the West there has already been a recognition of the importance of having such gender-neutral facilities and interestingly many men have availed its benefits. A caution in this regard would be however useful**. Periodic reviews of the new policies are essential to make sure that they do not work against the interest of women in particular and Science practice in general.**

ORGANIZATIONAL / INFRASTRUCTURAL PROVISIONS

A. Provisions to manage career and home: Provisions of on campus housing, transportation[13], state of art child care and elder care facilities as well as professionalized domestic help should be provided for both women and men faculty at all S&T organizations. This should include universities, research organizations and autonomous organizations. These provisions are important for scientists to manage their family responsibilities. This will release their time and energy that can be utilized for their scientific research activities. Priority accommodation and childcare and eldercare facilities for those with young children and elders would be important.

B. Flexibility in timings: The data revealed that despite multiple responsibilities, a higher proportion of women scientists in research reported working between 40-60 hours per week than men scientists. However flexibility in timings will benefit both women and men scientists.

It is important to evolve a gender neutral policy of flexible timings in all S&T organizations that allows one to manage multiple responsibilities. This is not to be construed to mean that scientists would want to work from home and not spend time in the laboratories. Rather, it is an indication that organizations are willing to introduce policies that will allow a greater participation of scientists to engage with research. The policy will have extended office hours which will give a margin of three hours for starting and closing work officially. This will mean that scientists will start their office hours between 7 and 10 am and close it respectively between 4-7 pm in the evening. Work can be organized by the scientists so as to use the official timings to interface with the administration if necessary and to hold official meetings at a time when convenient for all team members. The quorum required for departmental meetings should have an acceptable representation of both genders. The extra time margin provided could be used productively on research.

C. Opportunities for networking and collaboration: Increasing opportunities for networking and collaboration through increased number of travel grants; organizing workshops and conferences dedicated to facilitate collaborations; integrating sessions in conferences and workshops for honing networking skills are important and such measures to enhance it among women scientists needs attention. In considering applications for conferences and workshops, it is important to ensure that there are adequate number of applications from both women and men through active pursuit[14]. The selection must take care of representing members of both groups, even while specifying the merit criteria. It would be important to have a transparent, publicly displayed checklist indicating the requirements for merit based selection, both to encourage more women to apply through knowledge of these criteria as well to ensure transparency in the selection procedure.

Mentoring: Mentoring mechanisms and integrating sessions during workshops and conferences to enhance capabilities of women scientists are important factors in attracting and retaining women in Science. As adopted by some corporates, mentoring can also be encouraged by instituting official policies that pair senior and junior colleagues to provide for guidance. Providing incentives for mentoring of women scientists and linking it as an assessment criteria on annual reviews and promotional reviews should be mandatorily introduced.

POLICY CHANGES

D. Policy on transparency in selection and evaluation procedures: All institutions must make available the criteria for selection and promotion of all faculty. According to literature the availability of actual selection criteria helps increase the pool of women applicants and builds confidence among those who contemplate whether to apply or not because of the low success rate for women. Studies on the hiring practices of institutions can provide vital clues to the evaluation procedures and qualities perceived as desirable for a good candidate. Such studies would also help institutions develop a ready checklist to be made available to all candidates during selection.

E. Policy on Time Bound Target Recruiting System (TRS): For institutions that do not have adequate representation of women at all levels, starting from students to faculty (including Assistant Professors, Associate Professors, Professors, Deans, etc), develop a time bound recruitment target system(TRS). This should be based on the current representation of women in the institution as well as the age and the size of the institution. **Make it mandatory for institutions to review TRS based on outcomes**[15] **rather than restricting it to providing opportunities or process based.**

F. Increase in recruitment of women to premier research institutions: The government must proactively increase the number of women scientists in premier institutions to break the stereotype that women scientists are best as college or university teachers. Increasing the number of women in premier institutions that gets greater visibility; that have comparatively higher resources and better infrastructural facilities, will have a far reaching impact on women wanting to choose a scientific career.

G. Mandatory disclosure of gender break-up of faculty and students across departments and levels: It must be mandatory that every S&T organization, within a time frame, puts up gender disaggregated data of their employees at every level starting from students to the professors and deans. The data must be presented department wise.

H. Mandatory composition of one-third women members in committees: It must be mandatory that all decision-making committees, like the search/ selection/hiring committees, committees that decide on promotions at all levels as well as other decision-making committees have at least one third women representation (or work towards it within a specific time frame). Efforts to get women representatives from outside the institution, city and state must be explored. It would also be important to make mandatory a rotational system of selection of women representatives to different institutional as well as national committees based on merit. This will give opportunities to all women to be a part of the decision making process. It will broad base the participation of women scientists and hence become more representative.

