Comprehensive Literature Review of Current and Promising Practices to Support Unpaid Caregivers in Science, Technology, Engineering, Mathematics, and Medicine (STEMM)

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INTRODUCTION AND EXECUTIVE SUMMARY

Unpaid caregivers are an important—and sizeable—portion of the current and future science, technology, engineering, mathematics, and medicine (STEMM) workforce. Student caregivers constitute at least 22 percent of the undergraduate and 33 percent of the graduate populations (Institute for Women's Policy Research, 2019), with estimated rates even higher for faculty. Yet despite their relative prevalence, caregivers' needs are often missing from institutional policies and practices; this represents a significant gap in efforts to bolster diversity, equity, and inclusion. Caregivers often struggle to manage the intense time demands of providing care and the mental strain and financial challenges that can accompany caregiving—all of which are significantly exacerbated by work and study conditions unresponsive to their needs.

This comprehensive literature review explores the promising practices and related governmental mandates to protect and advance academic caregivers. While we find that more research is needed on specific interventions, especially those applicable to caregivers who are not parents of minors, there is relative consensus on several promising practices to facilitate the recruitment, retention, and success of caregivers in STEMM. Several key findings emerged across the populations studied, and are described below.

More Data Is Needed

Across all populations—students, trainees, employees, and faculty—the literature is disproportionately focused on meeting the needs of pregnant people and new parents, with few articles specific to the needs of those providing care for ill, disabled, and/or elderly adults. In

keeping with this narrow focus, much of the literature also conflates the needs of women with the needs of caregivers generally, risking furthering gender stereotypes that caregiving is "women's work" and overlooking the unique experiences of caregivers who are not women. And, despite a growing body of research outside of academia pointing to the importance of understanding intersections between caregiver status and race, little research has investigated what these intersections mean for promising practices to improve racial diversity in STEMM. Adding to the challenge of insufficient data is that much of the literature focused on solutions to the challenges faced by caregivers in STEMM is based on institutional change programs that apply a number of interventions simultaneously (e.g., flexibility policies and women's mentorship programs). While a multipronged approach is likely to serve as a catalyst for culture change in support of family caregivers, it makes it challenging to assess the impact of any one intervention. Future research on specific aspects of caregiver-responsive policies is needed. Institutions can assist in filling the research gaps by collecting data on caregiving status through existing data systems and making the data available widely.

Formal Policies Are More Effective Than Ad Hoc Ones

Despite the need for additional research, we do know that across populations, caregivers thrive when caregiving-responsive practices are documented and communicated through clear and formal policies. Informal policies are often applied by faculty or department heads, who have limited training and may hold power over a caregivers' career success, which leaves room for arbitrary or incorrect use of policies or even outright bias. Throughout each of the core interventions addressed in this report (e.g., leave and accommodations), one best practice is very clear: institute formal policies rather than ad hoc ones.

Caregivers Need Leave, and the Ability to Use It

There is clear consensus that caregivers in STEMM need access to leave. This applies regardless of gender, career level, and caregiving type, although caregivers for infants and children are the most impacted. In order for leave polices to be accessible and equitable, the leave time line must be long enough (at least 12 weeks), implemented in a transparent fashion (e.g., through an established policy with clear expectations), and caregivers' economic well-being must be preserved while on leave (e.g., by maintaining health benefits and pay, where applicable). Institutions must also avoid forcing caregivers to prework or pay back leave, a practice typically illegal where the leave is legally mandated (e.g., under the Family and Medical Leave Act [FMLA]). Finally, leave policies only work when institutions follow the law as well as best practice by ensuring leave-takers' standing is preserved, typically through the use of tenure clock extensions, promotion policies, and antibias training.

Accommodations Reduce Strain and the Need for Leave

Caregivers in STEMM also benefit greatly from accommodations and duty modifications. For example, students and faculty are both entitled to clean, private, non-bathroom lactation spaces and lactation break time. Students may benefit from accommodations in the classroom or specific to coursework, while faculty may wish to utilize adjusted course loads and job-sharing opportunities. Flexibility and creativity are critical components of ensuring caregivers receive the support they need, in a way that best suits their individual circumstances—especially for students who must manage the additional burden of inflexible program time lines.

Interventions Must Be Widely Communicated to Be Effective

Beyond merely adopting caregiver policies, a best practice universal to all populations and interventions is to ensure successful communication and training on the policy. Students and faculty often report difficulty accessing existing supports or not knowing where to turn for assistance in navigating leave, accommodations, and nondiscrimination protections. This lack of information is particularly acute for postdoctoral fellows, medical residents, and others who do not fit cleanly within the typical bureaucratic categories of either faculty or degree-seeking students. The most promising policy communication ensures information reaches the caregivers as well as those around them, including policy implementers and peers. This widespread communication and related training are essential for ensuring policies are implemented accurately and help shift culture to one in which caregivers utilizing the policy are treated as users of any other benefit—not as individuals asking for favors. Training should include the importance of the policies at issue, how they work, and who is accountable for enforcing them or answering questions. Many institutions accomplish this by providing caregiver resource navigation websites and/or a staff person to direct the caregiver.

Basic Needs Support Reduces Caregiver Strain and Improves Retention

Student and faculty retention and success is improved through supporting their basic needs, most notably for high-quality and affordable care options. At minimum, institutions should establish policies to facilitate the funding of childcare and eldercare (including travel grants and drop-in and after-hours care), apply for funding where available, and connect students

and faculty with community services where direct support is not feasible. Notably, institutions must account for the extreme economic precarity of student and trainee caregivers. In addition to the need for affordable childcare, the student parent population struggles with housing (68 percent) and food insecurity (53 percent) (Goldrick-Rab et al., 2020). While truly resolving this struggle for both students and faculty will take structural change, institutions can ameliorate the problems with cost-effective solutions including, at minimum, connecting caregivers with basic needs services in the community (e.g., nutrition assistance programs, housing grants, childcare referrals), and incorporating the needs of students with caregiving obligations into their existing initiatives (e.g., planning of new housing developments and meal plan options).

Financial Support Is Critical

Providing caregivers with paid leave, additional staffing to allow for accommodations, and childcare or eldercare is a major—though necessary—expense, which should be prioritized as essential both to legal compliance and to improving diversity in STEMM. External and institutional funders are needed to provide the funding that will allow caregivers to thrive. And institutions should reduce bureaucratic barriers to accessing funding that already exists.

Summary

Attending to the needs of both student and faculty caregivers in STEMM is essential to advancing the field. When the needs of caregiving students and trainees are not met, they cannot become faculty, and when early-career faculty caregivers are not supported, they cannot become the later-career changemakers the field needs. As STEMM disciplines continue to make strides

to serve caregiving students and faculty, this literature review contains innumerable best practices and legal mandates that can serve as a foundation.

In this review, we discuss the key legal/governmental mandates impacting caregivers and their institutions as well as the promising practices for retaining and advancing caregiving students/trainees and faculty. The interplay between governmental and institutional policies are addressed in each relevant subsection. (See Appendix A for a summary of key promising practices and how they intersect with the myriad laws that support caregivers.)

STATUTORY MANDATES TO ADVANCE CAREGIVERS IN THE WORKFORCE AND EDUCATION

Myriad laws require educational institutions to provide family-responsive benefits and protections to employees, students, and trainees. Additional laws provide benefits administered via a state system. In sum, these laws require that students, trainees, and employees be provided access to maternity disability leave and maternity-related accommodations. Federal and state laws also require caregiving leave for *eligible* employees and other modifications when necessary to avoid discrimination on the basis of sex, pregnancy status, or caregiving status. These laws protecting caregiving students, trainees, and employees also make illegal any retaliation and interference that could prevent individuals from using them. Reminding educational institutions of the legal obligations addressed herein supports legal compliance as well as the implementation of promising practices for retaining caregivers in STEMM by creating a sense of urgency around addressing family caregiver issues and normalizing the provision of supportive practices.

Maternity, Parental, and Caregiving Leave

Employees, including faculty, medical residents, and postdoc employees, often need leave for pregnancy and childbirth recovery or to provide care for a relative, a newborn, or newly adopted child. Depending on the situation, employees may have a right to leave under the Family and Medical Leave Act, state and local laws, Title IX , and/or other nondiscrimination statutes.

FMLA

The federal Family and Medical Leave Act requires covered employers to provide their eligible employees with unpaid, job-protected leave for up to 12 weeks in a 12-month period (FMLA, 1993). During the leave period, employers must continue to provide their employees with continued health insurance coverage. This law applies to all public institutions as well as private employers with more than 50 employees.

Employees eligible for FMLA leave must have worked at least 1,250 hours for the employer in the 12 months prior to the start of leave, must have worked for the employer for at least 12 months total, and must work in a location with at least 50 employees in a 75-mile radius (FMLA, 1993). Eligible employees can use the leave for pregnancy, bonding with a newborn or newly adopted/placed child, or to care for a member of the employee's immediate family (child, spouse, employee's own parent) with a serious health condition. Serious health conditions under the law typically include physical or mental health conditions requiring an overnight stay in a hospital or similar facility; conditions which incapacitate the family member for more than three consecutive days *and* require ongoing medical treatment such as follow up appointments and/or medication; chronic conditions that incapacitate and require treatment at least twice a year; or pregnancy.

The FMLA has special considerations for employee spouses working for the same employer. These employees are limited in the amount of time they can take for bonding with a newborn or newly adopted/placed child. Leave for child bonding is limited to 12 weeks *total* for dual-career employees at the same institution, while leave for one's own pregnancy, health condition, or child's health condition is not split. For example, if a faculty member takes 8 weeks of pregnancy FMLA leave and 4 weeks for baby bonding, those 4 weeks could be deducted from the 12 that her faculty spouse is eligible to use for baby bonding (*Fact Sheet #28L*, 2015).

To access this leave, employees should provide 30-day advanced notice when the need is foreseeable and offering notice is practicable. If the need for leave is not foreseeable, the employee should provide notice as soon as practicable. Employees may be required to fill out paperwork confirming their relative's medical condition. Following the employee's leave, they must be reinstated to their job or one that is nearly identical. Leave may be taken intermittently, but employers have a choice of whether to allow intermittent leave to bond with a newborn or newly placed child.

Finally, the FMLA prohibits employers from interfering with employee's ability to take leave or retaliating against them for taking leave. The law is enforced through the U.S. Department of Labor and private lawsuits.

State and Local Leave Laws

At least 16 states provide their own job-protected leave for caregiving employees. These laws are typically very similar to the federal FMLA, though they often have expanded eligibility, such as lower employer size thresholds or the length of time an employee must have worked to be eligible for leave. Twelve states and Washington, D.C., have a law requiring paid leave for

new parents and family caregivers (A Better Balance, 2023). Several of these laws have been recently enacted and are not yet providing benefits. Notably, state paid family leave laws typically have caps on benefit amounts (e.g., no more than $700 a week) and as such are typically unable to fully replace a faculty member's pay.

Title IX

Title IX of the Education Amendments of 1972 prohibits discrimination on the basis of sex and requires educational institutions to provide their students/trainees and employees with leave related to pregnancy.

Students and nonemployee trainees must be provided leave for pregnancy and related conditions (such as childbirth or miscarriage recovery) for as long as is deemed medically necessary by the student's health-care provider (Title IX Regulations, 2020). Following the student's time away from studies, they must be returned to the same status they held prior to taking leave. To accomplish this, students may be entitled to make up work, a delayed finish for the semester, and/or automatic readmission.

Employees of educational institutions must also be provided with leave for pregnancy and related conditions. Employers must, at minimum, allow employees to take leave without pay for a "reasonable time" when needed due to pregnancy, childbirth, and related conditions. Following this leave, the employee must be reinstated to the status they had prior to leave, or to a comparable position ("without decrease in rate of compensation or loss of promotional opportunities, or any other right or privilege of employment") (Title IX Regulations, 2020).

Other Laws Requiring Leave

The Pregnant Workers Fairness Act (PWFA), discussed below, requires that employers provide reasonable accommodations, including leave where appropriate, for those impacted by pregnancy and related conditions (Pregnant Workers Fairness Act, 2022). The Americans with Disabilities Act (ADA) also requires that employers provide leave, when needed, as a reasonable accommodation for people with disabilities, including pregnancy-related disabilities and mental health disabilities that may be impacted by caregiving (Americans with Disabilities Act, 1990). Many states have their own laws providing benefits to public employees (Legislatures, 2015). Finally, antidiscrimination statutes such as Title IX, Title VII, and the ADA may also require leave be provided to individuals protected by the laws in some circumstances where it is offered to others with similar needs.

Maternity Accommodations

Pregnant and postpartum people often need changes at work or school to protect their health and ensure equitable access to employment or education. These changes are commonly referred to as "reasonable accommodations" or "academic adjustments" and can include changes such as new seating, changes to schedules, lactation breaks, personal protective equipment, and avoiding exposures to teratogens (Center for WorkLife Law, 2023). In addition to state and local laws, most employees, trainees, and students are entitled to accommodations under the federal Pregnant Workers Fairness Act, PUMP for Nursing Mothers Act (PUMP Act), and/or Title IX.

Pregnant Workers Fairness Act

The PWFA is a federal law that requires employers to provide their employees impacted by pregnancy and related conditions with changes to how, where, or when their job is done. The PWFA went into effect in June 2023 and covers all public employers and those with at least 15 employees (Pregnant Workers Fairness Act, 2022).

Eligible employees are those who are impacted by pregnancy and related conditions, such as pregnancy symptoms and complications; infertility; miscarriage, pregnancy loss, and abortion; childbirth and recovery; postpartum depression; and lactation. To access accommodations under this law, the employee would need to inform their employer of their pregnancy-related limitation. Then, the employer is obliged to engage in an interactive process with the employee to determine a reasonable accommodation that would be responsive to the employee's needs. Accommodations are considered reasonable when they do not pose an undue hardship by being significantly expensive or difficult to provide in that particular situation and in light of the employer's resources.

PWFA prohibits employers from interfering with employees' rights under this law, such as forcing employees to take leave when other options are available or retaliating against an employee for needing accommodations or asserting their rights under the law. This law is enforced via the Equal Employment Opportunity Commission and private lawsuits.

PUMP Act

The PUMP for Nursing Mothers Act, a 2022 amendment to the Fair Labor Standards Act, covers employers of all sizes nationwide (PUMP for Nursing Mothers Act, 2022). The Pump Act requires employers to provide their employees with lactation breaks and a lactation space that is

not a bathroom and that is free from view and intrusion. Under the law, employees are entitled to take lactation breaks of a reasonable length as often as needed. Employers with fewer than 50 employees total may seek an exemption in limited circumstances. There are no exemptions for larger employers.

The PUMP Act prohibits employers from interfering with employees' rights under the law or retaliating against an employee for needing lactation accommodations or asserting their rights under the law. This law is enforced via the U.S. Department of Labor's Wage and Hour Division and private lawsuits.

Title IX

Title IX requires educational institutions to provide their students and nonemployee trainees with accommodations/academic adjustments when needed due to pregnancy and related conditions. Federal regulations state that pregnancy and related conditions, such as termination of pregnancy and childbirth, must be accommodated in the same manner that disabilities are accommodated (Title IX Regulations, 2020). The U.S. Department of Education has further clarified that, "to ensure a pregnant student's access to its educational program, when necessary, a school must make adjustments to the regular program that are reasonable and responsive to the student's temporary pregnancy status."

