# NSF-ADVANCE at the University of Michigan

## Proposal Summary

The University of Michigan proposes to undertake three different types of interventions to improve the opportunities and circumstances of tenure-track women faculty in basic science and engineering fields. These include: (1) **a campus climate initiative**, which will focus on activities (e.g., workshops, focus groups, climate surveys, consultation on increasing pools of female applicants in searches) that have been identified, or will be created, and made available to any interested unit (a department or college) throughout the University; (2) **a gender equity resource fund**, which will provide new types of direct support to individual women scientists; and (3) **a departmental transformation initiative**, which will permit a sequenced program of activities to be developed and tailored to a small number of units on a competitive basis. This sequenced program (including internal review or self-study, goal-setting, and a series of targeted activities addressing recruitment, retention and/or climate issues) will enable a sustained, committed intervention within a single department, as well as provide a model of change for other institutional units.

The campus climate initiative will encourage all science and engineering departments and programs to engage in some review and some "transformation" in terms of gender equity. The gender equity resource fund will allow individual women scientists to seek and obtain support for their own growth and development. The last set of activities will permit targeted dramatic change at the unit level within the Award period. The synergy generated by operating at all three levels will amplify the impact of each intervention.

All three sets of programs will be evaluated by independent researchers, expert in the area of gender equity. Evaluations will be conducted throughout the course of the Award, using both qualitative and quantitative methods. Results of early evaluations will be used to revise programs.

This project will be directed by Abigail Stewart, Director of the Institute for Research on Women and Gender (IRWG). The Deans of the three key colleges [Literature, Science & the Arts (LSA), Engineering and Medicine] and Associate Provost Pamela Raymond will serve as co-PIs. A variety of campus resources (the Center for the Education of Women, the Center for Research on Learning and Teaching, the Interdisciplinary Program on Feminist Practice, and the Women in Science and Engineering Program) will collaborate to create versions of programs they currently offer especially tailored for the community of science and engineering faculty. Interdisciplinary committees composed of senior faculty scientists and social scientists will provide advice on program implementation and evaluation.

This multi-level program is designed to improve the campus environment for women faculty in science and engineering at the University of Michigan, and as a result to increase the successful recruitment, retention and promotion of tenure-track women faculty in basic science fields. The presence and success of these women faculty will in turn affect the expectations and attitudes of the many women and men who are graduate and undergraduate students in science and engineering fields. Many of these individuals will go on to have science and engineering careers themselves; because UM trains so many students, it is anticipated that the impact of this program will reach well beyond this university. Creation of a more equitable climate at UM will affect other campuses through the next generation of science and engineering faculty who will themselves train students, as well as non-academic work settings in which scientists and engineers trained at UM are employed.

## Proposal Overview

The University of Michigan is committed to advancing gender equity in science and engineering. Genuine advance will require pervasive institutional changes; in turn, these depend on efforts at all levels of the institution. We believe that an NSF ADVANCE Institutional Transformation Award would provide crucial support, visibility and legitimacy to these efforts. Within this program, we propose three different types of interventions: (1) activities (e.g., workshops, focus groups, climate surveys, consultation on increasing pools of female applicants in searches) that have been identified, or will be created, and made available to any interested unit (a department or college) throughout the University; (2) new types of direct support to individual women scientists; (3) a sequenced program of activities that will be developed and tailored to a small number of units on a competitive basis. This sequenced program (including internal review or self-study, goal-setting, and a series of targeted activities addressing recruitment, retention and/or climate issues) will enable a sustained, committed intervention within a single department, as well as provide a model of change for other institutional units.

The first set of activities will encourage all science and engineering departments and programs to engage in some review and some "transformation" in terms of gender equity. The second set of activities will allow individual women scientists to seek and obtain support for their own growth and development. The last set of activities will permit targeted dramatic change at the unit level within the Award period. The synergy generated by operating at all three levels will, we believe, amplify the impact of each intervention.

All three sets of programs will be evaluated by independent researchers, expert in the area of gender equity. Evaluations will be conducted throughout the course of the Award, using both qualitative and quantitative methods. Results of early evaluations will be used to revise programs.

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## Current Status of Women in Science at the University of Michigan

The overall proportion of women who are tenure-track faculty[1] in science and engineering fields in the Colleges of Literature, Science and the Arts (LSA), Engineering and Medicine in Fall 2000 was 9%, 11% and 25%, respectively.[2] Fully ten years ago the comparable figures, where available, were not very different: 6% and 5% for LSA and Engineering. Even twenty years ago the figures were 2% for both of those schools. Undoubtedly we have seen change during these years; but the rate of change—at the University of Michigan as nationally—is painfully slow, far slower than the changes we have witnessed in the same period of time in the proportion of women tenure-track faculty in non-science fields (14% in 1980; 21% in 1990 and 35% in 2000). Moreover, the representation of women faculty in these fields is far below the rate of women achieving the doctorate in those same fields. For example, 23% of the science doctorates in LSA in 1999 were earned by women, while only 9% of the science faculty were women. The gap in Medicine is also large; in Engineering, the problem is different; there is little gap, but both rates are extremely low (8% for both in 1999).

Moreover, the pattern suggests little improvement in the rate of women at the highest faculty level (full professor). In LSA the rates were 2% in 1980, 1% in 1990 and 6% in 2000; in Engineering the comparable rates were 1%, 1% and 5%. The rates have improved somewhat more at the assistant

[1] Our focus throughout this proposal is on tenured and tenure-track untenured faculty; all statistics for UM faculty are based on this group.

[2] Figures for UM faculty are from the HRAA-HRRIS Human Resource Data Base. These figures were corrected by LSA, Engineering and Medicine staff to remove non-tenure-track faculty with the title of Assistant Professor. In addition, Medicine provided departmental breakdowns, which were not in the Data Base. Statistics are reported only for basic science departments in all three schools.

professor level (8, 21 and 23% for LSA; 6, 10 and 26% for Engineering), but remain disappointingly low. In addition, the fact that the tenured faculty rates do not increase to the rate of the untenured level suggests that women scientists are not succeeding or thriving on the tenure track.