Further as the study data has shown, perceptions and experiences of different age cohorts of women in Science are very different. **More importantly, the differences in perception of useful provisions among the different age groups indicates the need to balance policy making and decision making committees with younger women since they could have important inputs to contribute. The trend of appointing only senior and retired faculty to such important decision making groups needs to be revisited in this context. In other words membership to these committees should not be monopolized.**

I. Introduction of Long-term schemes for re-entry: There is a need for modification of existing re-entry schemes to cater to long term working opportunities for women and men who return to scientific career after a break. Provisions for short term schemes, temporary positions and post doc positions limit the potential attracting and retaining them in scientific research careers. It would be important to ensure complete autonomy for these scientists by making it mandatory for all government supported institutions or labs to take them on independent projects. To optimize the use of lab

facilities supported by the government, incentives can be given to these institutions for having taken more independent researchers on government schemes. These scientists can be subjected to a review processes once in five years as done in the case of scientists who are in tenure track positions. Facilities for these scientists like travel grants, PF, transport facilities, and child care/care of elders must be extended. It would be important to ensure to the autonomy of these women (or men) scientists. This can be achieved through the constitution of a local advisory committee that can guide and review their work, rather than linking the fellowship to the identification of a faculty member at a particular institute.

J. **Increase in job opportunities**: The study has highlighted the lack of job opportunities in formal spaces in S&T organizations as a significant factor for women dropping out of Science. While efforts to increase job opportunities in S&T organizations must be made, it may be useful to create entrepreneurial opportunities in S&T fields that require training at the highest level through the creation of venture capital. A support mechanism at the national and state level needs to be created for such an enterprise.

K. **Creation of scientific infrastructure through venture capital**: Alternatively, additional infrastructure and lab facilities to increase job opportunities in basic Sciences through the creation of venture capital could be explored. This could increase the capacity of the formal workspace related to S&T.

L. **Policy on employment of spouses in the same organization:** The study has revealed that the largest proportion of women who were unemployed had spouses who worked in the same field or organizations. A higher proportion of this group also reported that they had difficulty in finding jobs as reasons for their breaks. Together, this data highlights the importance of ensuring the continuation or accommodation of spouses in the same organization or at least within different organizations in the same city or town to prevent the loss of trained scientific women power. It should be made mandatory for all S&T organizations to state it upfront and bring into practice employing couples when found qualified. This is particularly relevant with respect to small cities and towns where opportunities for Science research are limited to one or two institutions. The government agencies must play a proactive role in facilitating employment of the spouse when the other is transferred to prevent the loss of trained scientific human power. Alternatively, provisions to carry the jobs to other mutually agreed upon institutions at other parts of the country, when the spouse is transferred should also be introduced to help women continue their career without breaks. Such a provision can be gender neutral as it would be helpful for men also to relocate while continuing on the job, when their wives are transferred.

M. **All recommendations need to be reviewed periodically to make sure that steps taken to attract and retain scientific human power (including men) are not detrimental to the interest of promoting equality.**

The recommendations developed here are the first step towards understanding and addressing the issues of the diverse groups of women in Science research. Several more research studies is required to understand the complex process of women's choices with respect to careers in Science.

ENDNOTES

INTRODUCTION:

[1] Kapil Sibal, Former Minister for Science & Technology (at a conference on 'Women's Impact on Science & Technology in the New Millennium', organized by the Third World Organization for Women in Science, 2005).

[2] As cited in Kumar (2009).

[3] As quoted in Science Career For Indian Women: An examination of Indian women's access to and retention in scientific careers. INSA Report, October 2004.

METHODOLOGY:

[4] Treating the two working groups of women – WIR and WNR as independent groups was important for this study in keeping with the objective of the study which was to understand the factors responsible for loss of women from scientific careers that require training at the doctoral level such as scientific research.

ANALYSIS:

[5] Flexibility in timings is a gender neutral provision that would allow both women and men scientists to maximize their output through better management of the day. Flexibility does not imply a complete change in the organizational day. Rather it implies a consideration for individual differences such as allowing for early starters who can come in an hour early and leave earlier; late starters who can stay on later; allowances for after-dinner work hours when the family has gone to bed; compensation by working through the lunch hour, etc.