The requirement to make adjustments for pregnant students is expected to be revised in October 2023, when the Department of Education's proposed Title IX regulations become effective. The most recently updated draft regulations mandate that "[r]easonable modifications to the recipient's policies, practices, or procedures for a student because of pregnancy or related conditions … [m]ust be provided on an individualized and voluntary basis …" (Office for Civil

Rights, 2022). The new regulations also clarify that students are entitled to lactation accommodations, as lactation is a pregnancy-related condition.

Employees limited by pregnancy and related conditions are also provided a right to accommodations under Title IX. Just as accommodations must be provided to employees with temporary disabilities, they must be provided to employees with pregnancy-related limitations (Title IX Regulations, 2020). Such employees should be provided with reasonable accommodations, and are entitled to benefits or supports available to those with disabilities.

Title IX coordinators are responsible for ensuring that these adjustments/accommodations are effectively implemented. Particularly relevant for STEMM, such adjustments may be required in any educational setting, including fieldwork, lab and clinical settings, and externships overseen by the institution. Title IX is enforced via internal Title IX compliance procedures, investigation, and sanction by the U.S. Department of Education, and through private lawsuits.

Antidiscrimination Protections

In addition to affirmative rights provided by federal and state laws, family caregivers are also entitled to protection under varied antidiscrimination laws. These laws prohibit educational institutions from treating pregnant people and caregivers worse than others similarly situated, including through harassment or refusing to accommodate.

State and Local Caregiver Antidiscrimination Laws

Over 200 states, cities, and counties have laws that prohibit discrimination on the basis of caregiver status or family responsibilities (Center for WorkLife Law, 2022). The laws vary in

scope, but most prohibit employers from taking adverse employment actions against an employee based on their caregiver status. Some laws cover only parents, or caregivers of immediate family, while others are broader. As of late 2022, six states have these protections for private and public employees: Alaska (protecting parents) (Alaska Stat. Ann §18.80.220); Connecticut (prohibiting inquiries about familial responsibilities) (Conn. Gen. Stat. §46A-60(9)); Delaware (protecting family caregivers, as defined by the FMLA) (19 Del. Code §711 (K)); Maine (prohibiting familial status discrimination and inquires) (5 M.R.S. § 4572); Minnesota (prohibiting discrimination against those living with minors and related inquires)(Minn. Stat. §363A.08); and New York (prohibiting discrimination against parents and those living with children)(N.Y. Exec. Law § 296).

Title VII

Title VII of the Civil Rights Act of 1964 (Title VII) is a federal law that prohibits employers with 15 or more employees from discriminating on the basis of sex, race, color, national origin, and religion (Title VII of the Civil Rights Act of 1964, 1964.) Under this law, it is illegal for employers to take negative employment actions when the action is based on the employee's sex, race, color, national origin, or religion. The law also protects job applicants.

Discrimination against caregivers in not directly prohibited by Title VII, but it often comes in the form of sex discrimination, which is banned by Title VII. This typically occurs when employers take adverse actions against their employees based on stereotypes or unfounded beliefs about how caregivers of a certain sex or gender will act or should act. For example, an employer could violate Title VII by choosing to fire a man who takes time off to care for his ailing parent, based on the belief that men should prioritize work over family care. Similarly, an

employer may violate Title VII by declining to promote or provide opportunities to a mother because of the stereotype that mothers do not want to work long hours or travel. Pregnancy-related bias is also actionable as a form of sex discrimination under Title VII (Pregnancy Discrimination Act of 1978, 1978). This includes institutions failing to accommodate pregnant employees as they would other employees similar in their ability or inability to work (Young v. United Parcel Service, Inc., 2015).

Discrimination against caregivers can also be based on racial discrimination, which is illegal under Title VII. Employers may violate the law by treating some caregivers worse based on their race or making employment decisions based on stereotypes about how a caregiver of a certain race will or ought to behave. For example, it is illegal to allow a white employee to arrive late to work because of childcare issues but discipline a Black employee for doing the same. Of cases brought against employers for family responsibilities discrimination, 8 percent also alleged racial discrimination, and 2 percent alleged national origin discrimination (Calvert, 2016).

Title IX

In addition to providing a right to accommodations and medically necessary, pregnancy-related leave, Title IX prohibits discrimination and harassment on the basis of sex. This includes discrimination based on past, future, or current pregnancy or related conditions, and sex or gender-based bias relating to one's parenting role. To that end, it is illegal to treat workers or students experiencing pregnancy less favorably than others, whether doing so is intentionally malicious or not. It is also illegal to base employment or admission decisions on someone's familial or marital status. Title IX's prohibition of sex discrimination also requires educational

institutions to provide comparable benefits regardless of sex; it would be illegal to provide baby-bonding leave to a student mother, but not a father.

The U.S. Department of Education's draft revised Title IX regulations, expected to be enacted in October 2023, will require training of all employees on Title IX (Office for Civil Rights, 2022). This training must cover the institutional obligation to address sex discrimination, including pregnancy or parental status discrimination, and will outline staff members' obligations to report and respond to discriminatory behavior or policies. Those staff members responsible for responding to discrimination complaints must also be identified and trained on how to fairly adjudicate discrimination concerns (Office for Civil Rights, 2022).

Americans with Disabilities Act

The Americans with Disabilities Act prohibits discrimination based on disability for all employers with 15 or more employees (Americans with Disabilities Act, 1990). Caregivers may be entitled to accommodation and antidiscrimination protection for their own disabilities, particularly pregnant students or employees experiencing complications. Notably, the ADA also prohibits "associational" discrimination, which is discrimination based on an employee's affiliation or relationship with a person with a disability, whether an immediate family member or not. For example, an employer may break this law after rescinding a job offer to an employee on learning their child has a disability, based on the belief they will be less available and committed to the job. Or an employer may violate the law by refusing to allow an employee to take time off to care for a disabled relative, while allowing other employees to take time off for other reasons. The ADA also prohibits harassment based on an employee's association with a person with a disability.

INSTITUTIONAL PRACTICES TO IMPROVE STUDENT AND TRAINEE

RECRUITMENT AND RETENTION

Introduction

Caregivers make up a substantial portion of the student and trainee population. More than 1 in 5, or approximately 22 percent of, undergraduate students are parents, as are 1 in 3 graduate students (Institute for Women's Policy Research, 2019). Of millions of students who are parenting, roughly 70 percent are mothers. These data also reveal that student parents are disproportionately from groups historically underrepresented in STEMM; 51 percent of undergraduate student parents are students of color, and 40 percent of Black women, 36 percent of American Indian women, and 26 percent of Latinas enrolled in undergraduate college are mothers. Students with dependents other than children made up 4.7 percent of the undergraduate population and 6.6 percent of the graduate student population in 2016 (Lee, 2023). And, more than 7 percent of medical students graduate with at least one non-spouse dependent, "the majority of whom are likely children" (Durfey et al., 2021).

The persistent lack of gender and racial diversity in STEM education and employment may reflect the underrepresentation of caregivers and mothers in particular. Of undergraduates in STEMM fields, 13.5 percent are parents, compared with 24.8 percent in non-STEMM fields (Lee, 2023). Women in STEMM are roughly half as likely to be mothers than those in non-STEM fields (14 percent v. 31 percent). These data vary by race, but further analysis with a race lens is needed.

Despite the correlation between students' parenting status, gender, and these other demographics to student field of study, educational institutions typically overlook the impact of

parenthood on these groups' educational opportunities, and more research is needed. Robust literature on the *struggles* of student parents exists'; however, there is only limited testing of interventions to promote their persistence and success in higher education.

Improving Data Collection

Limited data is available on the number of caregiving students in higher education, and even less data is available describing their prevalence and path to degree progress in STEMM. Without more nuanced data on this population, it is challenging for educational institutions and policymakers to be successful in "targeting supports and services, understanding student outcomes, and measuring what works to promote student parent enrollment, persistence, and completion" (Durfey et al., 2021). Collecting data on the experiences of student parents is critical to designing policies and practices that will support college enrollment, persistence, and completion; awareness of parenting students supports campuses in meeting their needs (Gault et al., 2020; Huerta et al., 2022; Sick et al., 2023).

Despite the importance of collecting data on student caregivers, state and federal data systems "do not adequately record the number of student parents in higher education" (Emrey-Arras, 2019). Currently, the best available source of nationwide data on caregiving students' prevalence and degree progression comes from the National Postsecondary Student Aid Study, which reports data roughly every 4 years (Kofoed, 2017). Further, undocumented students, including those who have Deferred Action for Childhood Arrivals, or DACA, status, are ineligible to apply (*Financial Aid and Undocumented Students*, 2022).

To achieve a more robust and nuanced understanding of the numbers and persistence patterns of student parents, new and existing educational data systems should capture parenting

status as well as other demographic information about parent and child (Gault et al., 2020) Durfey et al., 2021; Sick et al., 2023). This can be achieved through national data collection systems, such as Title IV institutions and the National Student Clearinghouse, and state data collection systems in addition to efforts at the university level (Gault et al., 2020).

Comprehensive data collection practices centered on student parents are already underway in several states. In Illinois, for example, the legislature passed a student parent data collection law in 2021, which requires public postsecondary institutions to collect information on parental status (Student Parent Data Collection Act, 2021). Similarly, in Oregon, legislation enacted in 2021 requires the state's Higher Education Coordinating Commission to draft questions for each institution to ask students annually, alongside other student data (Parental Identification on Institution Forms; Collection of Identification Information by Higher Education Coordinating Commission, 2022). California is expected to begin collecting student parent data with the implementation of its Cradle-to-Career Data System, and efforts are already underway to identify parenting students through the implementation of priority registration for student parents, which became law in 2023 (Priority Enrollment System for Student Parents, 2023). In mid-2023, the Texas legislature passed a law to require public postsecondary institutions to annually report to the state student parents' basic demographic data and academic progress (Protections for Pregnant and Parenting Students, 2023). Three state college systems identified in 2021 also collect some data on parenting college students, in Washington, Georgia, and Wisconsin (Cruse et al., 2021).

Though it is rare to find systematic data collection and reporting even among colleges with more robust supports for student parents, individual institutions are beginning to collect this data (Cruse et al., 2021). As an example, Long Beach City College asks students on admission if

they are student parents—then uses the information to provide wraparound support (Huerta et al., 2022). Monroe Community College in New York is often cited as a best practice example; the college has been collecting data on students' parental status for more than 20 years through an entry survey (DeMario, 2021). Monroe Community College's data has been useful in helping the institution identify student parents, connect them to resources and evaluate the efficacy of their programming (DeMario, 2021; Sick et al., 2023). Additional advocacy efforts are needed to tie these data systems into existing efforts to improve diversity in STEM.

The lack of racial diversity in STEMM fields is well reported; however, more research is needed to specifically address the intersections between racial diversity in the field and caregiving at the student/trainee level. This includes more investigation of how racism and classism intersect to impact mothers' academic and parental experiences (Anaya, 2011; Mutti-Driscoll, 2013). Coronel (2020) agrees that research on student parents fails to capture the experiences of parenting students of color, and recommends that future studies on student parents should target participants from various schools and socioeconomic backgrounds. Finally, researchers have also raised the need for more investigation of the impact of being an international student or postdoc on educational outcomes (Ajayi et al., 2022; Lee et al., 2017). In order for any of this work to be possible, robust demographic and academic progress data on student parents must be collected.

Data collection should not be limited to enrolled students, but should also consider postdoctoral fellows. According to Martinez et al. (2007), out of more than 1,300 postdoc survey respondents in the biological sciences, 33.6 percent of women and 44 percent of men responded that they were married with children (the population of postdoc single parents was too small to be significant). Many parenting postdocs report leaving labs as a result of discrimination or lack

of support, yet it is likely that funders and host institutions are unaware of this attrition (Lee et al., 2017). They suggest funders and institutions collect postdocs' gender, race, parental status, and time in position through regular reporting and periodic assessments of the demographic data to identify trends in diversity and attrition.

Until nationwide standards for collecting student parent data are set, researchers urge states and institutions to strive to adopt consistent definitions of being a parenting student (Sick et al., 2023). Across efforts to count the number of student parents in higher education, Sick et al. uncovered at least 19 different definitions used to determine whether someone is a student parent, with no practices consistent across the majority of definitions. This lack of consistency is a further barrier to understanding the trends in student parents' educational success. Best practice is to offer a definition that does not depend on cohabitation or the amount of time a student spends providing care, is not limited to providing care for minor children, and includes the varied forms of relationships that may lead to parenting (e.g., stepparents, guardians). In addition to their preferred definition, these researchers provide a simple question for use in surveying students: "Are you parenting a child?" (Sick et al., 2023).

Finally, few studies address the prevalence and path to degree completion of student caregivers who are not parents (Mackie et al., 2022). Free Application for Federal Student Aid (FAFSA) data indicate that this is a small part of the student population; however, the FAFSA question regarding dependency status is linked to tax definitions and does not encompass nonmonetary forms of providing support. In a nationally representative sample of almost 1,400 people, 11 percent of family caregivers were also college students (National Alliance for Caregiving and AARP, 2020). This indicates existing estimates of the number of student caregivers may be undercounts. Until the caregiving responsibilities of parenting and caregiver

students are acknowledged and addressed, efforts to improve the recruitment and retention of parenting students in higher education will fall short.

Preventing and Addressing Bias, Generally

Many student and trainee parents report that the culture and climate of academia is not conducive to parenting or caregiving generally. There are widespread findings that the family life of students is often unacknowledged or even frowned upon ((Lynch, 2008; Serrano, 2008; Springer et al., 2009). In addition to a culture that is not inclusive of student caregivers, many experience outright bias, particularly mothers and pregnant people, whose status is more likely to be readily evident (Reuter, 2005). Compounding the issue is that while Title IX has banned discrimination on the basis of pregnancy since the 1970s, those protections had been largely ignored until recent years ((Mason and Younger, 2014). In response to this need, most interventions focus on creating structural change, such as by enabling caregiving students to access the leave and accommodations they need. Key to ensuring these efforts actually prevent bias is promoting communication, training and accountability systems.

One foundational strategy for reducing bias against parenting students and trainees is to educate campus communities of the legal protections already available, and to operationalize legal principles in local policies (Anderson and Green, 2022; Reuter, 2005; *Title IX Communications Guide*, 2022). Mason and Younger (2014) report that "inadequate compliance programs, coupled with minimal dissemination of the statute, have prevented students from advocating for themselves because most do not know they are protected under Title IX." Institutions may need to conduct an assessment and revise their policies to include all relevant antidiscrimination protections (Mason and Younger, 2014; The Pregnant Scholar Initiative,

2022). NASA's toolkit on Title IX provides a useful example of campus assessments to this end (*Title IX & STEM: Promising Practices for Science, Technology, Engineering & Mathematics*, 2009).

Across interventions, a core component is policy dissemination through multiple and effective communication materials and trainings. As an example, California's education code requires postsecondary institutions to have a written policy on parental accommodations, leave, and nondiscrimination and to share the policy with graduate students at orientation, to include it in faculty training, and to make it available on their website (Prevention of Pregnancy Discrimination against Graduate Students, 2015). Beyond legal requirements, information about family-friendly services should be shared widely with staff and students; colleges can use a "parent friendly" campus map (Springer et al., 2009), create a web page specific to student caregivers (Robertson et al., 2013; *Title IX Communications Guide*, 2022), add orientation sessions specific to resource navigation for caregivers (Crumb, 2021), and utilize social media and syllabus statements (*Title IX Communications Guide*, 2022). A link to a student caregiver web page should be provided to all accepted students directly from the admissions office, asking student parents to register to receive resources and future updates (Robertson et al., 2013).