The pattern is not, of course, uniform across different departments. Within LSA, Biology has the largest number of tenured and tenure-track women scientists (10), and nearly one-third of assistant and associate professors are women. However, only 6% of the full professors are women. Mathematics has only 5 women; they constitute 25 and 30% of the lower ranks and only 2% of the full professor level. Statistics, Physics and Astronomy offer the most disturbing pictures, with 1, 4 and 0 women respectively, constituting a total of 8, 7 and 0% of the faculty in those departments. It is also noteworthy that from 1991-1995 only 13% of the doctorates in Astronomy went to women, though fully 62% of the masters' degrees were awarded to women.

In Engineering, there are 7 women (13%) in Mechanical Engineering, but none at the full professor level, and there are 4 each (24% and 15%) in Nuclear and Civil and Environmental respectively. There are no women at all in two departments (Aerospace and Biomedical) and only 1 in Industrial and Operations.

In Medicine the picture is different in different fields. For example, Microbiology and Immunology went from 5% in 1990 to 39% in 2000, and Pharmacology went from 5% women faculty in 1990 to 18% in the same period. Others have shown no change at all (e.g., Human Genetics was 27% in 1990 and in 2000) or actually declined (Laboratory Animal was 20% in 1990 and 0 in 2000).

There is, then, a clear overall pattern of exceedingly slow growth in the proportion of women faculty in science and engineering, especially at the highest tenured ranks. In addition, there is considerable variation across departments and among colleges in the current proportion of women faculty and in the pattern of change over the past ten or twenty years. The broader consistency in the overall pattern suggests that there may be some features common to science and engineering departments in the University that make it difficult for women to enter and remain in academic science. This suggests there may be some remedies that could be generally effective in addressing women's advancement in academic science. The variation in the pattern suggests that there are probably crucial particularities associated with fields within science, or to departmental cultures and practices, that make them more or less hospitable environments for women scientists. This variation suggests that there may need to be highly particularistic remedies for the difficulties faced by women in some fields within science and engineering.[3] Our proposal aims to include both kinds of remedies—both general and particular.

**Past and Recent Efforts to Address Issues Facing Women Faculty**

The University of Michigan has made a number of efforts, particularly over the past decade, to address the needs of women faculty and students, in general (not those of women scientists in particular). Four areas have received persistent attention over more than a decade: child care, sexual harassment and climate, networking, and recruitment and retention of women faculty.

***Dependent Care***: In 1989, the President's Advisory Commission of Women's Issues recommended a new policy (which was adopted) on Childbearing and Dependent Care; it provides a year off the tenure clock for women who give birth and for women and men who face significant dependent care responsibilities. The following year the Modified Duties Policy was adopted, which enabled women faculty who give birth to take a term off from formal teaching responsibilities, while receiving their normal salaries. The University staffs a Family Care Resources Program that provides information and referral to child and other dependent care resources. It also operates four day care centers at the University, all with sliding fee scales. In 1998, a Child Care Task Force conducted a thoroughgoing

[3] Unless otherwise specified, this term ("science and engineering") includes only basic science departments in the Colleges of Literature, Science and the Arts, Engineering and Medicine. Total tenure track faculty in LSA science departments in fall 2000 were 296; in Engineering 292; and in Medicine 114. This is the vast majority of tenure track science faculty at the University; there are 157 across six other schools and within the Psychology Department in LSA.

review of the University's child care policies and programs, and prepared a long-term strategic plan for child care at UM.

***Harassment and Climate***: A new sexual harassment policy was adopted in 1993, and a number of efforts were launched to encourage departments to be reflective about their climates for women faculty and students. Most recently these efforts have included institutionalization of an interactive theater troupe in the Center for Research on Learning and Teaching (CRLT); this troupe presents classroom scenarios originally developed by the Women in Science and Engineering (WISE) Program and the Graduate Experience Project, to raise issues of diversity and inclusion. In 1996, a Faculty Work-Life Study was initiated by the Center for the Education of Women (CEW) and the Center for the Study of Higher and Post-Secondary Education (CSHPE), surveying the University's instructional faculty to assess workload, institutional climate and career satisfaction, and to explore perception differences by gender and race. The resulting report (published in 1999) showed that women were less likely than men to feel that their research interests were valued by their colleagues; were less satisfied with their opportunities to collaborate with other faculty members; were more likely to believe they were "constantly under scrutiny"; reported spending more time on service and advising, and less time on research and creative work; and found the institutional climate less supportive.

***Networking***: In 1994, the Center for the Education of Women (CEW) and the Women's Studies Program initiated the Women of Color in the Academy Project, which created a network of women of color faculty. CEW recently launched a Junior Women Faculty Network, for tenure-track women in all fields.

***Faculty Recruitment and Retention:*** In 1992, then UM President James Duderstadt commissioned a report on the status of women at the University. As a result of that report, a broad effort to address gender issues--the Michigan Agenda for Women--was announced by Duderstadt in 1994. In addition, he commissioned the continuation of regular reports on the status of women at all levels of the University. These on-going reports provide in-depth data by college and by LSA departments covering the participation of women along the pipeline from bachelors to doctorate level degrees, and from assistant professors to executive administrators. He also announced a variety of resources and programs, including a central-administration-supported program supporting recruitment of senior women faculty, the establishment of the Institute for Research on Women and Gender, and a career development award program for women faculty members who make significant service contributions to the University. In 1999, Provost Nancy Cantor established a committee to evaluate salary equity by gender and race-ethnicity, and make recommendations for remedy of any discovered inequities.

***Recent Focus on Women in Science.*** The particular needs of women *students* in the sciences and engineering were addressed in 1980 by the establishment of the Women in Science and Engineering Program (WISE). It aimed to increase the number of women students who choose majors, advanced degrees, and careers in science, mathematics and engineering, and continues to offer programs for pre-college, undergraduate and graduate students. In recent years, though, a number of efforts have focused more directly on concerns of women faculty in the sciences. During academic year 1999-2000, senior women faculty in one LSA department developed a survey based on the model of the MIT women faculty. The Dean of LSA expressed willingness to support the survey, either in the department or on a college-wide basis. Before this could happen, in January 2001, four UM administrators and faculty attended the "MIT meeting" on gender equity in science, called by President Charles Vest. Upon return from that meeting, UM President Lee Bollinger constituted an "MIT follow-up" committee to formulate and implement active efforts to address the needs of women scientists at Michigan. Development of this grant proposal was one of the projects stimulated by that committee; the gender equity survey in LSA has been incorporated into this proposal (and broadened in scope). A number of other activities were also initiated. Associate Dean of Engineering Linda Katehi convened an advisory committee of senior women faculty within that College. Senior women faculty in LSA were systematically interviewed about their perceptions of problems facing women junior and senior faculty, as well as difficulties in recruitment. Plans were initiated for a campus-wide survey that would allow assessment of the difficulties facing women faculty in science and engineering in detail. (These plans will be described below, as the survey,

and a space and research resources inventory will provide baseline data for evaluation of the impact of the interventions planned for ADVANCE support.)