[6] Includes flexibility in timings, discriminatory work practices, lack of women colleagues, mentors and role models, restricted chances for participation, too few women in decision making posts, harassment, etc

[7] As explained earlier in footnote 5

[8] As explained earlier in footnote 5

[9] As explained earlier in footnote 5

[10] The percentage was calculated based on the total number of responses received from all three groups (WIR, WNR and WNW) with respect to childcare facilities etc, at workplace.

[11] Note: The percentage of publications under each category of publication is calculated for the total 568 women surveyed and 226 men surveyed.

[12] The nature of flexibility in timings has already been discussed earlier. Please refer to earlier discussions on flexibility in timings for the same.

SUMMARY AND RECOMMENDATIONS:

[13] In the view of the security reasons, it is not just enough for organizations to compensate for travel but provide assured transportation facilities for late working hours for both women and men. This provision has already been adopted by the private sector, particularly IT and ITES services which has enabled more women also to work in these sectors.

[14] Subject specific databases developed by IAS and NIAS as well as the data base of DST can be used to send out mails calling for papers/abstracts. Information by and large is restricted to premier and well know institutions.

[15] Outcomes refer to the actual increased number of women employee across all levels and departments.

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APPENDIX I: DATABASE REGISTRANTS DETAILS

Table 1: Zone Wise Distribution of Database Registrants

Zone	Women		Men	
	Frequency	Percent	Frequency	Percent
South	747	38.1	111	27.5
East	194	9.9	47	11.7
West	338	17.2	70	17.4
Central	69	3.5	27	6.7
North-East	42	2.1	22	5.5
North	463	23.6	124	30.8
Outside India	113	5.7	2	0.5
Total	**1966**	**100**	**403**	**100**

Table 2: Discipline Wise Distribution of Database Registrants

Discipline	Women		Men	
	Frequency	Percent	Frequency	Percent
Agriculture	36	1.8	13	3.2
Animal Sciences	152	7.7	39	9.7
Anthropology	13	0.7	0	0
Chemistry	287	14.6	65	16.1
Earth and Planetary Sciences	55	2.8	14	3.5
Engineering and Technology	171	8.7	73	18.1
Environmental Sciences	20	1	4	1
General Biology	400	20.4	40	9.9
Interdisciplinary	35	1.8	8	2
Mathematical Sciences	161	8.2	44	10.9
Medicine	73	3.7	19	4.7
Physics	289	14.7	55	13.6
Plant Sciences	274	13.9	29	7.2
Total	**1966**	**100**	**403**	**100**

Table 3: Category Wise Distribution of Database Registrants

Category	Women		Men	
	Frequency	Percent	Frequency	Percent
In Science Research	1525	77.6	290	72.0
Not engaged in Science Research	298	15.2	100	24.8
Not Working	142	7.2	3	0.7
Not Specified	1	0.1	10	2.5
Total	**1966**	**100**	**403**	**100**

Table 4: Age-wise distribution of Database Registrants

Age Break Up	Women		Men	
	Frequency	Percent	Frequency	Percent
50 years and Above	128	6.5	156	38.7
40-50 years	501	25.5	133	33.0
30-40 years	684	34.8	105	26.1
30 years and Below	653	33.2	9	2.2
Total	**1966**	**100**	**403**	**100**

APPENDIX II: RESPONSES ON SURVEY OBTAINED FROM WOMEN SCIENTISTS

Table 5: Nature of Employment for WIR

Category	Frequency	Percent
R&T in Universities/colleges	124	39.7
R&T in academic institutions	103	33.0
Research Only	64	20.5
Any other	21	6.7
Total	**312**	**100**

Table 6: Nature of Employment for WNR

Category	Frequency	Percent
Teaching at UG level or below	105	57.7
Administration	29	15.9
Consultant	9	4.9
Temporary / part-time research	18	9.9
Temporary / part-time Teaching	8	4.4
Others	13	7.1
Total	**182**	**100**

Table 7: Zone Wise Distribution of women surveyed

Zone	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
South	127	40.7	63	34.6	32	43.2
East	37	11.9	13	7.1	9	12.2
West	54	17.3	30	16.5	9	12.2
Central	12	3.8	12	6.6	3	4.1
Northeast	4	1.3	4	2. 2	2	2.7
North	78	25	60	33.0	19	25.7
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 8: Caste-Wise Distribution of women surveyed

Caste	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
General	251	80.4	145	79.7	56	75.7
OBC	17	5.4	15	8.2	5	6.8
SC	6	1.9	3	1.6	2	2.7
ST	1	0.3	0	0	0	0
Others	26	8.3	11	6.0	7	9.5
Not Applicable	11	3.5	8	4. 4	4	5.4
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 9: Age-wise Distribution of women surveyed