By sharing family-responsive policies and related materials in settings accessible to caregiving students *and* others, postsecondary institutions provide resources to those who need them, while also normalizing such supports to the population at large (Lynch, 2008; Springer et al., 2009). To further normalize caregiving, training on policies and resources should be coupled with education on the importance of work-life balance, the value of parenting, and the barriers faced by parenting students (Lynch, 2008; Mason et al., 2007; Springer et al., 2009).

Finally, bias against unpaid caregivers cannot be addressed without accounting for the multifaceted experiences of caregivers across their varied identities including race, national origin, class, sexual orientation, gender, and ability. Despite the high proportion of students who are women and/or people of color acting as caregivers, literature focused on diversifying STEM and retaining students with marginalized identities typically does not contain insights specific to student parents or other student caregivers (see, e.g., Allen-Ramdial and Campbell, 2014; Briggs, 2016; Hill et al., 2010; NASEM, 2020; Tsui, 2007). This is notable considering the intersecting oppressions they often face (Manze et al., 2022). Student parents may need any combination of the interventions outlined in this report *in addition* to interventions targeted to prevent and respond to bias based on race, gender, and other identities. As this evidence on preventing intersectional forms of caregiver bias in STEMM develops, best practice is to center student parent voices and learn from their experiences at the institutional level (Brown and Nichols, 2013; Theisen et al., 2018).

Leaves of Absence

Student Caregiver Leave

Taking leave and returning from it are key transition points where student caregivers may be unnecessarily delayed in their studies or pushed out of their field altogether. Students with children are more likely than those without children to have taken time off from school, and African American students are more likely than white students to have done so (Hess et al., 2014). As such, creating pathways for continued enrollment, or facilitating an easy return, are essential to protecting student caregivers' academic progress. Educational institutions are also legally required to provide leave, when medically necessary, for pregnant and postpartum

students and nonemployee trainees (such as postdocs) (Title IX Regulations, 2020). Despite this legal obligation, many institutions fail to offer leave in a formal policy.

The majority of literature focused on caregiving leave focuses on parental leave for graduate and medical students—more is needed on the unique challenges faced by undergraduates and caregivers for adults at all levels of education. National data on the prevalence of parental and family leave policies at the undergraduate level could not be identified. More research is needed to document the prevalence of these policies and explore the efficacy of undergraduate leave practices. Undergraduate institutions often do not have a continuous registration policy, and therefore may expect students to simply fail to register when leave is needed. While providing leave options specific to caregiving remains a relevant best practice, maternity leaves are commonly addressed under standard medical withdrawal policies.

Leave for graduate students has been more thoroughly addressed through policy. In 2014, California adopted a law requiring graduate schools within the state to provide leave to birthing parents for at least 12 months, and to adjust time to degree and qualifying exam deadlines by 12 months as well (Prevention of Pregnancy Discrimination against Graduate Students, 2015). This law also provided 1 month of leave and extensions for non-birthing parents. (Note: the significant gap between time provided to the birthing and non-birthing parent may violate other antidiscrimination law, as the time granted to birthing students exceeds the period of time reasonable to address the physiological demands of childbearing.) The efficacy of this statute has not been investigated in the literature.

According to Mason et al. (2007), only 26 percent of universities in the United States had graduate student maternity leave policies in 2007. This number has likely increased; however, while many graduate institutions have leave policies available in their handbooks and posted

online, we did not identify more recent nationwide data on the prevalence of graduate school parental leave. Most graduate programs do not meet the best practice of offering paid maternity leave (Mahabir et al., 2023). Paid leave for graduate students helps prevent financial barriers for graduate student parents' educational attainment and makes leave feasible (Springer et al., 2009). Multiple studies noted that a federal paid maternity leave policy would benefit many students (Yalango, 2019; Benish, 2018). Until federal action is taken, institutions can opt into state paid leave programs for their student employees to save costs.

Family leave policies tailored to the unique needs of undergraduate medical education are more well reported in the literature. In 2019, Kraus et al. reviewed websites of 199 M.D.- and D.O.-granting medical schools for policies relating to pregnancy, birth, and family, finding that 33 percent had some form of parental leave policy available. This represented 25 percent of M.D.-granting institutions (Kraus et al., 2021). Roselin et al. reviewed the websites of 59 highly ranked allopathic medical schools for family and parental leave policies, and confirmed them with institutional staff. Of the schools reviewed, 46 percent had leave policies with any mention of parental needs, and only 18 percent had policies the institutions referred to as parental or family leave policies (Roselin et al., 2022).

Policies and Practices that Facilitate Leave Access for Students

Adopting a formal policy for parental or caregiving leave with clear standards is a mechanism by which institutions can make their policies easier for students to access, and for faculty and administrators to manage correctly (Bye et al., 2017; Daskalska et al., 2022; Kraus et al., 2021; Roselin et al., 2022). In contrast, many institutions declare that they will provide leave

on an individualized, ad-hoc basis, a practice that can result in varied outcomes, including bias or other illegal practices (Roselin et al., 2022).

Formalizing parental leave practices also benefits the student and institution more broadly by norm setting. By actively communicating that parental or caregiving leave is normal and supported, institutions may allay students' fears and set the standard the inclusion is expected (Roselin et al., 2022). Having a policy around leave also makes students more likely to engage in conversation about the leave (Daskalska et al., 2022). Undergraduate medical education (UME) students want information regarding how to arrange for maternity or parental leave and how that is to be communicated (De Haan, 2022; Durfey et al., 2021). Nevertheless, a 2021 survey of 33 medical school websites found that only 45 percent provided information about how to arrange for maternity/parental leave, and only 27 percent indicated the amount of leave a student could take while still graduating with their class (De Haan, 2022).

Including all parents and caregivers is also an important step with myriad positive impacts both in the lives of the students and on the broader community. The majority of UME parental leave policies included parents of all genders (Kraus et al., 2021; Roselin et al., 2022); however, 35 percent of the policies identified by Kraus mentioned only mothers, and just 5 percent included adoptive parents. Best-practice policies are gender inclusive and not heteronormative, for example, referring to "parents" rather than "mothers and fathers" (Kraus et al., 2021; Roselin et al., 2022). Of note, Roselin et al. stress that when only birthing parents are allowed to take leave, the policies "may be derided as 'special treatment for women,'" presumably limiting their usefulness as an intervention in support of gender equity. Finally,

federal law requires that leave or accommodations made for childrearing be provided to all students equally without regard to sex or gender (Title IX Regulations, 2020).

Similarly, while many leave policies support parents, both biological and adoptive, family caregivers in other contexts are rarely included or mentioned explicitly. The assumption, then, is that family caregivers would be expected to reach out to student services, where their request for leave would be reviewed on a case-by-case basis. The lack of policies specific to caregivers other than parents is reflected in the lack of literature examining student caregiving experiences and needs for support.

Leave policies should be transparently administered and the implications of using them made clear. Best practice is for leave to be provided as an entitlement, rather than establishing onerous application requirements (Roselin et al., 2022). At minimum, leave should be provided in accordance with a published policy, with clear application instructions. Medical students (and presumably others as well) stress that it is critical they be given the relevant information to understand how to access leave and the impact of taking a leave of absence on their graduation date (Bye et al., 2017; Daskalska et al., 2022; Kraus et al., 2021). Of medical schools with a policy in 2019, 32 percent offered an option allowing the student to maintain their graduation date (Kraus et al., 2021).

One approach used to allow students to maintain their graduation date is to **allow students to maintain their enrolled registration status.** All of institutions identified by Roselin et al. as having parental leave policies provided some option for students to reduce or eliminate their workload, while remaining registered. Kraus et al. (2021) found 32 percent offered an option allowing the student to maintain their graduation date. This may be classified as a form of

leave, or as an accommodation, depending on the institution. Similar recommendations have been made as they relate to postdoctoral fellows, with others suggesting more competency-based training requirements (Kaseda et al., 2023).

Institutions should make length of leave clear, ideally at least 12 weeks (Daskalska et al., 2022). They note that lengthier leave terms can make it challenging for student parents to graduate on time and recommend institutions start with a 6-week leave policy with additional coursework accommodations. While this is not ideal, it represents a mid-way between an undefined term of leave and a more difficult to manage, guaranteed 12 weeks of leave. Recall that any leave policy must allow leave as long as medically necessary under Title IX. As such, maternity leaves often require flexibility; in that context, it is important to have formal leave policies with a set leave term, and after this structure has been set, policies can allow for flexibility to meet the needs of varied circumstances (Daskalska et al., 2022).

Provide accommodations to reduce the length of leave needed. Leave does not operate in isolation; rather, the demand for leave reflects and interacts with other supports available to student parents. Of 550 community college student mothers surveyed, 41 percent indicated needing leave for caregiving generally, 38 percent for pregnancy, 24 percent for childcare, and 22 percent for addressing the needs of a sick child (Hess et al., 2014). Each of these driving factors can be addressed by other interventions herein. For example, providing pregnancy accommodations or addressing restrictive absence policies may limit the need for students to take a lengthy leave.

Offering alternatives to leave is a necessary best practice, particularly as taking leave can come with heavy costs for students and postdoctoral trainees. Students taking leave experience

financial costs through accrued student loans and delayed earnings as well as challenges while on leave caused by losing access to health benefits, financial aid, and other benefits of enrollment (Kraus et al., 2021; Roselin et al., 2022). Roselin et al. (2022) found that several undergraduate medical programs ensured their students retained access to campus supports by providing an "enrolled academic adjustment" option that allowed their students to reduce their academic duties while preserving their student status. Such policies are likely preferable for those students who do not want to take a lengthy leave and are discussed further in the "Family-Responsive Academic Adjustments" section.

Ensure reinstatement for all students who use leave of absence policies. It is easy to assume that students utilizing an institutional leave policy will be allowed to return following their time away, but institutional policies do not make that clear. In fact, one study of UME leave of absence policies found that 43 percent of general leave policies required approval for the student to return from leave, often without specifying the standards applied to the reinstatement request (Roselin et al., 2022). Recall that returning students to the status they held prior to taking maternity leave is a requirement under federal law. Failing to permit readmission may invite legal liability (Frankola v. La. State Univ. Sch. Of Med., 2017).

Communicate leave offerings widely. The University of North Carolina School of Medicine engaged in an interactive process with students to develop a parental leave policy (Gaghan and Parker, 2022). The policy was communicated online, through class meetings and orientation, and in faculty trainings. This multipronged approach makes it easier for students to access their rights. Moreover, others in the field recommend as a positive first step ensuring websites and student handbooks include these policies.

Establish accountability systems. Institutional Title IX coordinators are responsible for ensuring students can take time away from their studies when needed for pregnancy and related conditions. Best practice leave and attendance policies will advertise this point of contact and related grievance procedures, which also reduces institutional risk of liability.

Provide funding for student and trainee leave. Daskalska et al. (2022) note that a good precedent for students is the Kirschstein National Research Service Award (Kirschstein-NRSA) training grant fellowship, which allows up to 8 weeks paid parental leave per year for trainees and fellows. They recommend that other National Institutes of Health (NIH) institutes and funding agencies should implement similar policies to support student parents in STEMM.

Resident Physician Leave

The provision of maternity and parental leave is a critical support for caregivers in medicine. Residents are legally considered employees and may therefore be eligible for protections of the FMLA and state/local family leave laws, unlike many other trainees and students addressed in this section. However, medical residents face unique barriers to being able to take leave and require tailored solutions.

The American Board of Medical Specialties (ABMS) has recently enacted a policy to require all member boards with training programs of at least 2 years to allow a minimum of 6 weeks of time-off training for parental and caregiver leave, without exhausting other forms of time off (e.g., vacation and sick leave) and without extending training (*ABMS Parental Caregiver and Medical Leave During Training Policy*, 2021). The new standard addresses the longstanding problem of institutional leave policies being inaccessible or inequitable in practice; the need to extend training to take leave can begin a cascade wherein "a brief extension of

training at one stage may lead to a longer interruption for progress toward more advanced training" (Jagsi et al., 2007). Institutions under this policy must indicate when taking time away from training will require extending the trainee's program end date. In a survey of resident mothers in more than 78 programs, the most common determinant of the length of maternity leave was the residents' desire to avoid extending residency (Stack et al., 2019), meaning the ABMS policy is well suited to improve the ability of birthing residents to take necessary leave and begin their careers on schedule. The ABMS policy further supports the continued education of residents who take leave by encouraging the scheduling of subspeciality fellowships after July to allow those who must extend their training to have access to the fellowships. Critically, the policy requires the collection of data on usage of these policies, a useful tool for assessing the efficacy and usage of the policy.

A policy enacted by the Accreditation Council for Graduate Medical Education (ACGME) now requires all accredited programs to offer 6 weeks of *paid* leave to residents and fellows for parental and caregiving leave. While this policy went into effect in 2022, the council began enforcing the mandate in July 2023. This policy allows medical residents to be able to afford the leave that they need (Ortiz Worthington et al., 2023), reducing gender disparities in the process; men are less likely to take leave when it is unpaid (Halverson, 2003).

Offering at least 6 weeks of paid leave is a best practice; however, institutions that *only* offer 6 weeks of parental or caregiving leave may be violating federal law despite following the standards set by the ACGME. Institutions are required to provide job-protected leave beyond that time, as the FMLA requirement to provide up to 12 weeks of job-protected leave applies to residents (who are now considered employees under employment law) so long as they meet length of service eligibility standards. Similarly, when a birthing resident needs a leave of

absence longer than 6 weeks due to medical necessity, they are entitled to longer leave under Title IX and potentially the Pregnant Workers Fairness Act as well.

A late 2021 study found that all of the 23 medical specialty board overseeing training programs of at least 2 years had leave policies, as required by the ABMS (Magudia et al., 2021). One policy did not set a time limit, while another only provided a minimum leave length requirement. Across all boards, the mean annualized leave permitted was 7.5 weeks—an increase from 5.2 weeks in 2018. Some subspecialities offer their own more expansive guidance for their residency programs. Notably, the American Academy of Family Physicians (AAFP) (Parental Leave During Residency Training, 2022) and the American Board of Family Medicine (ABFM) (*ABFM Time Away from Residency,* 2023) require 12 weeks of paid parental leave. The American Board of Urology takes a different approach of allowing trainees to average their clinical training over the first 3 years (138 weeks required) and last 2 years (92 weeks required) (*American Board of Urology Policies*, 2022). This approach, if implemented equitably at the institutional level, may allow trainees flexibility in managing caregiving needs beyond a set 6-week leave term. Note that these policies only govern board eligibility at the end of training; individual sponsoring institutions may impose different policies.

Facilitating Leave Access: Resident Physicians

It is likely that the existence of many layers of policies—federal and state statutes, accreditation and specialty board policies, institutional policies, and individual program directors' policies—will serve as a point of confusion and contention among trainee physicians looking to understand and exercise their rights to caregiving leave. To that end, it is particularly important for institutional policies to clearly address parental and caregiving leave offerings in a manner responsive to the various requirements and unique needs of their program.