**Specific Barriers to Women's Advancement in the Sciences**

As a result of the various activities that have taken place in the past decade, and especially in the past year or two, the program proposed here aims to address the following particular problems identified in documents and interviews with women faculty in science and engineering (and echoed in research studies on these issues nationally and internationally):

(1) *gap between the rate of production of women doctorates by a given department, and the rate of women tenured and tenure-track faculty in that field* (CAWMSET, 2000; Fox, 1996; Vetter, 1996; Sonnert & Holten, 1995; Wenneras and Wold, 2000; Wickerware, 1997). Thus, for example, between 1991 and 1995, 29% of Ph.D.s in mathematics at UM were awarded to women while the percent of female faculty was only 4%; by contrast, 25% of Ph.D.s were awarded to women in political science, while 23% of the faculty were women.

(2) *uniformly low rates of senior women faculty in science departments* (limiting the pool of female mentors and models for junior women, among other problems; see CAWMSET, 2000; Fox, 1996; Mark *et al*., 2001; Sonnert & Holten, 1995; Vetter, 1996).

(3) *perceived marginalization of (some) senior women* (creating negative models for younger women and a sense of hopelessness about future possibilities for them; see MIT, 1999; Lawler, 1999; Sonnert & Holten, 1995).

(4) *inhospitable climate for junior women* (which includes the relative lack of open attention to work/family issues and challenges in the classroom; CAWMSET, 2000; CSHPE & CEW, 1999; Finkel & Olswang, 1996; Hensel, 1991; Schneider, 2000; Tack and Patitu, 1992; Tracy, 1998).

(5) *perceived inequities in teaching and service burdens* (CAWMSET, 2000; CSHPE & CEW, 1999; Fox, 1995), and difficulties associated with using student ratings to compare the quality of teaching across gender in disciplines strongly associated with male stereotypes (Basow, 1995).

(6) *perceived inequities in space/equipment resources, and in salaries* (CAWMSET, 2000; CSHPE & CEW, 1999; MIT, 1999).

(7) *lack of recognition of the women faculty by their (male) peers and chairs* (reflected in their relatively lesser appointment to important committees, and nominations for disciplinary and University awards; see CSHPE & CEW, 1999; Delamont, 1989; McIlwee & Robinson, 1992; MIT, 1999; Zuckerman, 1991).

**Vision, Goals and Anticipated Impact of the Project**

We have designed programs targeted at removing or lowering these barriers. The programs have been designed on the basis of ideas that have surfaced not only from a planning committee for the grant itself (which included women scientists, and social scientists who study gender equity issues generally and in science fields), but also from senior women science faculty consulted individually and in small groups, from the published literature about effective interventions, and from both the MIT-sponsored meeting in January, 2001 (which included considerable discussion of interventions and programs that were more and less successful at various campuses), and the MIT follow-up committee meetings at UM.

(1) A **Campus Climate Initiative.** This initiative aims at a broad-based improvement in the climate for women scientists across campus, by increasing awareness both of the particular difficulties facing women in science and engineering, and certain kinds of practices that promote gender equity. Science and engineering departments and programs will be invited to take advantage of a variety of services and programs that will be made available by request. In an effort to ensure that there is true "buy-in" to these activities, there will be no effort to impose or require these services and programs. Instead, they will be made attractive to departments because they will be freely available and will be adaptable or tailored to the particular characteristics or needs of the requesting department.

(2) **A Gender Equity Resource Fund.** This resource fund will be created to support a wide range of needs of individual women scientists. It will constitute a discretionary pool of funds, to be

administered by the Steering Committee, that can be requested to support expenses that are identified by tenure-track women scientists as critical to their professional advancement. These may include extraordinary child care expenses associated with a particular kind of scientific work (in the field, lab work, etc.), needs for particular kinds of graduate or postdoctoral student support (e.g., to maintain lab activity), and needs for release time, for travel for collaboration or special training, or for equipment.

(3) **Departmental Transformation Initiative.** This initiative is designed to demonstrate the possibility of dramatic improvement in a relatively short (four-year) period of time. Substantial resources will be made available, on the basis of competitive applications in response to a call for proposals, to up to three departments (one each in LSA, Engineering and Medicine). These departments will demonstrate that they have set major and attainable goals in terms of climate, recruitment, retention and promotion of women scientist faculty over the subsequent four-year period.

We anticipate that by launching all three of these initiatives we will communicate strong campus-wide commitment to shifting from a painfully incremental process of change in the participation of women in science to a much more dramatic process of transformation. While it might be tempting to focus exclusively on dramatic, targeted change efforts (and we believe such efforts are likely to have further effects in attracting women scientists at all levels to the University), we believe it would be unduly dispiriting to those in other departments facing equally difficult problems as individuals, or wishing to make a beginning at improving the environment. Therefore, we will encourage the individual efforts of all departments, and of individual faculty, by making resources available at these two levels, and we will also encourage much more dramatic goal-setting and self-transformation in selected departments. We anticipate that by encouraging the active participation of all three kinds of actors (all departments, all women scientists, and three targeted departments), we can simultaneously encourage and support change agents at many different levels and locations, and evaluate the relative efficacy of both diffuse and more targeted change efforts.

## Performance Plan and Method

We have designed a phased introduction of our program; each element will be described in detail in the next section, but we provide an overview here. In **phase one**, which will occur during Fall 2001, before ADVANCE funding is received, we will conduct a **baseline climate survey** of the entire campus, sampling all tenure-track men and women faculty in science fields, all non-tenure-track women faculty in science fields, and all tenure-track women faculty in social science fields. In addition, we will initiate a **space, equipment and resource inventory**, at the level of individual faculty in each science and engineering department. This inventory will include attention to the precise elements of "start-up" packages at the time of appointment, as well as current space, equipment and resources (including human resources—students, post-docs, technical assistants, etc.) allocated to each faculty member. Collecting these data prior to funding will provide a critical set of baseline data both for unit-level information (to permit units to design appropriate interventions for themselves) and for evaluation of the impact of the ADVANCE interventions. It also expresses to the local community the institution's commitment to a rigorous assessment of gender equity in these areas, regardless of the availability of external funds.