Age-intervals	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
<30 years	1	0.3	9	4.9	7	9.5
30-40 years	91	29.2	55	30.2	21	28.4
40-50 years	115	36.9	68	37. 4	17	23.0
50-60 years	94	30.1	45	24.7	15	20.3
60-70 years	10	3.2	3	1.6	13	17.6
70years and above	1	0.3	2	1.0	1	1.4
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 10: Annual Family incomes reported by women surveyed

Income	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Less than Rs. 2 Lakhs	7	2.2	8	4.4	9	12.2
Rs. 2 – 4 Lakhs	49	15.7	35	19.2	12	16.2
Rs. 4 – 6 Lakhs	75	24.0	64	35.2	21	28.4
Rs. 6 lakhs or above	178	57.1	73	40.1	29	39.2
Not Applicable / Not Replied	3	1.0	2	1.1	3	4.1
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 11: Timing of marriage reported by women surveyed

Timing of marriage	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Before Under-graduation studies	3	1.1	0	0	0	0
During Under-graduation studies	5	1.6	2	1. 1	0	0
After graduation	13	4.4	6	3. 3	3	4.1
During post-graduation studies	8	2.6	4	2. 2	1	1.4
After post graduation	80	25.6	59	32.4	20	27.0
During doctoral studies	84	26.9	51	28.08	24	32.4
After doctoral studies	75	24.0	38	20.9	20	27.0
Not Applicable	44	14.1	22	12. 1	6	8.1
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 12: Choice of selection of Spouse reported by women surveyed

Choice of Spouse	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Completely personal choice	101	32.4	42	23.1	21	28.4
Completely parental choice	102	32.7	69	37.9	31	41.9
With parental consultation	64	20.5	50	27.5	16	21.6
Can't say / Not applicable	45	14.4	21	11.5	6	8.1
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 13: Children reported by women surveyed

'Do you have children?'	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	232	74.4	147	80.8	62	83.8
No	34	10.9	12	6.6	6	8.1
Not replied / Not applicable	46	14.7	23	12.6	6	8.1
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 14: Age-group of children reported by women surveyed*

Age-group of children	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
0-5 years	50	15.3	36	18.2	19	20.9
> 5 – 15 years	119	36.4	71	35.9	21	23.1
> 15 years	158	48.3	91	46.0	50	54.9
Not replied / Not applicable	0	0	0	0	1	1.1
Total	**327**	**100**	**198**	**100**	**91**	**100**

Table 15: Time spent at work per week when children were growing up, reported by women surveyed

Hours per week	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
>70 Hours	7	2.2	14	7.7	3	4.1
60-70 Hours	18	5.8	45	24.7	5	6.8
40-60 Hours	146	46.8	23	12.8	20	27.0
20-40 Hours	54	17.3	43	23.7	11	14.9
< 20 Hours	5	1.6	14	7.7	2	2.7
Not applicable[1]	82	26.3	43	23.6	33	44.6
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 16: Help received for childcare as reported by women surveyed*[2]

Help with childcare	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Day care centre at work place	11	3.4	8	4.0	5	6.7
Day care centre outside work place	31	9.6	10	5.0	5	6.7
Your family	83	25.8	46	22.8	10	13.3
Your husband's family	74	23.0	69	34.2	11	14.7
Husband	28	8.7	10	5.0	5	6.7
Paid Professional	76	23.6	47	23.3	13	17.3
Any other	10	3.1	3	1.5	5	6.7
Not applicable / No help	9	2.8	9	4.5	21	28.0
Total	**322**	**100**	**202**	**100**	**75**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of women surveyed.*

[1] Not applicable has been used as an option by both women who did not have children as well as those who did not work. The exact break up of the category is not available from our data

[2] The table shows responses for women who have reported having children only

Table 17: Type of family currently living in reported by women surveyed

Type of family	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Nuclear	218	69.9	116	63.7	58	78.4
Joint	90	28.8	64	35.2	16	21.6
Not replied	4	1.3	2	1.1	0	0
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 18: Spouse's qualification reported by women surveyed

Spouse's qualification	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
High School	0	0	0	0	1	1.4
Higher Secondary	1	0.3	0	0	0	0
Graduate	37	11.9	39	21.4	13	17.6
Post-graduate	106	34.0	67	36.8	19	25.7
Doctorate	121	38.8	55	30.2	34	45.9
Not Applicable / Not replied	47	15.1	21	11.5	7	9.5
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 19: Spouses in science teaching, research or consultancy reported by women surveyed