As these leave policies are implemented and improved at the national level, sponsoring institutions must fill the gaps and best practice is to do so via polices at the institutional level, rather than program or departmental level (Weinstein et al., 2019). This approach ensures parity across programs, regardless of their individual resources. Institutional-level approaches also minimize confusion for those who will use the policy and allow institutions to centralize human resources activities. When considering these policies, institutions should provide as much specificity as possible regarding what taking a leave would look like in terms of makeup work and schedule adjustments.

Advocates for medical residents and fellows have also encouraged institutions to consider the full range of caregiver-responsive supports when implementing their new leave policies. In the intensive clinical training setting, these supports are crucial. For example, facilitating access to childcare and lactation breaks are important policy steps for institutions to adopt (Weinstein et al., 2019). Each of these supports carries long-term benefits, but the immediate benefit is enabling postpartum trainees to return to their studies.

The AAFP encourages programs to consider "home-study or reading electives" to minimize the time residents need to take off, a practice supported by many as medical training programs shift to be competency based, rather than requiring set terms (Parental Leave During Residency Training, 2022; Weinstein et al., 2019). Part-time options may be useful for medical trainees as well. For example, Weinstein et al. have called for the initiation of part-time GME (graduate medical education) tracks, which could allow trainee physician caregivers to continue their education and meet their family needs.

Effective strategies employ advanced planning for resident physician caregivers to be absent without requiring their peers to make up the work. Programs can do so by including

deliberate redundancy in staffing plans, or funding coverage by external staff (Weinstein et al., 2019). Unfortunately, the AAFP does expect the resident to make up call before or after the leave "so other residents aren't disadvantaged" (Parental Leave During Residency Training, 2022). While this is likely a best practice for reducing peer-on-peer bias against caregivers, it does raise issues of equity for the birthing parent, who must complete additional call during pregnancy or early child-rearing days. Prior research reported this phenomenon in resident mothers, forcing recovering postpartum residents to return from their relatively brief leaves into an atypically demanding schedule (Stack et al., 2019). This practice may violate federal law when the physician is covered by the FMLA (Gulati et al., 2022).

Finally, while most of the literature on residents' parental leave is related to women, men also face challenges using leave policies (Castillo-Angeles et al., 2022). Castillo-Angeles et al. studied the needs and challenges faced by 15 expectant non-childbearing surgical residents across four institutions finding that male residents felt more stigmatized in taking leave compared with their female colleagues. Male residents also reported little mentorship on effective management of work-life integration. Paternity leave policies were often vague or even nonexistent. This may shift as new parental leave policies for residents—which must allow leave for all parents—are enacted in response to the ABMS and ACGME policies. Future research data collected under the new policies should explore the prevalence and experiences of fathers taking caregiving leave.

Family-Responsive Academic Adjustments

Parenting and caregiving students who desire to take less leave, or who need ongoing changes to be able to stay enrolled while meeting their educational goals may benefit from

family-responsive academic adjustments. These adjustments are often referred to as "accommodations" particularly where they are used to meet the health needs of a pregnant or postpartum student. In the case of students who are pregnant or experiencing pregnancy-related conditions, reasonable accommodations must be provided under Title IX.

Reducing course load is an example of a common academic adjustment for caregiving students. For example, Springer et al. (2009) suggests more graduate programs allow their students to study part-time. This option could look like extending a student's time to degree, and prorating their stipend to match their reduced workload (Springer et al., 2009). At the undergraduate level, student parents often attend class part-time in order to meet the demands of caregiving and work, especially while enrolled at community college (Huerta et al., 2022).

Students who are experiencing pregnancy complications often seek accommodations to allow them to participate virtually. Providing additional virtual courses or allowing access to virtual courses as a program may ease students' time burdens. Early research on course modality reached mixed conclusions. One study of undergraduate caregivers found that students enrolled in virtual coursework were more likely to face challenges in persistence overall due to being time poor—but were also more likely to successfully complete their online courses (Wladis et al., 2023). The ability to take online courses may help mediate some of the challenges faced by student caregivers who face extraordinary time demands. The potential downsides of virtual education should be weighed in light of the risks of having *no* available course option (for caregiving students and pregnant students unable to participate in person).

Even without experiencing complications, students in the STEMM fields may require accommodations to protect the health of their pregnancy. Many educational institutions have offices that will assist employees with understanding potential exposure risks and procuring

personal protective equipment. Similar programs for students are not well known, and students have reported difficulty accessing the safety information and accommodations they need. At minimum, educational institutions should provide a point of contact responsible for ensuring pregnant students have the health and safety equipment and information they need.

Lactation accommodations are an essential component of supporting postpartum students. The new Title IX regulations expected to be enacted by the Department of Education in late 2023 include a clear requirement for educational institutions to provide their students with a clean, private, non-bathroom lactation space and the time to use it. To avoid negative impacts on a student's education caused by missing class, universities should strive to place lactation rooms in areas readily accessible to the students who need them. For example, one university in Washington found that most student lactation space users surveyed reported a walk of roughly 5 minutes to reach their closest space (Sturtevant et al., 2021). Longer distances are often untenable, particularly for students who need to leave class or clinicals to pump. Because students often struggle to arrange class schedules around their lactation breaks, supportive institutions often have a lactation policy making clear to faculty that these students should be excused without penalty (Clark and Lucero-Nguyen, 2021; *Model Campus Lactation Policy for Students*, 2020).

Currently, lactation policies covering nonemployee students are rare, with one study of more than a hundred institutions reporting a prevalence of just 3.6 percent (Bostick et al., 2016). Institutions that already provide lactation space and breaks for students often do so through a lactation support program (Clark and Lucero-Nguyen, 2021). Students register for the program and receive information on lactation supports and connections with other lactating students, as social support facilitates students meeting their lactation goals (Ryan et al., 2021). Additionally,

these programs often serve as a first point of contact for students who have challenges accessing space when and where they need it.

Student parents and caregivers for adults often need to miss class due to having a family member who is ill. Anecdotal evidence is that most institutions do not have formalized polices for allowing these students to attend to family needs, even in the most urgent situations, such as a hospitalized child. Typically, attendance policies are managed at the level of individual faculty. More research is needed on the provision of sick child/care-recipient leave for students, and how to best craft such policies in light of faculty resistance.

Institutions should consider improvements to their advising and registration systems so that caregiving students have assistance selecting and accessing the courses they need. A major barrier for undergraduate student parents is being able to access courses at a time that allows them to meet their care and work demands (Contreras-Mendez and Cruse, 2021). To address this need, experts have suggested providing evening courses and accelerated programs. The ability to access courses online may also help ameliorate this challenge for some students.

STEMM-interested student parents would also benefit from having a STEMM-centered advisor to more carefully inform them of the steps needed to pursue their degree and how to manage stackable credits (Costello, 2012). Carefully constructed advising systems can implement "early warning" procedures to flag students who are not on track.

To aid student parents who struggle with time poverty, in 2023, the state of California enacted a law to provide priority registration to student parents (Priority Enrollment System for Student Parents, 2023). As a result, students who care for children under 18 will be able to register for classes alongside other special populations (e.g., military members, disabled students). Texas also recently enacted a priority registration requirement for public

postsecondary institutions in the state that have an early registration option, beginning September 2023 (Early Registration for Parenting Students, 2023). These states did not previously track the number of student parents or their persistence; data is expected as early as 2024.

Mentorship and Community Building

Community building is critical to cultivating a sense of belonging and success for student caregivers in STEMM; mentorship, affinity groups, and student parent clubs are common ways to build community on campus. According to a 2020 report from the National Academies of Sciences, Engineering, and Medicine, universities should take a more intentional and inclusive approach to mentoring students in STEMM, as mentoring has a positive effect on academic achievement (NASEM, 2020). Such mentoring interventions are effective because they challenge stereotypes about what STEMM is and who can be successful in the field. This is an important reframe for caregiving students who often report feeling isolated (Ajayi et al., 2022; Hotez et al., 2020).

Mentorship for women of color in particular is critical, as "underrepresented students in STEMM are less likely than well-represented students to receive formal mentoring" NASEM, 2020); this is notable as student caregivers are more likely to be women of color and to be underrepresented in STEMM. While underrepresented students prefer to have a mentor with a similar background to their own, and while research does support a race and gender mentor match, it has also been shown that "shared beliefs, values, and interests" is a better indicator of mentor-mentee relationship quality and that culturally responsive mentoring should be used by all mentors (NASEM, 2020). This may have valuable implications for mentorship of student caregivers, though the research on caregiver mentorship and peer support is limited. It is

important for future research to consider not only race and gender when assessing STEMM mentorship programs but also family caregiving status.

Springer et al. (2009) also report the critical nature of mentoring and faculty support for graduate student success; however, these supports are disproportionately lacking for mothers. Mentorship opportunities can be improved through department chair and faculty training, family-life discussion in first-year seminars, and job market workshops for parents (Springer et al., 2009). Such mentorship opportunities can ease the transition to parenthood and allow students the opportunity to "ask confidential questions to a third party without fear of repercussions" and facilitate access to supportive resources (Mahabir et al., 2023).

In a study of 12 student mothers in a non-STEMM field, several participants agreed that their mentoring experiences helped them succeed educationally and balance conflicting roles (Kent et al., 2020). They reported the following criteria for choosing mentors: "specific personality traits, women who were also mothers, who shared research interests, and those who modeled career-life balance;" three African American women participants also considered race an essential factor. Notably, mentors were responsive to the caregiving responsibilities of the participants; they were available to meet after-hours (e.g., after children went to bed), and they were willing to meet at convenient locations, such as a coffee shop or at home (Kent et al., 2020). The authors recommend departments develop mentoring programs, pairing senior professor mentors with junior professors to teach mentoring skills; rewarding faculty for outstanding mentorship; establishing peer and alumni mentoring programs; intentionally connecting student and faculty mothers; promoting family support groups and family-inclusive activities; and providing flexibility around scheduling educational opportunities.

In a study of community college student mothers who participated in a pre-transfer mentoring initiative designed for student parents, the program reported improvements of students' sense of belonging and positive outlook on their educational goals (Lai, 2019). While this program, like most mentoring programs, did not reduce bias in the institution, participants reported that they felt supported by the mentoring program, improving student resiliency in the face of bias. Finally, some participants described how the mentoring program inspired them to advocate for resources and increase awareness for student parents at their campus (Lai, 2019).

While women may have less opportunities for mentorship in STEMM, men have less mentorship that specifically addresses their caregiving. Male residents often have little mentorship focused on effective work-life balance (Castillo-Angeles et al., 2022). This finding is supported by the lack of gender-inclusive mentorship at all levels of education in the literature reviewed. In the absence of direct mentorship for men on this issue, affinity groups and clubs for caregivers can offer an important support through safe spaces for students and trainees to interact and find a sense of belonging (Anderson and Green, 2022; Crumb, 2021).

One simple approach to build community is to support student caregiver study groups (Lovell and Scott, 2020). The most effective small study groups were organized at the college during the day, while nighttime groups were not well attended, as student-parents reported nighttime activities disrupted their caregiving routines (Lovell and Scott, 2020). Web spaces, listservs, and even bulletin boards for student parents have also been found useful (Springer et al., 2009).

Addressing Caregivers' Basic Needs

The low pay and long training periods across STEMM programs mean student caregivers "may face extreme financial hardship as they attempt to start a family while simultaneously continuing their training" (NASEM, 2020). Addressing student caregivers' basic needs is critical to supporting their educational success; access to stable sources of income, housing, childcare, food, mental health support, and health insurance impacts their ability to enroll, persist, and graduate from higher education (Goldrick-Rab et al., 2020; Mackie et al., 2022). While basic needs insecurity is common among college students, the rates are especially high among parenting students. In a 2019 survey, the Hope Center for College, Community, and Justice found that of 23,000 parenting students, 53 percent were food insecure in the last 30 days, and in the previous year, 68 percent had been housing insecure, and 17 percent had been homeless (Goldrick-Rab et al., 2020). These inequities were only further exacerbated by the COVID-19 pandemic (White and Cruse, 2021).

Programs to support the basic needs of students and trainees are becoming more prevalent as universities and colleges grapple with their students' growing economic precarity. Yet few interventions in the literature are STEMM specific. STEMM programs may want to consider communicating supports that are already available to their student populations, or pooling resources to specifically ensure that students/trainees in STEMM fields and STEMM-interested students have the support they need. Further, while the need for basic needs supports is prevalent across academia, the absence of these student caregivers is likely to be more acutely felt in departments with low diversity.

Centralizing supports and providing resource navigation is a key best practice for ensuring caregiving students are aware of and can most efficiently access basic needs

programming. Across the literature, researchers found that centralizing basic needs resources on college campuses ensured caregivers felt supported and improved academic success; these resources are often housed in "student parent resource centers" and provide information on childcare, grants, family housing, student and dependent insurance, and more (Coronel, 2020; Goldrick-Rab et al., 2020; Mason et al., 2007; Mason, 2022; Springer et al., 2009). Creating a university position specific to supporting student parents and their families is another promising practice (Robertson et al., 2013).

Holistic support for parenting students including addressing their basic needs, was critical in ensuring their success (Contreras-Mendez and Cruse, 2021). For example, in a case study from a large mid-Atlantic university during the 2009–2010 school year, Brown and Nichols (2013) found that a campuswide movement had been initiated to collect a small student fee for resources for caregiving students. The fees collected created a subsidy for childcare, a dormitory for families, and lactation rooms on campus resulting in a 93 percent retention rate for pregnant and parenting students (Brown and Nichols, 2013).

For those students and trainees who are also employed or receiving stipends from the educational institution, a first step at addressing basic needs insecurity is obvious but challenging: ensure adequate pay. As addressed in the National Academies' 2020 report on addressing the underrepresentation of women in STEM, it is a best practice to offer students, trainees, and employees a livable wage, commensurate with the training STEMM professionals have received, and to not defer contributions to retirement plans for postdocs.

Most of the literature supporting student caregivers' basic needs focuses on those who are parenting, however these recommendations are likely helpful to some degree in the wider

caregiving population. Additional research is needed to provide insight into which interventions are most useful for students providing care for adults.

Childcare

The majority of student parents in the United States have children who are not yet old enough to attend public school (Cruse et al., 2021). Perhaps unsurprisingly, childcare is a core concern of the population. Research has long shown that access to childcare is a key component of student parents' continued enrollment and success in higher education (Contreras-Mendez and Cruse, 2021; Fadale and Winter, 1988; Hess et al., 2014). Further, student parent surveys have indicated that childcare is the *most* significant factor in their academic persistence (Baskerville, 2013; Carey-Fletcher, 2007). Nearly 30 percent of students surveyed for the 2021 Community College Survey of Student Engagement reported that providing care for dependents was likely to cause them to withdraw from school, and student parents regularly cite a lack of childcare as a primary reason for leaving community college without meeting their educational goals (St. Rose and Hill, 2013).

The make-or-break need for childcare experienced by student parents stems in part from the extreme demands on their time, or "time poverty," which makes it challenging for student parents, and single mothers in particular, to devote the necessary time to their academic goals (Conway et al., 2021; Cruse et al., 2018). It also stems from economic poverty; student and trainee parents' low-income levels mean they are often unable to afford high-priced, quality care, and often need to work—which requires even more childcare. Childcare costs have been found to delay postsecondary completion in young parents in Canada, which has costs similar to the United States (van Rhijn et al., 2011). The need for childcare is perhaps most severe at the

community college level, which, despite having the highest needs in terms of economic precarity and numbers of parents, has also seen the most significant drops in provision of childcare in recent years (Cruse et al., 2021). This is especially notable in light of the fact that women are more likely than men to attend community college on their path to earning a bachelor's degree in a STEMM field (St. Rose and Hill, 2013).