In **phase two,** which will be initiated in Year 1 of ADVANCE funding, a range of activities will be introduced to science departments in a systematic way, as part of the **campus climate initiative**; departments will be encouraged to take advantage of these programs and to perform self-study and goal-setting activities on the basis of data and consultation provided to them. During this phase the **gender equity resource fund** will be announced to individual women scientists, and applications will be encouraged throughout this period. These two activities will continue throughout the grant period.

In **phase two,** the final set of activities will also be announced campus-wide. Applications for **departmental transformation initiatives** will be invited from all science and engineering departments in the three colleges. It will be made clear that successful applications will depend on thorough self-study (perhaps using the resources of the campus climate initiative), goal-setting to achieve significant change in recruitment, retention and/or climate, and identification of programmatic activities aimed at meeting those goals. **Baseline qualitative data** will be collected before the program begins. Prior to the

intervention, individual interviews and focus groups will be conducted with all women faculty and a random subsample of men, both in the three targeted and three comparison departments (selected to be roughly the same size, with a similar gender composition of faculty and students, and with similar styles of research). In addition, exit interviews will be conducted with faculty who left those departments recently.

**Phase three** will begin near the end of Year 1 of the ADVANCE grant (fall of academic year 1992-93), when three departments will begin a four-year process of self-transformation. Resources will be committed to a sequenced set of activities, in which successful goal-attainment will be a condition of each stage of funding. During this phase (which will continue in Years 2-5), all three initiatives (campus climate, gender equity resource fund, and departmental transformation initiative) will be ongoing.

Finally, in the last year of the project, a campus-wide climate survey and space, resource and equipment inventory--parallel to the ones collected in phase one--will be undertaken to assess change, both campus-wide and in the targeted departments. In addition, individual interviews and focus groups will be conducted with women scientists who applied to the gender equity resource fund, who were in targeted transformation departments, and who were in comparison departments. Comparison interviews with some men scientists will also be conducted.

## Elements of the Campus Climate Initiative

A menu of activities will be announced as available to all science and engineering departments and colleges. These activities will enable science departments in some of the smaller schools and colleges (e.g., Dentistry, Pharmacy, Public Health), as well as those in the three key colleges, to pursue improvements in gender equity. We anticipate that individual departments may be at different points in a process of identification of gender equity as a matter for serious, committed attention. In some cases, departments may not acknowledge that there is a serious problem deserving sustained attention. In these cases, it may be most useful for the department to be provided some tools for self-reflection and self-study. Departments will be encouraged to use the process of reflection and self-study as opportunities for goal-setting, if they persuade themselves that there are problems that deserve systematic attention.

**Self-Study Activities:**

***Climate Survey Discussion***. At the most basic level, findings from the baseline climate survey will be disseminated and discussed in departments. This survey will cover faculty members' service responsibilities and teaching loads, as well as their research activities, resources, and perceptions of the department and university climate. For development of the survey we will draw on earlier efforts at the University and elsewhere ( e.g., Blackburn & Lawrence, 1995; CSHPE & CEW, 1999; Hollenshead*, et al*., 1996; MIT, 1999; Sonnert & Holton, 1995) to assess workplace environment with mailed questionnaires. The initial survey will sample all tenure-track women faculty at the University of Michigan in science or engineering departments (about 146, of whom about 94 are in LSA, Medicine and Engineering). For comparison purposes, data will also be collected from a subsample of comparable men faculty in the same departments and from all tenure-track women faculty in social science departments, and all women faculty in non-tenure-track faculty-level appointments in science departments. Findings from the survey will be summarized in a written report, which will be released to the entire campus, posted on the IRWG website, and linked to appropriate other websites. It will also be distributed to any department's individual faculty members by request (and will include information derived from the salary equity study currently being undertaken at the University). In addition, members of the evaluation research staff or faculty advisory committee (described in detail below) will be available to meet with departments as a whole, or with committees or groups within departments, to discuss the findings. Because it is critical that the very small numbers of women in particular fields not be identifiable, we will not distribute data from the survey separately by department. Instead, we will simply note any departments that dramatically depart from the aggregate pattern. Dresselhaus (2000) describes benefits to individual women scientists, and for institutional change, from documenting this information.

***Data-Based Workshops for Disciplines***. In a similar vein, we believe that it may be important to provide some departments with information about the particular experiences and accomplishments of women scientists in their discipline. Sometimes faculty are unaware that there are problems for women in science—in fact, some actually believe that there is so much "help" available that it is actually easier for women than for men (Glover, 2000; Morse, 1995). Alternatively, the specific barriers that arise in particular specialties may need to be addressed, and the fact that there is considerable cross-national variability in the participation and success of women in science fields (Fehrs & Czujko, 1992; Glover, 2000; Loder, 1999) may also be helpful to consider (since this information tends to dispel the notion that there are biologically-based gender differences in the capacity to perform successfully in certain disciplines or activities). Therefore, staff and students associated with the Women in Science and Engineering (WISE) program will work with faculty in particular departments to plan data-based workshops on the gender (and race-ethnicity) patterns in that field, based on the current beliefs and concerns of faculty within that department. This kind of data-driven workshop is likely to be particularly useful in helping to raise awareness that there actually is a problem in departments where there is doubt about this point (Lane, 1999; Etzkowitz, *et al*., 1994).

***Dissemination of Inventory Results to Departments***. Data from the space, equipment and resource inventory, aggregated by gender, rank and other pertinent factors, will be provided to each department. Departments will be invited to examine these data for evidence of gender inequities, and to devise solutions to those inequities. Evidence from the MIT experience is that documentation of inequities, in the context of an administrative climate of intolerance for gender inequity, results in significant changes (MIT, 1999).

***Focus Groups on Departmental Climate.*** Some departments may either already have considerable awareness of their own problems, and/or have already initiated a variety of activities to address these problems in recent years. These departments may request a facilitator for departmentally-based focus groups on the department climate for faculty and graduate or postdoctoral student men and women. Upon request, facilitators will conduct these focus groups, aimed to identify particular department issues perceived by different groups within the department (e.g., male and female faculty or male and female students, etc.). A formal report of the focus group findings will be presented by the facilitator both in writing and in discussion with the faculty (and perhaps students) in the department. The facilitator will encourage faculty to consider setting goals and making changes that might address the issues that surface, and will (if appropriate) provide information about resources already available at the University or made available through this initiative that may be helpful to the department in initiating change.