Spouse in science?	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	125	40.1	50	27.5	32	43.2
No	101	32.4	80	44.0	21	28.4
Not applicable /replied	86	27.6	52	28.6	21	28.4
Total	**312**	**100**	**182**	**100**	**74**	**100**

Table 20: Average number of working hours per week reported by women surveyed

Hours per week	WIR		WNR	
	Frequency	Percent	Frequency	Percent
>70 Hours	13	4.2	1	0.5
60-70 Hours	51	16.3	11	6.0
40-60 Hours	196	62.8	82	45.1
20-40 Hours	46	14.7	68	37.4
< 20 Hours	6	1.9	20	11.0
Not applicable / Not replied	13	4.2	1	0.5
Total	**312**	**100**	**182**	**100**

Table 21: Reasons reported for not taking up previous jobs applied for by women surveyed*[1]

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
For better professional prospects	29	23.4	18	16.4	0	0
Job was temporary	7	5.6	9	8.2	0	0
Due to family reasons	16	12.9	15	13.6	2	3.3
Got present job earlier than the other post	16	12.9	11	10.0	2	3.3
Did not get the job	35	28.2	46	41.8	40	66.7
Organizational reasons[2]	8	6.5	2	1.8	9	15.0
Any other	13	10.5	9	8.2	7	11.7
Total	**124**	**100**	**110**	**100**	**60**	**100**

Table 22: Reasons reported for leaving previous posts by women surveyed*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
For better professional prospects	170	41.1	124	36.7	40	26.1
Job was temporary	97	23.4	116	34.3	46	30.1
Due to family reasons	96	23.2	71	21.0	43	28.1
Organizational factors[3]	22	5.3	14	4.1	4	2.6
Any other	29	7.0	13	3.9	20	13.1
Total	**414**	**100**	**338**	**100**	**153**	**100**

Table 23: Reasons reported for taking up present posts by women surveyed*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Suitable to qualification	129	12.9	60	11.1	189	12.3
Professional advantages and opportunities	345	34.5	157	29.0	502	32.6
Enjoyment/ Personal Satisfaction	188	18.8	101	18.7	289	18.8
Family reasons	154	15.4	89	16.5	243	15.8
Organizational Reasons[4]	102	10.2	61	11.3	163	10.6
Any other (please specify)	81	8.1	73	13.5	154	10.0
Total	**999**	**100**	**541**	**100**	**1540**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of women surveyed*

[1] Responses of only those who applied to jobs and did not take them up is represented here

[2] Organizational reasons include long/inflexible hours, no room for professional growth and lack of daycare facilities at the workplace

[3] Includes uncongenial and discouraging work atmosphere, long/inflexible hours, denial of promotion, lack of childcare facilities

[4] Includes convenient location, attractive salary, prestige associated, congenial atmosphere, flexible timings, good exit-options, day-care facilities, transport facilities, accommodation

Table 24: Reasons reported for breaks by women surveyed*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Marriage	10	8.8	8	8.7	6	9.4
Care for children / elders	54	47.8	47	51.1	27	42.2
Transfer of Spouse	12	10.6	4	4.3	3	4.7
Transfer of Father	1	0.9	1	1.1	1	1.6
Difficulty finding jobs/ guides/institutions	7	6.2	6	6.5	14	21.9
Any other	29	25.7	26	28.3	13	20.3
Total	**113**	**100**	**92**	**100**	**64**	**100**

Table 25: Women's knowledge and use of special schemes

	WIR	WNR	WNW	Total
Heard about	81.4 percent	63.7 percent	78.4 percent	75.4 percent
Have Received	29.5 percent	28.6 percent	27.0 percent	28.9 percent
Would like to receive in the future	84.0 percent	86.8 percent	79.7 percent	83.8 percent

Table 26: Reasons for attending conferences and workshops*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
To showcase my work / visibility	123	16.9	46	12.4	19	14.3
Interest in topic of conference	158	21.8	72	19.5	16	12.0
To keep myself updated / learn more	227	31.3	133	35.9	44	33.1
Networking	168	23.1	71	19.2	33	24.8
To improve soft skills	20	2.8	12	3.2	5	3.8
Any other	22	3.0	19	5.1	2	1.5
Don't know / Can't say	1	0.1	0	0	0	0
Not applicable	7	1.0	17	4.6	14	10.5
Total	**726**	**100**	**370**	**100**	**133**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of women surveyed*