Providing on-campus childcare is an important solution, yet the presence of a campus childcare center does not mean that those centers are accessible to the parents who need it most; typically, these centers, which also provide care for the children of faculty, have a limited number of childcare slots for the children of students and waitlists are common (St. Rose and Hill, 2013). A national mixed-methods study of postdoc parents' experiences found that only 29 percent of postdocs reported being eligible for on-campus childcare, and even fewer could actually use it (Lee et al., 2017). Postdoc survey participants noted that campus childcare facilities would not accept young infants, had waitlists longer than their postdoctoral appointment would last, and were unaffordable. Further, postdocs reported that the hours of childcare availability did not match their work schedules, which were longer than those worked by others on campus. To address these needs, the authors recommend offering affordable on-site childcare that is available for postdocs, or at minimum offering back up childcare to cover the postdocs who need additional care during the longer hours often worked by the population (Lee et al., 2017). More recent data from the National Postdoctoral Association's Institutional Policy Report indicate that 40 percent of institutionally funded postdoc trainees had access to on-site childcare in 2019, down from 41 percent in 2016, and that 16 percent were eligible for subsidized child care, a 2 percent increase from 2016 (Ferguson et al., 2021).

While all student parents may benefit from affordable childcare, parents in STEMM fields are more likely to need childcare during hours where typical providers are unavailable. Access to childcare outside of typical working hours ensures these students and postdoc trainees can work the hours necessary to thrive in STEMM and can take advantage of opportunities to be in the lab or clinical setting. Providing childcare (including during evening hours and drop-in hours) is a key recommendation for supporting low-income and student parents in STEM (Costello, 2012). Colleges and universities can address this need by providing backup care, or funding evening childcare for those in STEMM departments.

Myriad public funding sources exist for childcare programs, in addition to private foundation and university funding (Boressoff, 2013). For example, NIH allows for reimbursement of costs incurred for childcare and parental leave for all grant awards, with the exception of the National Research Service Award. Each full-time NRSA fellow can receive up to $2,500 per budget period as a reimbursement for childcare costs (Family-Friendly Initiatives, 2021). The most commonly used source of public funding for campus childcare services is the Child Care Access Means Parents in School Program (CCAMPIS), which provides federal funding for institutions to provide childcare services to low-income students (Edgerton, 2023). The persistence rate of students funded by CCAMPIS (78 percent) is higher than the national average (75.5 percent), which includes high income and childless students (Edgerton, 2023).

STEMM departments may want to consider applying for CCAMPIS funding to enable student parents in their programs to obtain childcare to participate in classes or clinical activities outside of typical hours. As long as the student recipients meet CCAMPIS income eligibility guidelines, they can be funded through the program. (Note that the funding is not available to trainee postdocs.)

Even those colleges that are unable to directly provide campus childcare may be able to bridge the gap for student parents who need the service by offering less expensive supports. For example, educational institutions can affordably connect their students with resources in the community by providing childcare locator and referral services (Cruse et al., 2018). Princeton University provides students with free counseling to understand the university's benefits and how best to utilize them (Millman, 2007). These services can reduce the time burdens on student parents and may result in them accessing the care they need. Additionally, institutions can support student parents by automatically adjusting their financial aid to account for dependent care expenses (Generation Hope, n.d.). Another low-cost but welcome intervention is to provide a dependent care flexible spending account (FSA) for student employees (Mahabir et al., 2023). FSAs allow employees to deduct the cost of dependent care from their pre-tax income; an added benefit of some plans is that the full amount is available from the beginning of the plan year.

One solution to meeting the increasing demand for childcare is pooling resources. Community and technical colleges in Arkansas have coordinated through the Career Pathways Initiative to offer childcare to thousands of student parents (St. Rose and Hill, 2013). The program relies on varied sources of federal funding, including Temporary Assistance for Needy Families (TANF), and the community colleges provide in-kind contributions of space and instructors. In addition to providing on-campus childcare, this program contracts with private vendors, and helps with referrals to community-based care. This program resulted in increased retention and program completion, with only 25 percent of students withdrawing in one semester, compared with 40 percent of students not enrolled in the support program. Notably, the program also provides assistance with educational expenses and guidance and counseling (Bone, 2010).

One major issue for scientific programs is the lack of childcare funding for conferences. The National Science Foundation (NSF) allows use of grant funds to cover temporary dependent care costs to attend their conference; however, the childcare must be arranged by the parent (*Proposal & Award Policies & Procedures Guide*, 2023). Some organizations will set up childcare at their conferences and offer grants to cover part of the cost (Sadanandappa, 2019). However, there needs to be a much bigger response from organizations in order to provide an equitable opportunity for parent researchers (Calisi and a Working Group of Mothers in Science, 2018). More research on the efficacy of this funding for students is welcome.

Family Housing

Housing access is another significant burden on student caregivers and their families, and providing the option of affordable family housing is a critical support (Anderson and Green, 2022; Mason et al., 2007; Serrano, 2008). Researchers recommend offering subsidized rent or providing rent based on a sliding scale (Anderson and Green, 2022; Mason et al., 2007). McCarthy (2021) suggests universities repurpose existing housing into family housing, which may include renovations, and to offer students a variety of different housing configurations, depending on what works best for them and their families. Robertson et al. (2013) recommend building new residence areas within walking areas to campus, and explicitly acknowledge that housing should "support different configurations of [caregiver] families." Beyond rental support, some universities provide home purchasing assistance; according to Millman (2007), Princeton University provides a lower cost mortgage program for their graduate students.

In establishing housing plans, student caregivers should be consulted; goals should include identifying and creating more affordable living options close to the central areas of campus (Anderson and Green, 2022; Robertson et al., 2013). Finally, the Campus Family

Housing Database is a research-based tool that can be used by caregivers and advocates who are looking for colleges and universities with family-friendly housing options (Anderson and Green, 2022). As more universities consider STEMM-focused "residential villages" or "scholar communities" (housing units designed to build supportive communities of students with particular interests), they should consider how to include students who need to live with their families.

Food Security

Food security supports student caregivers; it matters for families' health and ensures caregivers have the physical and mental energy to engage fully (Anderson and Green, 2022). Potential opportunities to support food security for student caregivers include providing food or subsidies, such as grocery gift cards, campus cash, or food pantries stocked with child-friendly food items; coordinating a food distribution program to families in campus family housing; provide space and supplies for community gardens or farms on campus to grow food; and offering a family meal plan for on-campus dining options, or free or reduced-price meals for children (Anderson and Green, 2022).

It is important to note that educational institutions do not need to build food security programs all on their own. Federal and state programs already exist to support food-insecure students, and educational institutions could be the bridge linking student caregivers (and their families) with supports that already exist. For example, the U.S. Department of Agriculture's Supplemental Nutrition Assistant Program (SNAP) reduces food costs for families, which could in turn reduce barriers to education. In 2016, 26 percent of undergraduate students with children participated in SNAP, with higher participation rates for single parents (Payne and Anderson,

2022). Eased requirements for SNAP qualification, as seen during the COVID-19 pandemic, would be useful for student caregivers and may mean even more now have access to the program (Burke, 2023). To build on the foundation this federal program offers, Anderson and Green (2022) suggest colleges could ensure SNAP benefits are accepted across campus, including among SNAP-eligible food vendors and dining services. Institutions could also help students stretch their benefits further, by aiding students in meal planning and budgeting for family food needs with SNAP benefits (Anderson and Green, 2022). The approach of raising awareness of SNAP and assisting students in stretching their food dollars and using a variety of food suppliers is already in use at institutions nationwide, including the CalFresh Healthy Living on College Campuses Project, a program of the California State University, Chico, Center for Healthy Communities, which undertakes SNAP education activities at nine California State University campuses (Campus Successes – Center for Healthy Communities, n.d.). Temporary Assistance for Needy Families could also be an important resource to which institutions could similarly facilitate access. As with SNAP, colleges could ensure that TANF electronic benefit transfer cards are accepted on campus (Anderson and Green, 2022).

Mental Health

Research on student caregivers and mental health is lacking (Ajayi et al., 2022), which is particularly concerning in light of the troubling findings that do exist in the literature indicating high levels of stress regarding balancing employment, classes, and homework while also being a parent (Coronel, 2020). For example, in a study of 200 student parents at Los Angeles Valley College, one-third of student parents reported difficulty managing their own mental health, and 18 percent reported challenges managing their children's mental health; students recommended

mental health supports such as peer support groups, professional counseling, and parenting classes (Mason, 2022). Anderson and Green (2022) offer the following recommendations to address caregivers' mental health: ensure students have access to free and culturally appropriate therapists that offer family counseling support; leverage virtual care; engage social work and psychology graduate students to support caregivers; and connect families to counseling for children, which may be covered by student or public health insurance.

Health Insurance

Access to health insurance keeps caregivers healthy and has been shown to inform student parents' decision-making about their education (Ellis, 2020). To obtain security and stability for student caregiver families—and the educational benefits that follow—health insurance should be made available to both students and their dependents, preferably at a subsidized cost or on a sliding fee scale (Anderson and Green, 2022; Robertson et al., 2013; Springer et al., 2009; Mason et al., 2007). Anderson and Green (2022) recommend family health insurance policies be included in cost-of-attendance calculations. Again, institutions unable to provide best practice benefits on their own can work to raise awareness and facilitate student caregivers' access to state or national resources that provide health-care benefits (Serrano, 2008). For example, California's health insurance program for low-income individuals partners with campus outreach efforts, and it maintains a funding pool to support student outreach and enrollment assistance. In a study of 60 student parents, Galasso and colleagues (2018) found that the majority of participants used Medicaid as their insurance during pregnancy. For that reason, it might be important for medical facilities on college campuses to accept public insurance or create partnerships with local providers that do (Anderson and Green, 2022).

INSTITUTIONAL PRACTICES TO IMPROVE EMPLOYEE RECRUITMENT AND RETENTION

Introduction

Unpaid caregivers represent a sizeable portion of STEMM faculty, with diverse needs based on life stage, career path, and individual characteristics. Data on their prevalence is fragmented, with many studies only addressing a small portion of the overall population. Caregivers are likely abundant; in the workforce as a whole, an estimated 1 in 4 are providing care for adults (Lebnitz and Keafer Morrison, 2015) and 1 in 3 have minor children (*The Status of Women in the States: 2015*, 2015).

Despite this variety of experience, the vast majority of research on academic caregivers has centered upon family formation—most centrally marriage and childbirth—which is the largest contributor to the leaky pipeline of women scientists out of STEMM fields between graduate school and the acquisition of tenure (Goulden et al., 2011) yet has lesser impacts on men (Cardel et al., 2020). It is therefore unsurprising that the literature and interventions largely focus on the needs of women, for whom the tension between reproductive clocks and tenure clocks can be personally and professionally devastating. The literature, and in turn, this section, focuses heavily on the interventions most salient to addressing women's (namely mothers') underrepresentation in STEMM: dual-career recruitment, leave, and accommodations. More research is needed to understand the degree to which the impact of these interventions can be understood to benefit caregivers who are not mothers or even parents.

The research supports a number of key conclusions about how to support faculty caregivers in STEMM. First, formal policies are necessary but not in and of themselves sufficient. Universities and departments need to make significant efforts to communicate policies to faculty, ideally in multiple formats, as part of a robust effort to destigmatize use. Moreover, isolated policies are unlikely to make a difference at the critical level of culture—universities should think holistically about the package of family-friendly benefits they offer and assess use, access, and employee experience on an ongoing basis. Finally, benefits should be sufficient to meet employee needs, applied equally to all faculty, and, to the greatest extent possible—paid to ensure accessibility and equity. Efforts should be taken to ensure that use of benefits like leave, stop-the-clock, and beyond are associated with equal, not worse, career outcomes by attaching them to caregiving status or otherwise being thoughtful about differential gender impacts.

Family-Responsive Recruitment Policies

Caregiver Recruitment

Reforming the recruitment process is a major goal when it comes to improving representation and support for caregivers (who are disproportionately women) in STEMM, a setting in which bias is pervasive (Ibrahim et al., 2017; Philippidis, 2012). Most of the research on this topic pertains to women rather than caregivers more broadly, but the limited research specific to caregivers endorses many of the same interventions.

First, diverse search committee makeup can improve the ability of institutions to recruit diverse talent. When search committees are chaired by women or people of color, who are more likely to be family caregivers, applicant pools are more diverse (Kazmi et al., 2022). In a 3-year study of recruitment data from a large R1 university, women-led committees received 23 percent

more women applicants, and committees chaired by a person from an historically underrepresented racial minority (URM) group increased URM applications by 100 percent (Kazmi et al., 2022). Critical to this intervention's success was ensuring that women and URM search committee members' efforts were equitably rewarded in performance appraisals. Tracking search committee demographics, search practices, and the applicant pools was also reported to be helpful (Kazmi et al., 2022).

Regardless of the makeup of the search committee, training may support more equitable hiring practices in the face of the bias pervasive in academic hiring. For example, many institutions employ general bias training for search and promotion committee members—which should include awareness of existing policies like tenure extensions and clarification that use of these policies for any reason cannot be grounds for discrimination (Carr et al., 2017). To the extent possible, this training and any related recruitment tools should be catered to each search, and available in a variety of modalities, including online options and refresher courses and interactive workshops for department chairs and search committees (Koppes Bryan and Wilson, 2015). Search committee members should be trained on implicit bias and provided with resources for recruiting diverse faculty, and should consider offering faculty mentors for search committee members and a family advocate for job candidates (Cardel et al., 2020; Casad et al., 2021). Casad et al. (2021) suggest Montana State University and the State University System of Florida provide promising examples of such efforts.

One intervention that can be readily employed through training and recruitment policies is to use rubrics in hiring. To ensure success and prevent committee members from shifting standards to match favored applicants, "Committees should convene prior to evaluating any candidate to create rubrics, and then apply those rubrics to exemplars to train raters and calibrate metrics"

(White-Lewis, 2020). California State Polytechnic University, Pomona, conducts focus groups with faculty to refine best practices in the search (Casad et al., 2021). Finally, committees and departments should be rewarded for their successful efforts (Casad et al., 2021).

Engaging an outside advocate may assist institutions in more successful recruitment. For example, institutions may want to consider appointing an "equity advisor" to assist in the recruitment process and advise committee members along the way (Koppes Bryan and Wilson, 2015). A similar approach can be taken during the negotiation process through the provision of confidential negotiation counseling for candidates (Koppes Bryan and Wilson, 2015).

Transparency regarding the family-responsive policies available at the institution is another critical step in the process (San Martin et al., 2023). By effectively communicating these policies, institutions may better reap the benefits of the time devoted to creating such policies. San Martin et al. (2023) suggest that family-responsive policies be shared with applicants in writing, especially parental leave and stop-the-clock policies.

There is abundant literature on the recruitment of women, but little evidence identified that offers interventions specific to caregivers rather than women as a group. Family caregivers may benefit from hiring practices attuned to their caregiving needs, such as the use of virtual interviews, subsidies for partners to accompany the applicant while travelling, breaks in interviews to facilitating pumping, and childcare funding (San Martin et al., 2023).