**Interventions:**

Some departments may be ready to request interventions as soon as the menu of activities is announced, because they have already engaged in some degree of self-reflection about climate issues. For that reason, we will launch several climate intervention activities at the same time as the self-study activities. Departments that engage in a self-study process may request interventions after they have completed some self-study.

***Climate Theater Performances***. First, we will offer departments an opportunity to host the *CRLT Players*, who present a classroom scenario originally developed by the Women in Science and Engineering Program and the Graduate Experience Project that graphically portrays a summary of the research on why women students drop out of math, science and engineering, and demonstrates effective strategies for countering these trends. We suspect (based on responses to the performances in departments and among LSA department chairs) that it may be helpful to illustrate climate issues in the context of faculty-student/classroom situations. These may be sufficiently distanced from the particularly fraught faculty-faculty interaction context to make it easier for groups of faculty to discuss the issues comfortably and openly. However, we anticipate that it will be valuable to add to the repertoire of possible scenarios some that reflect the teaching experiences of women science faculty as well as gender issues among science faculty and within science lab contexts. We will therefore commission additional scenarios, and offer departments some choices in what performances are created with and for them. We

anticipate (based on faculty responses to observing these performances to date) that this kind of performance can provide vivid examples of difficulties women faculty face, without putting women in the position of having to explain such situations and experiences to their male colleagues.

***Faculty Advisory Team for Recruitment and Hiring.*** We will create a recruitment and hiring advisory team of UM faculty gender-equity advisors,[4] including men and women senior faculty in the sciences. We believe that recruitment of new faculty is both an opportunity for additions of new women faculty in departments where women are underrepresented, and that hiring processes offer opportunities for increasing faculty members' awareness about the operation of subtle biases (Morahan, *et al*., 2001; Georgi, 2000). This kind of committee has been created at Harvard and other universities and was discussed at the MIT meeting as particularly effective (Morahan, *et al*., 2001; Sonnert & Holton, 1995*)*. This group will be well-educated (partly by research and study, also by training from the Harvard team and other consultants) on the range of processes that may either enhance or limit the pool of women applicants and their success in the pool. These processes include attention to the way that positions or fields are defined (which often determines how many women could possibly be in the pool); proactive recruitment of female applicants; inclusion of the "best" woman applicant in the final pool of interviewees (regardless of her apparent rank when compared with men); discussion of applicant qualifications in terms of multiple criteria, rather than foreclosure on a single ranked list; etc. In addition, the committee will consult with departments on hiring practices that are likely to be more successful and more gender-equitable at the last step in recruitment. These include attention to the potential tradeoff of a partner hire vs. research start-up needs (since women scientists are much more likely to be partnered with other scientists than are men (Loder, 1999; McNeil & Sher, 1999; Morse, 1995) this is an important issue to address); use of a detailed list of potential needs discussed openly rather than a more closed negotiation; and monitoring of timely and full delivery of start-up packages.

***Targeted Consultation with Chairs.*** Some of the UM gender-equity faculty advisors will also provide department chairs and other leaders with targeted consultation on retention. Retention and promotion of women faculty are clearly a equally important considerations in improving the overall climate for women on campus. Many women faculty have identified the particular actions of chairs as a critical factor in departmental climate, and in their own satisfaction within departments. Targeted consultation may include analysis of focus group-generated data from faculty and/or students in the department and (especially) interviewing of recently departed faculty and students (that is, those not retained). It may also be important to assess perceptions, within the department, of the reasons for those departures, since widely-shared perceptions can motivate departures of those who remain. Analyses of the results of interview and focus group data will be provided to departments requesting them.

***Best Practices Workshops.*** In addition, we will offer a "best practices" workshop for small groups of chairs (and other leaders) within science departments, to outline the kinds of departmental leadership behavior that can make a difference in retention of women scientist faculty. These practices include not only outstanding practices in recruitment and hiring (as outlined above), but careful attention to life-stage-related needs, including in the early stage child care issues, as well as adequate student and other resources and mentoring; and including in middle and later stages attention to needs for bridging funds, and increasing responsibility (in committee assignments) and recognition. These workshops will be led by at least two individuals—a male chair who has successfully adopted some or all of these practices, and a female scientist or social scientist faculty member able to describe research evidence about them and/or their felt impact for women faculty.

***UM Network of Women Scientists.*** Finally, we believe that the best way to address retention of women faculty is probably creation of a network of women scientists with its own resources for hosting speakers, creating retreats with junior women, post-docs or students, and simply socializing. In consulting with women scientists on campus we were struck by their extreme isolation from one another, and from other communities of women on campus. They are eager for opportunities to interact with one another in a setting that is serious (not one that seems stigmatizing or trivializing), pleasurable, and

[4] These individuals will be provided with release-time in order to perform this task.

requires little or no effort for them. Interestingly, Fox (1996) argued that because science is a social process, scientists need to gain information and status through face-to-face interactions, *but* women scientists tend to be isolated from many networks or to be alienated within them (see also, Sonnert & Holton, 1995; Glenn, Monroe & Lamont, 1993). Therefore we will create a UM Women Scientists Network, which will be fully staffed at IRWG. All women scientists on campus will be invited to participate in it, but we will also be open to creation of subgroup networks as well. We will provide at least three activities in the first semester of the grant, which we will plan. These will include: a first dinner occasion away from campus, where women faculty will simply meet one another in a social setting, and be encouraged to share information about their work and their departments; a networking lunch with women administrators on campus; and a networking opportunity with women faculty in non-science fields. At the end of this first semester, we will ask the Network members to identify desired activities (which we anticipate may include external speakers, further social opportunities together, interactions with post-docs and/or students, etc. Subsequent events will be planned on the basis of the Network members' input. One possibility would be to expand the network beyond the University of Michigan, through use of the internet and electronic mail lists, to connect women faculty to other colleagues (and possible mentors) working in similar areas (Etzkowitz, *et al*., 1994).

***Women Talking Science Program.*** In addition, women science faculty will be invited to take advantage of the ongoing *Women Talking Work* program, which offers women professionals an opportunity to discuss, for an extended period, their work-related difficulties (including the balancing of professional and personal life) with a small group of women with similar concerns. Jane Hassinger has facilitated these groups for several years, providing professional women with an opportunity to discuss the research and theoretical literature about gender equity, as well as their personal experiences at work. In recent years, several UM women science faculty have participated in these groups, and have discussed the benefit they derived from this experience (in offering them theoretical tools, empirical comparisons, and relief from isolation) in public presentations on campus. By tailoring these workshops to the work lives and challenges of women in science, we suspect that a special series on *Women Talking Science* will reach a much larger number of women scientists.