Table 27: Perceived Reasons for why women drop out of science given by women surveyed*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Family Commitments	473	51.7	254	50.9	108	53.7
Due to socio-cultural / conservative set up of society	74	8.1	39	7.8	13	6.5
Organizational Factors[1]	185	20.2	97	19.4	45	22.4
Lack of sufficient jobs	41	4.5	27	5.4	9	4.5
Other lucrative career options	38	4.2	29	5.8	10	5.0
Any Other	104	11.4	53	10.6	16	8.0
Total	**915**	**100**	**499**	**100**	**201**	**100**

Table 28: Perceived reasons for why men drop out of science given by women surveyed*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Family Commitments	93	12.6	57	13.4	22	13.3
Other lucrative career options	367	49.6	202	47.5	76	45.8
Organizational factors[2]	37	5.0	23	5.4	12	7.2
Lack of sufficient jobs	52	7.0	25	5.9	17	10.2
Peer pressure to do well in life[3]	40	5.4	26	6.1	7	4.2
Lack of patience and dedication to a scientific career[3]	90	12.2	72	16.9	21	12.7
Any Other	61	8.2	20	4.7	11	6.6
Total	**740**	**100**	**425**	**100**	**166**	**100**

Table 29: Provisions perceived to be useful to retain women in science reported by the women surveyed*

Reasons	WIR		WNR		WNW	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Provisions of Accommodation / Transportation	135	18.1	48	10.9	19	10.6
Provisions of Child care facilities at workplace	121	16.2	57	12.9	28	15.6
Flexibility in Timings	231	30.9	137	31.1	51	28.5
HR policies / Higher salaries	97	13	74	16.8	22	12.3
Refresher programmes / Fellowships	77	10.3	54	12.2	23	12.8
Any other	86	11.5	71	16.1	36	20.1
Total	**747**	**100**	**441**	**100**	**179**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of women surveyed*

[1] Includes no flexibility in timings; not enough female colleagues, mentors and role models; discriminatory work practices; marginalization at the job; restricted chances for participation, advancement and promotion; too few women in decision making posts; sexual or other forms of harassment

[2] Includes flexibility in timings; discriminatory work practices; marginalization at the job; restricted chances for participation, advancement and promotion; harassment

[3] These categories were generated from the 'any other reasons' category given by a large number of men and women

APPENDIX III: COMPARISON OF MIR AND WIR SURVEYED

Table 30: Zone Wise Distribution of WIR & MIR

Zone	WIR		MIR	
	Frequency	Percent	Frequency	Percent
South	127	40.7	56	34.8
East	37	11.9	16	9.9
West	54	17.3	24	14.9
Central	12	3.8	8	5.0
Northeast	4	1.3	7	4.3
North	78	25	50	31.1
Total	**312**	**100**	**161**	**100**

Table 31: Caste-Wise Distribution of WIR & MIR

Caste	WIR		MIR	
	Frequency	Percent	Frequency	Percent
General	251	80.4	121	75.2
OBC	17	5.4	20	12.4
SC	6	1.9	3	1.9
ST	1	0.3	1	0.6
Others	26	8.3	8	5.0
Not Applicable	11	3.5	8	5.0
Total	**312**	**100**	**161**	**100**

Table 32: Age-wise Distribution of WIR & MIR

Age-intervals	WIR		MIR	
	Frequency	Percent	Frequency	Percent
<30 years	1	0.3	2	1.2
30-40 years	91	29.2	50	31.1
40-50 years	115	36.9	54	33.5
50-60 years	94	30.1	46	28.6
60-70 years	10	3.2	9	5.6
70years and above	1	0.3	0	0
Total	**312**	**100**	**161**	**100**

Table 33: Annual Family incomes reported by WIR & MIR

Income	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Less than Rs. 2 Lakhs	7	2.2	4	2.5
Rs. 2 – 4 Lakhs	49	15.7	43	26.7
Rs. 4 – 6 Lakhs	75	24.0	64	39.8
Rs. 6 lakhs or above	178	57.1	50	31.1
Not Applicable / Not Replied	3	1.0	0	0
Total	**312**	**100**	**161**	**100**

Table 34: Timing of marriage reported by WIR & MIR

Timing of Marriage	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Before UG studies	3	1.1	0	0
During UG studies	5	1.6	3	1.9
After graduation	13	4.4	9	5.6
During PG studies	8	2.6	2	1.2
After PG	80	25.6	38	23.6
During doctoral studies	84	26.9	29	18.0
After doctoral studies	75	24.0	76	47.2
Not Applicable	44	14.1	4	2.5
Total	**312**	**100**	**161**	**100**