Dual-Career Recruitment

Dual-career academic couples pose a unique challenge and opportunity when it comes to recruiting and retaining women in STEM. Administratively, dual-career hiring and management

requires specific strategies and can be difficult in the absence of clear or widely known policies. Dual-career recruitment is a gendered problem, and therefore one with significant bearing on caregivers in STEMM. Faculty hiring has consistently been found to be one of the major contributors to the leaky pipeline for women and scholars of color, and attending to dual-career needs can support more equitable hiring (Monahan and Fisher, 2023). Women are slightly more likely to be in academic relationships than men—40 percent compared with 34 percent, respectively, and they cite inability to secure an academic position for their partner as the number one reason that they would decline a job offer (Monahan and Fisher, 2023). This is also a source of bias—institutions may be less likely to offer a position to a woman with a faculty partner if they are unable to hire them both, whereas a man, being perceived as less dependent on his spouse, will be more likely to be offered the job. Insofar as it can be facilitated via dual-career hiring, geographic mobility has also been found to support women in career advancement and can help close the gender leadership gap (Putnam, 2018).

Meanwhile, the gendered costs of failing to meet the needs of dual-career academic couples are profound. Since the early 2000s, the decline in the number of tenure-track faculty positions alongside growing graduate school enrollments has led to an ever tighter academic job market in which it is challenging to find even one, let alone two, academic jobs in the same institution or region (Rivera, 2017). According to a comprehensive 2023 study, the problems surrounding dual-career recruitment and management have remained largely unchanged over the last two decades (Monahan and Fisher, 2023). When academic couples are unable to find work in the same place, they have few good options. In some cases, couples turn to commuting relationships, which most often place women in the role of primary caregiver for children and households while men travel for work (Monahan and Fisher, 2023).

Even where dual-career hiring does take place, both the hiring process and the status of coupled hires in their faculty positions is complicated by gender bias. Hiring committees tend to assume that women are more likely to put their partners' career needs first, and that they are more geographically constrained and less committed to work as partnered men or single applicants (Monahan and Fisher, 2023). They are also far less likely to discuss male applicants' relationship status than those of their female counterparts (Rivera, 2017). This may reflect biased assumptions about married women's caregiving obligations. In instances where dual hires are made, women are more likely to be seen as the "second hire," a status that carries stigma and issues of legitimacy (Culpepper, 2021).

Although dual-career couples have long existed in higher education, there is a widespread absence of official policies, and knowledge of policies where they do exist. Less than half of universities sampled in a 2008 study had formal written policies surrounding dual-career couples, and earlier research in 2000 found than only a quarter did so (Monahan and Fisher, 2023; Schiebinger et al., 2008). Among some more than 9,000 faculty surveyed in 2008, more than two-thirds did not know whether their university had formal policies to support dual-career couples or not (Schiebinger et al., 2008). Recommendations for best practices include developing and strengthening formal dual-career policies with a focus on minimizing discrimination and stigma, circulating these widely, and providing training to department heads and hiring committees to raise awareness of the attendant issues and opportunities for supporting equity and diversity (Koppes Bryan and Wilson, 2015; Monahan and Fisher, 2023). A further recommendation is for universities to develop reciprocal arrangements with other institutions—both academic and otherwise—to facilitate placement of partners. This is particularly important in rural areas. Establishing dual-career liaisons and a point person can facilitate information

dissemination as well as regular evaluation of outcomes and attitudes. In the circumstance where a university cannot find an appointment, bridge funding or providing other resources may be helpful (Koppes Bryan and Wilson, 2015). One example is the University of Massachusetts Amherst's partner employment program, which tries to place partners in academic or other university jobs (Koppes Bryan and Wilson, 2015). The impact of these interventions is undocumented.

While the relevance of dual-career hiring to women's advancement is clear, the specific impact of dual-career hiring and supporting faculty couples on caregiving has not been studied. As discussed in the sections below, faculty couples may experience unique challenges relating to family leave and retirement planning.

Leave

Faculty Institutional Leave Policies

Leave is a cornerstone of supporting family caregivers in STEMM. Sufficient and accessible leave—leave that faculty can take without significant adverse career or financial repercussions—results in more equitable parenting throughout the lifespan and may ameliorate the strain of caregiving on employee mental health and productivity. More research is needed to aggregate and compare leave types and outcomes to further support best practice recommendations.

Creating a family leave policy is essential to ensuring faculty are able to access the time off that they need. Despite the proliferation of caregiver leave in the private sector, continued resistance to the creation of official policies persists in academia (Anthony, 2011; Linder et al.,

2022). Informal policies or a practice of addressing family leave on a case-by-case basis may appear beneficial because they are inherently flexible, but these practices can lead to discrimination and differential treatment (Anthony, 2011; Linder et al., 2022). Women faculty members have described pressure to utilize ad hoc, negotiated informal leave, with negative outcomes (Linder et al., 2022). To that end, best practice is to craft a formal policy that is universal, transparent in application, and well promoted (Marcus, 2007; Windsor et al., 2021). Policies should be accessible to all employees, irrespective of length of service at an institution (Miller and Lee, 2022, Anthony, 2011).

A challenging aspect of drafting a formal leave policy is setting a leave length that matches the needs of both the employee and the institution. Recall that leave must be provided for a "reasonable period of time" under Title IX, but reasonableness varies from person to person and department to department. There is widespread consensus that a leave term of at least 12 weeks is most beneficial for employees and their families (Miller and Lee, 2022). This is in alignment with the FMLA's requirement to provide leave for 12 weeks annually for welcoming a new child or caring for a family member with a serious medical condition (FMLA, 1993). Of course, this falls just short of a typical university semester, often leading institutions to offer leave in semester increments (Anthony, 2011).

Faculty and other STEMM employees in medical and health sciences fields may be less likely than their peers in other disciplines to have access to a leave policy that offers sufficient time off. As an example, a 2022 study of ophthalmologists found that only 59 percent reported the existence of optional parental leave for both parents, even though it is guaranteed by FMLA (Kalra et al., 2023). A 2019 study of the top 25 schools of public health in the United States found that 80 percent had paid childbearing leave for faculty and 48 percent for staff (Morain et

al., 2019). For non-birth parents, 68 percent of the public health schools had leave for faculty and 52 percent for staff. These institutions averaged a leave term of 8 weeks, just half of the 14 weeks of paid leave recommended by American Public Health Association. Further, although these schools had published policies, they were often unclear and difficult to understand (Morain et al., 2019). Similarly, a 2019 study of 91 top U.S. medical schools found that only 53 percent offered paid parental leave (Itum et al., 2019). Leave lengths, pay rates, and eligibility vary significantly institution by institution (Riano et al., 2018) and policies can even vary within the same institution (Anthony, 2011).

Agender leave policies are best practice for supporting family caregivers broadly in that they allow for parents or caregivers of any gender to access the leave they need. But such policies may have unintended consequences. The primary users of these policies remain women who give birth, with leave being more common among women and people of color of all genders than their white male counterparts (Armenia and Gerstel, 2006; Herr et al., 2020). Several scholars have expressed concern that providing leave universally may benefit faculty who are not using the time to provide care, disproportionately men (Burch et al., 2023; Feeney et al., 2014). One recommendation is to amend leave policies to make clear that leave time cannot be used for research or productive activities, and to tie leave eligibility (along with tenure probation extensions) to birth recovery or caregiving of at least 20 hours per week (Burch et al., 2023; Williams and Lee, 2016). A wide variety of policies exist in practice, and their comparative efficacy has not been assessed empirically.

Another approach to address the unique needs of birthing employees is to layer forms of leave. While all faculty and staff should be permitted to take time off when they need it to provide care, birthing people must provide that care *and* address their own health needs. As such,

it would be appropriate to allow these employees to take additional time specific to their own health needs (Miller et al., 2022; Sallee, 2008). Under this approach, all caregivers may be entitled to a 12-week leave, and birthing caregivers could be entitled to the same *plus* an additional leave term to account for their temporary incapacity (Williams and Lee, 2016).

Dual-career faculty couples face unique challenges negotiating and accessing leave. A significant portion of faculty spouses are in the same department, leading to strain when both seek to use their family leave. Moreover, the FMLA allows employers to require employee spouses to split time caring for a newly adopted or newborn child. More research is needed to assess the specific challenges facing dual-career academics in accessing leave.

Facilitating Leave: General Policies and Practices

Despite leave policies being on the books for decades, STEMM fields continue to see disparities in employees' use of the leave available to them. While faculty of all genders may be hesitant to take the full amount of leave available to them (Linder et al., 2022), women are more likely to need and not fully utilize family and medical leave. A 2010 study found that only 30 percent of women faculty across all disciplines take their full entitlement of leave for childbirth (Marcus, 2010), and it is well documented that pre-tenure women often return to work sooner than required after childbirth (Cardel et al., 2020). In fact, women in STEMM are the least likely to use parental leave benefits of women in all academic disciplines (Lundquist et al., 2012).

Studies show a prevalence of anxiety about maintaining a research and publication record during periods of leave across disciplines. While much of this is tied to worries about tenure, concern about reputation and job security persist in the current academic climate (Hardy et al.,

2018). This point speaks to the importance of promotion and tenure process interventions to reduce the prevalence and potential impact of taking a leave of absence. Norm-setting may also play an important role in mitigating bias; for example, administrators should make frequent statements of support of faculty using the policies and encourage people of all genders to do so (Sallee, 2008). Effective communication is key. For example, the University of California (UC), Davis, undertook a 3-year project to promote academic culture flexibility and raise awareness of family-friendly policies such as leave. At the end of the project, female faculty reported a culture shift for the better (Cardel et al., 2020).

Institutions can also make leave more accessible by addressing in a formal policy whether and how much work should be performed while on leave. A common finding is that employees continue to work while on leave (Ollilainen, 2019; Schimpf et al., 2013). Ollilainen's study of the experiences of 34 faculty mothers found that institutional parental leave policies expected academic productivity during leave as the norm, leaving the amount of work to be completed up to the discretion of a department chair or supervisor (Ollilainen, 2019). Such policies increase the risk of employee burnout and resentment.

Requiring an employee to work while on FMLA leave may also constitute illegal interference with that leave, opening institutions to liability (Gulati et al., 2022). At the same time, employees' leave is typically viewed more favorably when they remain engaged while away. To avoid negative repercussions from either approach, institutions may want to consider leave planning that sets clear terms and limits on any work being done while away and ensures that employee time working while on leave is tracked and not deducted from their leave allowance. For example, an employee who desires to continue to check work email and

participate in decision-making may be able to take 14 weeks, rather than 12 weeks without engagement during leave.

It is important to guard against requiring leave-takers to compensate for their time away. This phenomenon has been documented in both urology and cardiology (Gulati et al., 2022; Peters and Hartigan, 2023). as well as in various residency policies. Peters and Hartigan found that 38 percent of urology residents surveyed were required to make up for call time missed during their anticipated maternity leaves, for example, by working additional hours during pregnancy. Similarly, Gulati et al. found that 37 percent of women cardiologists studied had to perform additional service or calls prior to taking maternity leave. This additional service was associated with higher rates of being placed on bedrest prior to delivery, and nearly 40 percent of the cardiologists surveyed experienced pregnancy complications, higher than the national average (Gulati et al., 2022). In addition to being dangerous, this practice is also typically illegal; it may violate the FMLA when it is denying or interfering with someone's FMLA leave. It may also be an illegal form of sex discrimination in the typical case where other employees are not required to make up work hours expected to be missed for incapacitation and serious health needs not related to pregnancy. The best practice on this front is clear: stop forcing physicians and other employees to work additional hours to account for their maternity leave (Gulati et al., 2022; Peters and Hartigan, 2023). One approach for managing the increased staff demands that are associated with physicians taking leave is to hire locums to fill in for physicians on maternity leave (Gulati et al., 2022). Institutions may also want to consider providing support in negotiating a plan and coverage for duties during leave (Cardel et al., 2020).

A critical piece of the leave accessibility puzzle is providing pay. Studies have shown that without pay, people are less likely to take the leave that they need—especially men

(Halverson, 2003). Men are more likely to report difficulty making ends meet while on FMLA receiving less than their full pay (Herr et al., 2020). Without pay, leave is much more likely to be something only birthing women take (due to the necessity for childbirth recovery) and bear the costs of. In short, unpaid leave perpetuates gender inequity.

Institutions have the capacity to address many of the factors that make the equitable use of leave policies unfeasible, but it is undeniable that a lack of national policy and the persistence of fragmented policies across institutions complicates usage (Schimpf et al., 2013). Perhaps the most important missing policy piece is national paid family leave, which could ease the burden on institutional employers while also creating new cultural norms in support of taking leave. Without a comprehensive paid leave policy, employer institutions must fund their own leave—often creating tension between an institution's budget and diversity priorities.

To fund paid family leave in the absence of a federal policy, institutions can look to several sources. First, an increasing number of institutions are offering paid family leave that builds off of state paid family leave or disability leave programs. This is useful because typically state family leave programs have an income cap that may not allow faculty members to collect enough to cover their cost of living. By providing this "last mile" of paid family leave, institutions can cover the gap left by state leave programs and allow their employees to have full income replacement—without the institution bearing the full cost. Institutions may also want to consider employing various funding streams to paid family leave. As an intervention that can increase both racial and gender diversity, funding to meet those goals may be applied. The University of California, San Francisco, undertook a multiyear collaborative assessment and recommendation process that ultimately resulted in the campus increasing its paid leave from 4

weeks to 12 (UCSF, n.d.). The program's pooled benefits fund is supported by charging all funding sources less than 1percent of faculty salary.

Federal funding sources typically allow paid family leave as a benefit. For example, NIH allows for adjustments to accommodate parental leave, eldercare, and disability up to 12 months during the project period. NRSA awards allow stipends for up to 60 days of parental leave per year. Finally, NIH offers supplemental programs that provide up to $50,000 in direct costs, plus facilities and administrative costs, for certain investigators experiencing critical events such as pregnancy, childbirth, or adoption (Family-Friendly Initiatives, 2021). NSF grants permit a program extension of up to 12 months for researchers who take a leave of absence for dependent care responsibilities (*Proposal & Award Policies & Procedures Guide*, 2023). Supplemental funding is available to support additional project personnel when a member is on family leave. While this policy is welcome, researchers often report struggling to take the time they need while meeting their research objectives; no-cost extensions are less preferable than supplemental funding that would allow the researcher to complete their own work over a longer period of time, with funding.

All grants funded by the U.S. government, such as those for NASA, the Department of Energy, and the Department of Defense, are awarded pursuant to the Office of Management and Budget's Uniform Administrative Requirements. These requirements allow for paid family-related leave, but only if those benefits are normally provided to employees (*Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*, 2014).

Despite recent efforts to normalize publishing gaps when needed due to family caregiving, there remains pressure from funding sources to not have substantial research gaps

and to meet inflexible timelines (Gabriel et al., 2023; Marcus, 2007). In this respect, grant-funding bodies also have an important role to play to support faculty researchers at key times of transition in their personal and professional lives. The National Institutes of Health have instituted supplements for some grant recipients with flexible funding designed to support research productivity following childbirth, adoption, or primary caregiving responsibility for an immediate family member (Ten Hagen et al., 2022), and those who have taken time off to care for children or other responsibilities are eligible to apply for reentry supplements through the NIH (Family-Friendly Initiatives, 2021).