**Gender Equity Resource Fund**

Many women scientists report that they have particular needs for support that are simply unrecognized and unmet (Glover, 2000; Preston, 1994). For example, many face extraordinary expenses for specialized child care necessitated by the special time and space demands of scientific research (long stays at field sites, long and late hours at labs, need for extended travel to research sites or collaborators' laboratories). These expenses pose a special burden for women scientists at the beginning of their careers, when their earning capacity is lowest and their need to equip their laboratories and establish operations in them may demand the longest working hours from them. While young male faculty may also face such demands, women are much more likely to have partners in the same line of work (with the same time demands); they are, therefore, much less likely to have partners whose work would allow them to fill in this needed care.

Women scientists also report that their research support needs (for lab space and equipment, for research assistance and doctoral and postdoctoral students to train, for teaching release time, for summer salary, for colleagues' travel to their lab to collaborate, and for their own travel to others' laboratories) are often not met, or met at a lower level than men's. This may result from women's reluctance to request adequate support, from authority figures' resistance to supplying support, and even from women's lesser awareness of support possibilities (as a result of their relative isolation from mentors and networks). This outcome can occur even in the context of apparently neutral or benign leadership. For example, if authority figures require extensive justification for supports, and women faculty are less inclined than men to press for those supports (because of less confidence or for other reasons), women may end up with fewer resources, without authority figures intending that outcome or even being aware of it. However, since scientific productivity often requires a lengthy start-up period, and depends on stable trained

assistance, lesser resources at the beginning of a career can have dramatically multiplied effects over a period of years.

We propose to establish a Gender Equity Resource Fund to begin to address women science faculty's unmet needs. Many features of this fund are based on successful programs attempted elsewhere, such as the longstanding Clare Booth Luce Professorships (see Baker, 1999; Erskine, 1999). Funds will be awarded based on a brief application, outlining the needed resources, and their relationship to gender equity. A small standing committee of faculty at IRWG will serve as a selection committee, using as a model IRWG's procedures for administering an annual, campus-wide small grant competition for faculty (which has operated for six years across the University, awarding 79 grants, totaling nearly $400,000). Competition for funds will take place twice each year, during every year of the award. It is critical, in our view, that the resources allocated from this fund be allocated in response to felt needs by women faculty scientists themselves; they will be able to ask for precisely the kind of support they think they need, and to apply for it without the mediating judgments of any authority figures in their home environments (see Erskine, 1999 re the importance to women scientists of developing a sense of "entitlement" as well as being offered validation of one's own needs and the worth of one's work). While we aim to establish the fund with $100,000 per year, it's difficult to estimate the demand on it. If the demand is much larger, we will attempt to identify other university resources to meet the demand; it will be helpful, even if we are unable to meet all of the identified need, if we are able to document the extent of felt need of this sort, so we can devise appropriate institutional remedies.

**Departmental Transformation Initiative**

Many studies have documented that the problems for women in science arise in many features of institutionalized science, including the peer review process for grants (Wenneras & Wold, 1997) and for publication *(*Yu Xie & Schauman, 1998*),* in the selection processes that affect postdoctoral opportunities and faculty hiring (Valian, 1999)**,** promotion and tenure (Glover, 2000; Zuckerman, 1991), and achievement of honors and awards in the disciplines (Delamont, 1989; McIlwee & Robinson, 1992; Zuckerman, 1991). There is, however, considerable evidence that the problems with the most widely-ramifying implications for women scientists' morale, confidence and productivity (hence for their retention, promotion and success) are those that arise in their work environments (Fox, 1996; Rowe, 1990; Wertheim, 1995). In universities this usually means in their departments. For that reason, we will target three departments (one each in LSA, Engineering, and Medicine) for dramatic transformation as an environment for women faculty. We believe that if we are able to accomplish substantial change within the award period, even in a single major science department at the University of Michigan (much less in three), we will significantly alter the climate within which not only women faculty work, but also women students are being educated. Moreover, we suspect that highly visible changes of this sort will operate as a major symbolic incentive for other departments within the University, as well as for women scientists exploring faculty and postdoctoral opportunities. We believe that if we make the University of Michigan well-known for its successful implementation of a positive climate for even some women scientists, the University will be a magnet for the best women scientists in the country--thus enhancing our capacity to recruit and retain even more women scientists to the faculty. In addition, by creating a positive climate in some major science departments, we will not only resocialize male and female faculty to different norms and practices, but also socialize from the beginning a new generation of students into those different norms and practices. Thus, we suspect that targeted transformation will have many ripple effects beyond the department faculty most personally affected.

The critical first step in this process is the identification of departments 'ripe' for transformation. We believe there are a number of well-established criteria for selection of departments. First, they must be departments with a genuine interest in and commitment to change. In the context of academic freedom and departmental autonomy, no department can be motivated from outside to be transformed. Therefore, they must be departments with a relatively broad consensus about the desirability of working on this kind of transformation, as well as leadership committed to the process of bringing it about. Second, for change to happen on a short timeline, they must be departments with either a "running start" (that is, they are

already improving or well-poised for transformation) *or* they must be departments that have or anticipate significant resources to support that change. The ADVANCE Award offers substantial resources to the University and to departments, but one crucial resource it cannot provide is tenure-track faculty lines, and given the low rate of tenure track women faculty, departmental climate is likely to be difficult to change without more tenure-track women faculty. Departments will need to demonstrate, then, that for some reason they will be able to increase the proportion of faculty who are women; for example, they may expect new lines (if they are part of a major University initiative, e.g., the Life Sciences Initiative or the Information Technology Initiative, that has or will generate substantial resources) or they anticipate retirements or openings for some other reason.