Table 35: Choice of selection of Spouse reported by WIR & MIR

Choice of Spouse	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Completely personal choice	101	32.4	41	25.5
Completely parental choice	102	32.7	41	25.5
With parental consultation	64	20.5	72	44.7
Cant say / Not applicable	45	14.4	7	4.3
Total	**312**	**100**	**161**	**100**

Table 36: Spouse's qualification reported by WIR & MIR

Spouse's qualification	WIR		MIR	
	Frequency	Percent	Frequency	Percent
High School	0	0	5	3.1
Higher Secondary School	1	0.3	4	2.5
Graduate	37	11.9	42	26.1
Post-graduate	106	34.0	80	49.7
Doctorate	121	38.8	26	16.1
Not Applicable / Not replied	47	15.1	4	2.5
Total	**312**	**100**	**161**	**100**

Table 37: Spouses in science teaching, research or consultancy reported by WIR & MIR

Spouse in science?	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Yes	125	40.1	30	18.6
No	101	32.4	121	75.2
Not Applicable / Not replied	86	27.6	10	6.2
Total	**312**	**100**	**161**	**100**

Table 38: Children reported by WIR & MIR

'Do you have children?'	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Yes	232	74.4	139	86.3
No	34	10.9	17	10.6
Not Applicable / Not replied	46	14.7	5	3.1
Total	**312**	**100**	**100**	**100**

Table 39: Age-group of children reported by WIR & MIR*

Age-group of children	WIR		MIR	
	Frequency	Percent	Frequency	Percent
0-5 years	50	15.3	39	17.4
> 5 – 15 years	119	36.4	84	37.5
> 15 years	158	48.3	100	44.6
Not replied / Not applicable	0	0	1	0.4
Total	**327**	**100**	**224**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of respondents*

Table 40: Time spent at work per week when children were growing up reported by WIR & MIR

Hours per week	WIR		MIR	
	Frequency	Percent	Frequency	Percent
>70 Hours	7	2.2	10	6.2
60-70 Hours	18	5.8	29	18.0
40-60 Hours	146	46.8	54	33.5
20-40 Hours	54	17.3	42	26.1
< 20 Hours	5	1.6	4	2.5
Not applicable[1]	82	26.3	22	13.7
Total	**312**	**100**	**161**	**100**

Table 41: Average number of working hours per week reported by WIR & MIR

Hours per week	WIR		MIR	
	Frequency	Percent	Frequency	Percent
>70 Hours	13	4.2	18	11.2
60-70 Hours	51	16.3	28	17.4
40-60 Hours	196	62.8	74	46.0
20-40 Hours	46	14.7	37	23.0
< 20 Hours	6	1.9	4	2.5
Not applicable / Not replied	13	4.2	0	0
Total	**312**	**100**	**161**	**100**

Table 42: Reasons reported for not taking up previous jobs applied for by WIR & MIR*[2]

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
For better professional prospects	29	23.4	25	28.1
Job was temporary	7	5.6	2	2.2
Due to family reasons	16	12.9	11	12.4
Got present job earlier than the other post	16	12.9	8	9.0
Did not get the job	35	28.2	37	41.6
Organizational reasons[3]	8	6.5	1	1.1
Any other	13	8.2	5	5.6
Total	**124**	**100**	**89**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of respondents*

[1] Not applicable has been used as an option by both women and men who did not have children as well as those who did not work. The exact break up of the category is not available from our data

[2] Responses of only those who applied to jobs and did not take them up is represented here

[3] Organizational reasons include long/inflexible hours, no room for professional growth and lack of daycare facilities at the workplace

Table 43: Reasons reported for leaving previous posts by WIR & MIR*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
For better professional prospects	170	41.1	162	64.5
Job was temporary	97	23.4	48	19.1
Due to family reasons	96	23.2	7	2.8
Organizational reasons[1]	22	5.3	18	7.2
Any other	29	7.0	16	6.4
Total	**414**	**100**	**251**	**100**

Table 44: Reasons reported for taking up present posts by WIR & MIR*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Suitable to qualification	129	12.9	49	11.2
Professional advantages and opportunities	345	34.5	147	33.5
Enjoyment / Personal Satisfaction	188	18.8	95	21.6
Family reasons	154	15.4	57	13.0
Organizational reasons[2]	102	10.2	21	4.8
Any other (please specify)	81	8.1	70	15.9
Total	**999**	**100**	**439**	**100**