Facilitating Leave: Stop-the-Clock Policies

Concerns about securing tenure can be a major barrier to academics taking the family leave they need. In a study of more than 1,300 faculty, 33 percent of women opted not to take their designated maternity leave because of concerns about tenure (Koppes Bryan and Wilson, 2015). Tenure clock extension policies have been used to allay concerns regarding having children and taking family leave in the pre-tenure years, but controversy persists regarding their efficacy and best practices.

Stop-the-clock or tenure extension policies have been among some of the most widespread institutional interventions implemented to support caregivers in higher education. The first stop-the-clock policy was introduced at Stanford University in the early 1970s for female faculty members who had babies prior to receiving tenure (Manchester et al., 2013). The aim of the policies was and remains to prevent birthing and caregiving faculty from being penalized in the tenure process by accounting for research, publication, and even teaching time lost to leave periods and caregiving responsibilities. As of 2005, nearly 90 percent of research

institutions offered stop-the-clock policies (Hollenshead et al., 2005). These range from policies that mainly apply to new parents—typically on a gender-neutral basis—to wider-ranging policies covering circumstances including the birth or adoption of a child, caring for a sick relative, personal illness, and other unforeseen research delays (e.g., Institutional Review Board delays) (Haller, 2023; Manchester et al., 2013).

It has now been nearly two decades since a report from the American Council on Education strongly recommended that any penalties in the hiring or tenure process resulting from caregiving gaps be abolished. Among other things, the report advised universities to allow faculty to extend the tenure probationary period by up to 2 years following a child's birth or adoption. Many institutions already meet these goals. For example, the Massachusetts Institute of Technology (MIT) automatically extends the tenure clock for a year for birthing parents (*Faculty Appointment Promotion and Tenure Guidelines*, 2023). Other parents who spend the majority of their academic time caregiving for at least 6 months are also eligible for a year extension. UC Berkeley allows parents to suspend the tenure process for a year (Marcus, 2010). Marcus' study of family-friendly academic policies concluded that "one of the biggest problems ... isn't that these kinds of benefits are not available for faculty with families. It's getting faculty to take advantage of them" (Marcus, 2010).

Two interrelated factors are driving the underutilization of stop-the-clock policies: lack of awareness of policies and fear of professional repercussions for using them. A 2022 study of ophthalmologists found that three-quarters of those surveyed did not know whether their workplaces had stop-the-clock policies (Kalra et al., 2023). Both men and women express worry that they will be judged harshly during the tenure process if they have stopped the clock or taken family leave (Sallee, 2008). In 2008, Princeton changed its stop-the-clock policy to require

faculty to opt out, because so few faculty had sought to use the policy when it was structured on an opt-in basis. Women surveyed as part of the study that led to the policy change reported concern about being seen as less focused and less committed to their work should they elect to stop the clock (Marcus, 2010).

While stop-the-clock policies are now one of a suite of family-friendly offerings provided by a sizable majority of research universities, there is continued debate in the literature surrounding the effectiveness of the policies. A national, retrospective survey of the experiences of faculty working in academic science fields in 2012 examined the impact of using tenure extensions (Fox and Gaughan, 2021). Fox and Gaughan found that women and men who used stop the clock were equally disadvantaged in time to tenure; the effect of tenure extensions on the granting of tenure is gender neutral. However, being a woman and having taken a tenure extension did negatively impact promotion to full professor, even years later. Fox and Gaughan urge taking a long-term perspective in future studies on caretaking in academia.

A 2013 study at a single large research institution found that there was no difference in the publication records of faculty members who used stop-the-clock policies compared with those who did not, while faculty who used the extension had higher rates of promotion (Manchester et al., 2013). That said, faculty using the tenure extension experienced salary losses. The salary impact was longer lasting among male faculty, perhaps due to the bias that attaches when men fail to perform their stereotypical gender role (Manchester et al., 2013).

A 2018 study by Antecol et al. made headlines with its findings that stop-the-clock policies in economics departments increased the likelihood of men receiving tenure, while decreasing women's likelihood of receiving tenure at their first academic institution (Antecol et al., 2018). Gugl posits, based on a model, that the effect may have been related to faculty

publication strategy (Gugl et al., 2022). It is important to note that this study did not observe

tenure clock extensions in practice; the analysis was based on whether the first institution the

faculty member was appointed to had a stop-the-clock policy in place, not whether the faculty

member actually used it (Antecol et al., 2018). Further, the analysis did not assess whether a

faculty member earned tenure—for the purposes of Antecol et al.'s analysis, faculty members

who switched institutions for more lucrative positions were treated the same as those denied

tenure. These faculty members may have earned tenure somewhere, just not necessarily at their

first institution.

While the issue of publication strategies and stop-the-clock policies deserves more

evaluation, experts have proffered several best practices designed to reduce the potential for

faculty members with fewer caregiving obligations to take advantage of a "working leave." One

solution may be to condition leave on agreement that faculty cannot use research products started

during the leave period in tenure portfolios (Burch et al., 2023). Disallowing research gains

obtained during what was supposed to be a leave period may equalize the impact on birthing

women, who are likely to need the leave term and stop-the-clock policy for recovery, while still

allowing caregiving men to benefit from tenure clock extensions as well. It also reinforces the

notion that caregiving leave is not a research sabbatical or other form of work (Burch et al.,

2023). Institutions that adopt this approach should consider carefully monitoring rates of leave

and advancement of leave-takers, as requiring leave to be treated as a true break from work could

increase the stigma around taking it. Another suggestion for reducing stigma around stop-the-

clock policies is for them to be "opt out" rather than "opt in." Such policies normalize their use,

sending the message that usage is expected (Burch et al., 2023; Zahneis, 2022). During the

pandemic, many universities offered all faculty the option to stop the clock due to COVID-19-

related work disruptions. Early research suggests that opt-out extension policies were preferable to opt-in policies from an equity perspective (Krukowski et al., 2022).

In the case of both parental leave and stop-the-clock policies, the best practice may be to tie policy use closely to caregiving responsibilities—for instance by requiring that policy use be attached to doing a minimum of 20 hours of caregiving per week (Bhattacharjee, 2005; Burch et al., 2023; Williams and Lee, 2016). Since 2005, the University of California system has asked all faculty members who request to stop the clock to submit a letter attesting to their substantial caregiving responsibilities (Bhattacharjee, 2005). Such requirements may be particularly helpful where tenure extension policies do not require the faculty member to have taken leave in order to be eligible for clock extensions. In considering these policies, it is important to note that institutions should avoid assuming that "primary caregiver" designations effectively communicate the time and effort taken to provide care. Rather than signaling a threshold of care making a faculty member eligible for taking the leave, "primary caregiver" policies are widely interpreted as policies for women and may signal that caregiving is not or should not be a shared responsibility (Burch et al., 2023; Levs, 2015; Williams and Lee, 2016).

Finally, regardless of the scope of stop-the-clock policies, they are only as effective as the tenure process they're attached to—tenure and promotion committees need guidance on how to use them. Clear policies requiring dismissal of this time from productivity calculations is critical (Antecol et al., 2018; Haller, 2023; Thornton, 2003). More research is needed to compare the efficacy and effects of opt-out policies versus those that are linked to caregiving status, and in general to understand the gendered impacts of stop-the-clock policies (Haller, 2023).

Accommodations and Duty Modifications

Caregiving academic employees often need changes to how, when, and where work is performed to meet their health needs or their responsibilities to provide care. These changes are referred to in various terms; "reasonable accommodations" for those with their own health conditions, "active service modified duties" for some caregivers, or even simply "workplace flexibilities."

Caregivers of all types of family members may benefit from shifted duties, but these changes are especially important for **pregnant and postpartum faculty who need workplace changes to stay healthy**. In the case of a faculty member requesting changes due to pregnancy-related health needs, the institution is under an obligation to provide reasonable accommodations (Pregnant Workers Fairness Act, 2022). Fear of pregnancy discrimination is one reason why employees do not get the accommodations they need; in one large survey of postdoc parents, many reported they did not feel comfortable asking, while only a small minority of requests were rejected (Lee et al., 2017). This can be addressed in part by establishing a clear pregnancy accommodation policy, with designated points of contact for managing requests (Lee et al., 2017). Supervisor training should also include the new legal requirement to provide pregnancy accommodations.

While many pregnant and postpartum employees need changes in their work duties to protect their well-being, others do not. Supervisors may remove their pregnant employees from high-prestige positions in a misguided effort to keep the employees safe. This has been a particular concern in STEMM fields (Anderson and Goldman, 2020; Englander and Ghatan, 2021; Gulati et al., 2022). Forcing an employee to take an accommodation they do not want or to take leave when they are able to work with adequate protective equipment or other

accommodations can be a violation of federal law (Pregnant Workers Fairness Act, 2022; Title VII of the Civil Rights Act of 1964, 1964). Best practice is to provide a clear point of contact for the employee and to engage them in an interactive process to identify accommodations that do not adversely impact the academic's career.

As of December 2022, new legal requirements are also in effect to provide as-needed **lactation breaks** and a private, non-bathroom lactation space for all workers who need it (PUMP for Nursing Mothers Act, 2022). This law may ease some of the challenges long faced by lactating employees in STEMM in the absence of legal protections (Sattari et al., 2020; Shauman et al., 2018; Soffer, 2019); federal workplace lactation law previously excluded salaried and professional workers, such as faculty and physicians, leading many to treat providing lactation space as a special "favor" to women. Of course, the mere existence of a law is not enough, particularly in a climate where, for example, 25–50 percent of physician mothers report experiencing breastfeeding discrimination (Jain et al., 2022; Ortiz Worthington et al., 2023; Shauman et al., 2018). Institutions must create policies to facilitate employee use of lactation space in a manner that is legally compliant and fosters gender equity. The American Academy of Pediatrics in 2020 endorsed a "culture plan" to improve support for breastfeeding physicians and trainees (*Creating a Culture to Support Breastfeeding Physicians and Medical Trainees*, 2020). The core of this culture plan is rooted in policy; institutions are encouraged to adopt a policy on lactation support, such as by adopting the AAFP's model policy on breastfeeding and lactation for medical trainees. Culture shift can begin by using the implementation of a policy as a vehicle to engage in conversation and education necessary for improvements in culture. Under this plan, institutions are encouraged to engage in an assessment including quantitative and qualitative input, followed by participation of key stakeholders in the policy adoption. Once a policy has

been drafted, institutions should share it widely—along with the goals of the policy and who is accountable for enforcing it—at every level. Finally, policies successful in creating culture shift in support of lactation include a commitment to ongoing reassessment, whether that be considering the number and location of lactation rooms, or surveying users regarding their ability to take breaks as needed. Notably, the provision of maternity leave has also been found to improve breastfeeding success and ease of returning to work (Frolkis et al., 2020; Melnitchouk et al., 2018; Shauman et al., 2018); as paid maternity leave policies increase, the impact on lactation support should be studied.

Many studies show a strong connection between **flexible work policies** and retention. Work-life integration programs and their use contribute to a positive culture, and positive work-life culture supports retention. The concept of modified duties is designed to create flexibility in faculty members' workloads by changing job responsibilities without any changes in pay. The most common modification is a reduction in teaching with the expectation that time devoted to the classroom will be reassigned to other responsibilities that allow for more flexible scheduling. Some universities reduce the work assignment for a set period of time, while others offer modification on an open-ended basis. A 2006 study found that 18 percent of 255 institutions surveyed had implemented a formal modified duties policy (Koppes Bryan and Wilson, 2015).

There are various ways to structure modified duties, and faculty performing different kinds of caring work may have different experiences and needs. Possible interventions include part-time work, job sharing, and adjusted tenure timelines. All of these policies should be framed as career enhancing rather than limiting (Ibrahim et al., 2017).

Workplace flexibility may work differently across genders. In a survey of more than 1,500 science faculty across 150 research universities, faculty men who reported their

department made it easy to informally adjust work schedules for family care reported more publications and lower teaching loads (Feeney et al., 2014). In contrast, there was no relationship between perceptions of flexibility and productivity of women. This may be a result of men being more able to access departmental flexibilities or that the flexibilities provided were sufficient to meet men's caregiving needs, but not women's. Women may benefit more from formal policies than informal "flexibility" at the departmental level.

Numerous institutions have adopted successful modified duties policies. Duke University allows faculty to adopt flexible and reduced work schedules for up to 3 years, where faculty members are able to decide what to reduce (Anthony, 2011). Stanford School of Medicine introduced work-life integration policies in the early 2010s in conjunction with the development of an Academic Biomedical Career Customization model (Ibrahim et al., 2017). The school worked with faculty to make individual career plans that supported them in adjusting up or down their involvement in patient care, admin, research, and education over the course of their careers. In the short term, the program increased faculty perceptions of work-life integration and institutional support. While the model also resulted in greater retention and faculty advancement and productivity over the long-term, the program appears to have been discontinued.

Research has consistently drawn attention to the benefits and potential of **part-time work for academics** (Drago and Williams, 2000). This may be offered as a temporary modification or an ongoing program to support caregivers and diversity in STEMM. Yet, higher education lags far behind industry in offering part-time options outside of the adjunct market (Wilson, 2008). A study of family-friendly policies in higher education completed in 2007 by the University of Michigan–Ann Arbor found that only 15 percent of the 189 institutions surveyed had a formal

written policy allowing professors to work part-time. In many other institutions, part-time work is negotiated on an ad hoc, case-by-case basis (Wilson, 2008).

In comparison to part-time work in other sectors, there are some specific challenges involved in orchestrating part-time faculty appointments. With faculty work split across the functions of teaching, research, writing, and service, it is not always obvious which components of work can be cut back. At the University of California, Davis, for example, faculty who work part-time have reduced teaching loads (Wilson, 2008). Research supports offering faculty appointments at 0.5 times with full benefits. Universities should also offer temporary reductions of full-time appointments on a short-term basis to support faculty facing a particular life event (Koppes Bryan and Wilson, 2015). Studies of work-life support for academics reference job sharing (or dividing one faculty position with benefits into two part-time positions with benefits) as another option. Although there are precedents for job sharing, particularly internationally (Stoller, 2023), little research has tracked the prevalence of such policies and efficacy in the U.S. context (Koppes Bryan and Wilson, 2015).

Most literature about modifications and accommodations relate to pregnant academics and new parents, **additional information is needed regarding the interventions most helpful to employees who need modifications due to caring for an adult.** For example, a 2007 study found that faculty providing eldercare were less likely to want to reduce their work hours than those caring for children (Keene and Prokos, 2007). Caregivers for adults may also need different communications approaches. A UC Davis study of clinical and/or research biomedical faculty found that 24 percent of male and 14 percent of female faculty respondents needed accommodations due to care for an adult or the death of a close family member (Shauman et al., 2018). Many of the existing family-responsive policies were not well utilized by these

employees, as they were overwhelmingly unaware of benefits or held misconceptions about the programs. Participants also reported that supervisors served as gatekeepers to policies—even where they were not required to approve a particular benefit. Shauman et al. (2018) suggest this points to the need to train department chairs and other supervisors so that they are aware of policy details and why facilitating access to the policies is so important. While there is no empirical evidence for the practice, Shauman et al. also suggest building in redundancy to cover absences and to create centralized funds to support faculty reduction in duties.