During the first year of the Award, the Steering Committee (composed of the Deans, Associate Provost and PI) will issue a request for proposals for Departmental Gender Equity Transformation to all science and engineering departments within LSA, Engineering and Medicine. This request will articulate the opportunity offered by the program (over $235,000 for each department allocated over the five years). Departments will be invited to apply by developing a plan for how it would improve its own climate dramatically over four years, both by using these resources and by other means (e.g., recruitments). In most cases, development of these plans will require departments to take advantage of some of the activities available under the Campus Climate Initiative to all departments. Thus, wise departments will take full advantage of those activities in the first year, in order to develop both the data-based understanding and the broad consensus about the issues that will make it possible to devise a realistic and ambitious plan. The first phase of the Departmental Transformation Initiative is, then, this process of self-study and goal-setting resulting in the development of detailed plans for self-transformation. These plans should address issues of recruitment, retention, promotion/tenure, and climate. In phase two, departments will still be able to make full use of the broad set of resources offered under the Campus Climate Initiative, and take advantage of specific opportunities created by their unique history and situation (especially in terms of hiring), but they will also have the freedom to allocate the Departmental Transformation funds in a discretionary way to meet the particular needs of their own change process. Thus, they may choose to bring in visiting scientists with pertinent research interests, and/or consultants within their discipline to help them address particular climate issues; they may allocate funds to women scientists to support their research; they may allocate the funds to improve the "startup" packages of women scientist candidates for new positions; they may identify entirely unique needs.

Two important points about the Departmental Transformation Initiative should be noted. First, attempting this kind of focused allocation of resources as an incentive for departmental goal-setting and change--if it is successful--may provide a new model for faster change in the advancement of women scientists. We hope that by adopting both this approach and the two other approaches (broad campus-wide efforts and individual scientist efforts), we will be able to make data-based comparisons of the efficacy of these three different strategies for making change. This will enable us to contribute to a broader base of knowledge about how best to intervene to advance women in science and engineering. Second, throughout the period of the grant, all three levels of resources will be available to the targeted departments. Thus, they will be able to benefit from campus initiative resources, the gender equity resource fund, *and* the discretionary resources associated with this strategy.

**Evaluation of the Efficacy of the Three Levels of Interventions**

The ADVANCE resources we are requesting are substantial. Their efficacy in effecting institutional transformation must, therefore, be assessed expertly. For that reason, we propose to conduct a baseline survey of many critical dimensions of possible gender inequity *before the funding is assured.* Significant University resources have been committed to permit collection of baseline survey data about the perceptions of faculty members in science and engineering regarding: departmental, university and disciplinary climate; teaching and advising responsibilities; committee and other service assignments; lab space, equipment and other resource allocations and recognition of accomplishments. Survey data will be collected from all of the tenured and tenure-track women scientists in the University, a random sample of men scientists in the University, and all non-tenure-track women in faculty ranks in the sciences, as well

as all tenured and tenure-track women faculty in the social sciences. This design will permit comparison of the perceptions and experiences of the key group (tenure-track women faculty in the sciences) with those of three other groups: tenure-track men in the sciences; non-tenure-track women in the sciences; and tenure-track women in the social sciences. We anticipate that we will be able to publish the results of this evaluation both in an aggregate form, and disaggregated by college (LSA, Engineering and Medicine). We will not be able to disaggregate at the departmental level without risking exposure of individual women, but we will be able to provide information to departments with a critical mass of women faculty about the degree to which their profile fits that of the aggregate. The baseline evaluation data will be collected before any interventions are announced. Their publication will, of course, both constitute an intervention and (we hope) provide a basis and stimulation for self-study and goal-setting among science department faculty.

In addition, funds have been allocated for a direct inventory of space, equipment and other resources at the individual level. This inventory will be modeled after that conducted at MIT, and will permit us to compare the perceptions of certain kinds of inequities (from the survey data) with some other, more direct indicators (e.g., square footage). We will provide the data from this inventory to each science and engineering department, as well as to the Steering Committee. It too will provide a critical tool for self-study and goal-setting.

Both the survey and the inventory will be repeated in year 5, after all three types of interventions have been launched and operated for four or five years each. Individuals will provide evidence about their exposure to all three types of intervention so we will be able to evaluate the differential efficacy, at least at the level of the individual, and the targeted departments, of the three kinds of change efforts. In addition, IRWG staff not involved with interventions in any way will conduct evaluations of campus climate initiative activities (workshops, focus groups, etc.) throughout the first four years of the project. These evaluations will be used to guide adjustments in the intervention activities themselves.

In addition to these quantitative indicators, the Center for the Education of Women (CEW) will gather a rich set of qualitative evaluation data, particularly aimed at evaluating in detail the impact of the Departmental Transformation Initiative. Grant, Kennelly & Ward (2000) argued that in-depth qualitative data provide important information that differs from survey data about women scientists' lives and work experiences. CEW has been a national leader in intervention and evaluation of programs focused on gender equity. Moreover, it is a recognized campus resource for addressing gender issues, and the staff have considerable experience collecting, analyzing and disseminating interview and focus group data. CEW staff will conduct baseline interviews with all of the women faculty in the three selected departments, and with an equal number of men faculty members in those three departments, at the beginning of the Departmental Transformation Initiative. They will conduct parallel interviews in three comparison departments, selected to be comparable in size, gender composition and (to the extent possible) style of research and climate. They will also conduct (baseline) focus groups with women and men graduate students in the three selected and three comparison departments. Finally, they will conduct exit interviews (primarily by phone) with women and men who have left the three selected and three comparison departments within the past few years.

During the middle three years of the project, CEW staff will conduct ongoing exit interviews with the women and men faculty who leave any science and engineering departments. They will also conduct initial interviews with new faculty members hired during this period. Finally, in the last year of the project, a full set of comparison interviews will be conducted with faculty members and graduate students in the three selected and three comparison departments. These interview and focus group data should provide rich detail both about the challenges facing women scientists and the impact of the various interventions not only for them, but for their colleagues and students.

In addition to this in-depth qualitative analysis of the impact of the Departmental Transformation Initiative, CEW will conduct case studies of two or three departments, identified during the first year of the project (in the course of the analysis of baseline data, as well as the applications for Departmental Transformation) as more beneficial environments for women. These case studies will be aimed at identifying some "best practices" that operate in those departments, that might be of particular value to

other departments. This knowledge will be used by the leaders of the "best practices workshops" from the Implementation Advisory Committee, once the case studies have been completed. In addition, the case studies will be widely disseminated within the University community. In this way, the evaluation data will become part of the intervention process, *after* the evaluation is complete.

**Administrative Structure for the Project**

We have devised an administrative structure for the project that combines attention to the perceived legitimacy of the program (in the eyes of unit-level and central administrators, as well as male and female faculty throughout the University), design of informed and flexible interventions, fair allocation of resources, and a capacity for independent and rich evaluation of the interventions.