Table 45: Reasons reported for breaks by WIR & MIR*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Marriage	10	8.8	0	0
Care for children / elders	54	47.8	0	0
Transfer of Spouse	12	10.6	0	0
Transfer of Father	1	0.9	0	0
Difficulty finding jobs / guides / institutions	7	6.2	1	14.3
Any other	29	25.7	6	85.7
Total	**113**	**100**	**7**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of respondents*

[1] Includes uncongenial and discouraging work atmosphere, long/inflexible hours, denial of promotion, lack of childcare facilities

[2] Includes convenient location, attractive salary, prestige associated, congenial atmosphere, flexible timings, good exit-options, day-care facilities, transport facilities, accommodation

Table 46: Number of women and men reporting publications

Publications / patents	Women		Men	
	Freq	Percent	Freq	Percent
Individual research papers in refereed journals	253	44.5	86	38.1
Collaborative research papers in refereed journals	481	84.7	210	92.9
Individual review articles	123	21.7	36	15.9
Collaborative review articles	104	18.3	59	26.1
Individual conference articles/proceedings/abstracts	223	39.3	63	27.9
Collaborative conference articles/proceedings/abstracts	242	42.6	128	56.6
Individual books authored/co-authored	73	12.9	30	13.3
Collaborative books authored/co-authored	52	9.2	44	19.5
Individual books edited / co-edited	36	6.3	22	9.7
Collaborative books authored/co-authored	22	3.9	16	7.1
Individual popular articles	111	19.5	59	26.1
Collaborative popular articles	31	5.6	20	8.8
Individual technical reports	85	15.0	28	12.4
Collaborative technical reports	65	11.4	40	17.7
Individual patents	25	4.4	9	4.1
Collaborative patents	26	4.6	14	6.2
Any other work (Individual)	20	3.5	20	8.8
Any other work (collaborative)	28	4.9	20	8.8

Table 47: Reasons for attending conferences and workshops*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
To showcase my work / visibility	123	16.9	47	12.9
Interest in topic of conference	158	21.8	49	13.4
To keep myself updated / learn more	227	31.3	116	31.8
Networking	168	23.1	99	27.1
To improve soft skills	20	2.8	31	8.5
Any other	22	3.0	19	5.2
Don't know / Can't say	1	0.1	0	0
Not applicable	7	1.0	4	1.1
Total	**726**	**100**	**365**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of respondents*

Table 48: Perceived Reasons for why women drop out of science given by WIR & MIR*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Family Commitments	473	51.7	226	58.5
Due to socio-cultural / conservative set up of society	74	8.1	51	13.2
Organizational Factors[1]	185	20.2	54	14.0
Lack of sufficient jobs	41	4.5	11	2.8
Other lucrative career options	38	4.2	19	4.9
Any Other	104	11.4	25	6.6
Total	**915**	**100**	**386**	**100**

Table 49: Perceived reasons for why men drop out of science given by WIR & MIR*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Family Commitments	93	12.6	31	7.9
Other lucrative career options	367	49.6	309	53.2
Organizational factors[2]	37	5.0	16	4.1
Lack of sufficient jobs	52	7.0	39	9.9
Peer pressure to do well in life[3]	40	5.4	29	7.4
Lack of patience and dedication to a scientific career[3]	90	12.2	57	14.5
Any Other	61	8.2	12	3.1
Total	**740**	**100**	**393**	**100**

Table 50: Provisions perceived to be useful to retain women in science reported by WIR & MIR*

Reasons	WIR		MIR	
	Frequency	Percent	Frequency	Percent
Provisions of Accomm-odation / Transportation	135	18.1	42	11.5
Provisions of Child care facilities at workplace	121	16.2	44	12.1
Flexibility in Timings	231	30.9	108	29.6
HR policies / Higher salaries	97	13	42	11.5
Refresher programmes / Fellowships	77	10.3	64	17.5
Any other	86	11.5	65	17.8
Total	**747**	**100**	**365**	**100**

** The question was a multiple response question and hence the number of responses does not match the actual number of respondents*

[1] Includes no flexibility in timings; not enough female colleagues, mentors and role models; discriminatory work practices; marginalization at the job; restricted chances for participation, advancement and promotion; too few women in decision making posts; sexual or other forms of harassment

[2] Includes flexibility in timings; discriminatory work practices; marginalization at the job; restricted chances for participation, advancement and promotion; harassment

[3] These categories were generated from the 'any other reasons' category given by a large number of men and women