The project will be housed at the Institute for Research on Women and Gender, which is a campus-wide resource for faculty and student scholarly and creative activities. Founded in 1995, the Institute administers 25 external research and training grants, as well as 9 internally-funded projects and 11 interdisciplinary programs. These activities, along with outreach to the media, and administration of funding programs for faculty and graduate student research support, are administered by a staff of 9 employees (8 FTE), assisted by several graduate and undergraduate interns. The Institute is housed in a centrally-located building (Lane Hall) that was recently renovated and expanded to accommodate its needs, and those of the Women's Studies Program. In addition to office space for the staff, Lane Hall offers five meeting rooms (and a kitchen and lounge appropriate for catering events), a fully-equipped focus group room (with one-way mirror and facilities for video- and audio-taping), an interview room, a computer lab and computer classroom, several individual researcher offices and six office suites for research programs. The Institute provides programming across the disciplines, and offers women scientists a place to meet with staff for the project, and with each other, that is both private (with respect to their departmental colleagues) and welcoming.

Staff for the project include the P.I., a faculty member in Psychology and Women's Studies, who is experienced in curricular and organizational change and who has more than a decade of experience in administration of cross-campus activities and programs as director of women's studies (1989-1995) and director of the Institute for Research on Women and Gender (1995-present). She participated in the MIT meeting as one of UM's representatives, is part of the "MIT follow-up" committee, and is a social scientist with many years of experience conducting both quantitative and qualitative research, including program evaluations. She will chair the Steering and Implementation Advisory Committees. The Project Manager is an experienced researcher/administrator, who came to IRWG from the Murray Research Center at Radcliffe College, where she was a co-director; she has many years of experience managing research projects, as well as administering research institutions. She will provide overall management of the survey and inventory evaluations, as well as the ongoing evaluations of climate initiatives. A half-time Program Coordinator will provide staff support to the diverse intervention activities; this individual will staff the UM Women Scientists Network, schedule and make arrangements for focus groups, consultations, workshops, interactive theater visits, production and dissemination of reports, and meetings of the various administrative committees and the faculty advisory recruitment and hiring committee. During the first and final years of the project, a full-time postdoctoral researcher will conduct the survey data collections and analyses, assisted by a graduate student. Finally, IRWG staff will provide other administrative support (for processing paperwork, budgeting, etc.). All core administrative staff for the project will be housed at IRWG.

In addition, staff for particular interventions and evaluation will be drawn from several other units on campus. Carol Hollenshead, director of the Center for the Education of Women, will (along with other CEW staff) conduct the qualitative evaluation of the Departmental Transformation Initiative, and will develop case studies and best practices material for use in the workshops. Cinda-Sue Davis, director of the Women in Science and Engineering Program, will develop and co-present (along with faculty members from the implementation team or in the departments) data-based workshops about gender equity in science and engineering. Patricia Shure, of Mathematics, will work with Davis on developing this workshop in that discipline, perhaps using it as a model for the other workshops. Hollenshead, Davis and

Shure have extensive experience with intervention and evaluation of academic climates for women faculty and students.

For the interventions we will draw on several existing University resources, in particular the *Women Talking Work* program of the Interdisciplinary Program in Feminist Practice**,** directed by Jane Hassinger; and the interactive climate theater program (*CRLT Players*) at the Center for Research on Learning and Teaching. Both of these programs have successful histories working with faculty at the University of Michigan.

The overall direction of the project, and the selection of the three departments for the Departmental Transformation Initiative will be provided by the Steering Committee. This committee includes the PI, the Associate Provost, and the deans of the three key colleges (LSA, Engineering and Medicine). This group provides crucial legitimacy to the activities of the program; it will review the plans for the introduction of intervention alternatives; design the competitive call for departmental transformation; and select departments from among the applicants.

The Implementation Advisory Committee will review the detailed plans for each of the interventions planned for the Campus Climate Initiative. It will offer advice and feedback on those interventions in advance, and will help address identified problems as they arise. The committee will include 13 male and female scientists (4 each from LSA, Engineering and Medicine and one from one of the other schools), the Associate Deans of each college (W.J. Adams, Economics/LSA; Linda Katehi, Electrical Engineering and Computer Science/Engineering; David Bloom, Surgery/Medicine), the Associate Provost (Pamela Raymond, Cell and Developmental Biology) and the Associate Vice President for Research (Marvin Parnes). [Biosketches are included for these individuals as well as the faculty who have agreed to serve (from LSA: Carol Fierke, Chemistry; Katherine Freese, Physics; Samuel Mukasa, Geological Sciences; Kathryn Tosney, Biology; from Engineering: Linda Abriola, Civil and Environmental Engineering; John Laird, Electrical Engineering and Computer Science; Matthew O'Donnell, Electrical Engineering and Computer Sciences; Tresa Pollock, Materials Science and Engineering; and from Medicine: David Burke, Human Genetics; Sally Camper, Human Genetics; Michael Savageau, Microbiology and Immunology; and Linda Samuelson, Physiology; from Dentistry: Lisa Tedesco)]. Individuals drawn from this committee will serve as crucial educators and informants of the faculty in each college, and campus wide. In addition, some members of the committee will serve as climate and retention consultants to departments, and will (jointly) offer workshops on "best practices" for chairs and for departments. This group thus constitutes a crucial body of experts who can provide advice about the design of interventions and can actually assist in them.

The Evaluation Advisory Committee will provide expert advice to the evaluation staff on the design of a survey instrument for the baseline and evaluation survey, will approve a sampling plan, and will consult on data analysis and interpretation of both baseline data and followup data. It will also consult on collection and analysis of qualitative evaluation data. The committee includes senior faculty experts in many fields in both quantitative and qualitative research, particularly evaluation research [e.g, Mark Chesler (Sociology), Mary Corcoran (Political Science/Public Policy), Paul Courant (Economics), Ann Lin (Public Policy), Richard Gonzalez (Psychology), Sylvia Hurtado (Higher Education), Janet Lawrence (Higher Education), Valerie Lee (Education), Yu Xie (Sociology); see biosketches]. The social scientists serving on this committee, like the IRWG and CEW staff who will conduct the evaluations, will not be directly involved in any aspect of the intervention programs associated with this project. In that way, the complete independence of the evaluation and the intervention components will be assured.

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