Funders may want to consider adopting funding streams geared toward providing (and assessing) research assistance for caregiving faculty. The Doris Duke Foundation's Fund to Retain Clinical Scientists program did just that by offering funding to promising junior faculty whose careers were at risk due to the incompatibility between caregiving demands and work. During the first year of the program, 21 percent of applicants provided eldercare, 1.6 percent cared for a partner, and 91 percent provided childcare (Jagsi et al., 2018). In 2018, awardees interviewed reported that the funding was a benefit to them, ensuring their success and retention (Jones et al., 2019). Participants also reported struggling with the time demands of the supplemental activities that accompanied funding—an important lesson for future program designers. In recent years, the National Institutes of Health have provided new streams of funding designed to support research productivity for faculty with caregiving responsibilities and critical junctures (Ten Hagen et al., 2022).

Addressing Caregivers' Basic Needs

Caregivers in academia experience significant financial strain caused by both caregiving (e.g., paying for childcare) and its relationship to work (e.g., salary losses from taking leave or

delaying tenure). When these caregivers are unable to meet their basic needs, their work and career suffer. Relevant to addressing these needs is the overall compensation of academics in STEMM. Average faculty pay and employer health-care insurance contributions (adjusted) has decreased since 2019 (American Association of University Professors, 2023). Women continue to be paid less than men faculty members at all levels. These effective income cuts are more likely to have a negative impact on family caregivers due to the increased costs they shoulder for everything from housing to insurance to day care.

Unfortunately, there is a need for more national-level information about the fringe benefits most relevant to family caregivers. Existing datasets include factors that are relevant but of less urgency to the broader caregiving population; for example, the American Association of University Professors' annual report on faculty compensation includes dependent tuition waivers, but not the benefits that will support the most vulnerable caregiving faculty, such as dependent care allowances, dependent health care, and housing (American Association of University Professors, 2023).

This section addresses some basic needs likely to be a challenge for caregiving faculty and employees, including childcare, eldercare, housing, and mental health support services. These benefits are often provided via "employee assistance programs" that subsidize programming or, more commonly, provide referrals to services. The efficacy of these programs in retaining caregivers in academia has not been widely studied but should be a focus of future research.

Childcare

Ensuring that faculty have adequate access to affordable, reliable, and high-quality childcare is a key form of support for caregivers in STEM that mitigates the "child tax" (Cardel et al., 2020). While already well established, the COVID-19 pandemic dramatized the importance of access to childcare for academic parents (Bender et al., 2021). The vast majority of research on best practices to support caregivers in higher education proposes that institutions develop and maintain on-site childcare options that offer proximity and an alignment with parents' work needs (Cardel et al., 2020; Carr et al., 2017; Ibrahim et al., 2017; Ladores et al., 2019). In addition to meeting the basic needs of working parents, on-site childcare can signal a climate that is broadly supportive for caregivers (Carr et al., 2017). Across nine research universities, on-campus childcare was faculty members' most requested family-responsive service in a 2005 study (Ward and Wolf-Wendel, 2005).

Many universities and colleges offer some on-site childcare options, but not always enough to meet demand from faculty and staff. Access is determined institution by institution and varies widely, as does the quality of care offered. While scholars (and parents) almost universally favor the adoption and expansion of on-site childcare as an option for faculty caregivers, some research suggests that it may have unintended results (Feeney et al., 2014). The research clearly demonstrates that on-site childcare access is associated with higher levels of productivity —— measured by both publication rate and teaching loads—across genders. Yet, men faculty who had access to on-site childcare increased their publication output while women shouldered an increased teaching load (Feeney et al., 2014).

On-site childcare, while largely beneficial to academic caregivers and the institutions that employ them, is just one of a wide array of strategies for meeting parents' childcare needs and

may be a better fit in some institutional contexts than others. A comprehensive 2020 study of best practices for supporting women and caregivers in STEMM at universities in the United States recommends the development of a comprehensive suite of childcare support (Cardel et al., 2020). This includes a university childcare and family resources web page, and a point person who can serve as a family resources officer. Universities should also offer backup and emergency care options, childcare for inclement weather days and public-school holidays that conflict with university schedules, and access to summer camps nearby. It is also helpful to subsidize the costs of work-related travel to offset childcare expenses (Cardel et al., 2020). These recommendations are in line with the unique time demands of a career in STEMM, which are less likely to be limited to the business hours of day care centers.

To take just a few examples, Arizona State University offers faculty consultations with a childcare services coordinator, and at the University of Pennsylvania, a childcare resources web page directs families to resources and activities. At Brown University, faculty benefit from backup and emergency care, as well as financial support for the family-related expenses incurred with work travel. The University of Chicago offers travel grants of up to $500 per year for faculty needing to travel for work with their children. The University of Houston has developed summer camps for kids and the University of Pennsylvania provides backup care for snow days (Cardel et al., 2020). Rice University's Children's Campus provides childcare for faculty members, with participants reporting that it decreased their job stress (O'Brien et al., 2015).

A large body of research highlights the specific challenges that faculty experience with securing childcare when it comes to conference and fieldwork travel. These challenges tend to disproportionately disadvantage women, who continue to shoulder more caregiving responsibilities in families, and contribute to the leaky pipeline. Travel for research and

conferences facilitates high-quality published work and is essential for networking. It is, in other words, critical for career development, particularly for junior scholars (Tower and Latimer, 2016).

Universities, professional associations, research societies, and individual conferences all have a potential role to play in easing the burden on faculty caregivers when it comes to work travel. Recent scholarship on the challenges surrounding work travel for caregivers in higher education strongly recommends that universities and other organizations do more to offset faculty's caregiving burden—whether for childcare, eldercare, or care for adult dependents with special needs (Calisi and a Working Group of Mothers in Science, 2018; Hardy et al., 2018; Tower and Latimer, 2016). There are a variety of ways to support childcare either at home or at conferences and events. The recommended best practice is to offer faculty a variety of options, including financial support that allows families to meet their own needs, and generously reimbursing reasonable expenses on a case-by-case basis. The needs of caregivers vary widely based on the age and needs of their dependents. For example, a lactating parent might prefer financial support to travel with their baby and a partner or other caregiver, rather than receiving a subsidy to pay for extended childcare at home. The parent of an older child might need an arrangement that allows their child to remain at home and attend school (Tower and Latimer, 2016).

Conferences should ideally provide on-site childcare and be child friendly by welcoming children to socials and even meals, and scheduling conference events during daytime hours only (Calisi et al., 2018). Organizations such as the Society for Neuroscience and the Society for Integrative and Comparative Biology have hosted conferences with on-site childcare, allowing for parents to frequently check in on children and facilitating breastfeeding (Calisi et al., 2018).

Small conferences that cannot easily provide on-site childcare can still connect families with local childcare resources (Bos et al., 2019). All organizations involved in supporting traveling faculty with caregiving needs should take care to assess and improve available options on an ongoing basis to ensure that they are actually meeting family's needs (Bos et al., 2019).

Research funding bodies can also take meaningful steps to support the childcare needs of faculty caregivers. Since March 2021, the National Institutes for Health have provided childcare support for recipients of Ruth L. Kirschstein National Research Service Awards. They have also granted extensions to the timeline for applying for K awards in order to increase flexibility for faculty grappling with additional caregiving responsibilities due to the pandemic (Ten Hagen et al., 2022). Childcare costs have also been fundable by the NSF as a fringe benefit. Since 2015, the Doris Duke Foundation has supported medical researcher at key times of transition in caregiving responsibilities with supplemental research funds (Jagsi et al., 2018). They also implemented a one-time COVID-19 relief fund.

Eldercare and Adult Dependent Care

Roughly 1 in 4 of the U.S. population is caring for an adult family member, faculty members included (Lebnitz and Keafer Morrison, 2015). However, the needs and solutions for providing eldercare at academic institutions have been less studied than childcare. As our population (and academia) ages, more faculty members will be responsible for providing care for their parents, spouses, and other adult dependents. Many of these faculty members are a part of the sandwich generation caring for adult loved ones at the same time as they care for children. While providing eldercare or care for disabled adults is remarkably common, it may receive less

attention in part because employees typically need to divulge eldercare obligations, and may be hesitant to do so (Gabriel et al., 2023).

People of all genders provide care for adult relatives and having eldercare responsibilities lowers the odds of a faculty member receiving tenure in a gender-neutral effect (Fox and Gaughan, 2021). However, women are more likely than men to leave workforce during peak productivity years to care for elders (Cardel et al., 2020). Recent scholarship has called for more focus on the needs of those providing spousal and eldercare (Dembe and Partridge, 2011; Gabriel et al., 2023; Skarupski et al., 2021), and there is much more to be learned about the dynamics of these disparities. Despite the somewhat limited empirical research on the efficacy of eldercare support programs, they are popular benefit offerings and may decrease absenteeism and increase productivity (Dembe and Partridge, 2011). Researchers have found that eldercare benefits successfully moderate the negative relationship between eldercare responsibilities and work (Calvano, 2013).

Best practices for providing eldercare and adult care supports are myriad yet tend to center around assisting employees with securing care and reducing the mental strain of managing caregiving and end-of-life planning (Koppes Bryan and Wilson, 2015). Institutions have offered a variety of programing, from support groups to respite care and meal preparation; however, the efficacy of these popular interventions is largely unstudied (Skarupski et al., 2021). Among early-career faculty surveyed at one institution, the most preferred types of caregiving assistance were the provision of a technician at work, a personal assistant or coach, and general household help (Hartmann et al., 2018). Preference for these forms of assistance varied by gender, with the most popular intervention among women being household help (81.6 percent of women, 56.8

percent of men) and among men, technician assistance at work (80.3 percent women, 81.1 percent men).

Many educational institutions provide services to support faculty and staff in caring for aging or disabled family members. Care services may be provided via third-party contractors off site, on site (e.g., Virginia Commonwealth University's on-campus adult day care) (Virginia Commonwealth University, 2023), paid for with university subsidies (e.g., the University of Maryland's backup care) (University of Maryland, n.d.), or the institution may provide referrals and subscriptions to care-finding services.

In contrast to expectant faculty members, those caring for adults are less likely to have their caregiving status or needs known in the workplace (Dembe and Partridge, 2011; Gabriel et al., 2023). As such, it is particularly important for employers to proactively educate workers on their eldercare services and benefits (Calvano, 2013). Underutilization and fear of disclosure are significant barriers to employees gaining the full benefits of the programs (Calvano, 2013; Dembe and Partridge, 2011). In a 2019 study of faculty at a large research institution, 91 percent indicated they were unaware of their university's policies and procedures for eldercare (Lebnitz and Keafer Morrison, 2015). Many reported difficulties in finding the information they needed, with STEMM faculty being significantly less likely to know institutional policies. The lack of awareness may stem from bias against these caregivers; more than half of faculty surveyed reported resistance in discussing eldercare concerns with their department chairs. Further, Skarupski et al., 2021 found that older full-time faculty were less likely to use institutional caregiving benefits than their peers under 55. Institutions should consider tailoring their offerings and communications strategies so that they are more effective in reaching those in need.

Important in the considerations of eldercare is the life stage of those faculty and employees most likely to need it. The "biggest squeezes" occur in early adulthood (primarily with children) and in the years preceding retirement (Patterson and Margolis, 2019). As such, institutions may want to consider offering eldercare supports as a critical tool for retaining their most senior faculty. There is limited data on the impact of eldercare support and retirement decisions in STEMM broadly, but studies in the medical field are instructive. Women physician's challenges with work-life integration are lesser in senior years but still prevalent (Templeton et al., 2020). Faculty women in academic medicine were more likely than faculty men to be caregivers and to cite caregiving and health care as important factors in one study of retirement decisions (Levine et al., 2022). In contrast, another study found no significant difference in retirement intention related to gender and caregiving; however, this may have been influenced by the relatively young ages of the faculty in the sample (Skarupski et al., 2021). It may be that later-career faculty women are choosing to delay retirement due to caregiving demands; a study across several institutions found that 51 percent of late-career women faculty reported the need to care for relative(s) as a reason to delay retirement, as compared with 37 percent of men (Berberet et al., 2015). More research is needed to understand this dynamic and the potential to address gender and caregiving gaps in the late-career professorate. Addressing the eldercare crisis may be particularly important in light of the benefits of faculty mentorship by senior women and people of color.

Interestingly, Skarupski et al. (2021) found no national directed effort geared toward supporting mid- or later-career faculty with caregiving demands, unlike early-career faculty, who are more often managing the demands of childrearing. Institutions should ensure that, at minimum, their existing support policies (e.g., sick leave, flextime, altered working schedules)

are marketed toward those who need eldercare, not merely those who are parenting (Lebnitz and Keafer Morrison, 2015).

Housing

The rising cost of living typically impacts caregivers more than those without caregiving responsibilities. Housing costs continue to climb for both renters and homeowners and constitute an increasingly unaffordable key component of cost of living (Schaeffer, 2022). Challenges finding affordable housing pose a significant barrier to faculty recruitment (San Martin et al., 2023). Despite an abundance of press on the issue, there is limited literature in academic journals on solutions for addressing housing affordability for faculty and academic employees in STEMM.

Housing affordability and access has been studied as a key stressor for medical residents. Housing affordability varies significantly by region, but nationwide, 60 percent of ACGME-accredited residency-sponsoring programs were experiencing rent burden—where the cost of rent constitutes an unsustainably high amount of the resident's salaries (Brewster et al., 2023). Brewster et al. (2023) found that while the cost of renting was increasing and outpacing resident earnings, housing benefits for medical residents were rare.

Although studies on the efficacy of faculty and employee housing initiatives are lacking, examples are plentiful. Stanford University offers a home-buying program. The University of Colorado provides housing assistance to faculty members (Faculty Housing Assistance Program, 2017). Both New York University and the University of Virginia have faculty residences (New York University, n.d.; University of Virginia, n.d.). MIT offers a home-buying program for

newly hired and newly tenured faculty (MIT, n.d.). The San Mateo County Community College District offers rentals and a loan program to support first-time homeowners (San Mateo County Community College District, n.d.). Several of these programs effectively make the university the lender or landlord, able to set rates and prioritize resources. Even where institutions are not able to provide such extensive support with housing, they may connect new hires with real estate agents and whatever forms of support do exist early in the hiring process (San Martin et al., 2023). Faculty housing initiatives may want to study how to leverage their housing assistance programs to provide support for family caregivers experiencing financial strain, and whether to include postdocs and residents, who are more economically vulnerable.

Mental Health Support

Gender is a strong predictor of mental health risk, and this was amplified by the pandemic. Women are more at risk not only due to caregiving responsibilities but also to institutional positions (Docka-Filipek and Stone, 2021). These positions are also more likely to cause strain for junior academics; a recent *Nature* study found that 51 percent of postdocs had considered leaving academia due to anxiety, depression, or similar issues affecting their work (cited in Limas et al., 2022). Some of these health challenges relate to workplace stress such as poor work-life balance and unmanageable workloads, which can be ameliorated by the above interventions (Ohadomere and Ogamba, 2020).

Academic employers often provide formal and informal mental health through employee assistance programs, and other mental health benefits as a part of health plans. A 2022 benefits study of more than 400 postsecondary institutions found that a majority offered core mental health services, including in-person counselling (85 percent), e-visits with a clinician (84

percent); substance use/abuse services, coaching, and cognitive behavioral counselling (75 percent); and critical incident stress management (63 percent)—and 60 percent of institutions offered all of these services (*College and University Benefits Study*, 2022).

A 2022 systematic study of mental health interventions for academics identified training, stress management programs, mindfulness sessions, writing retreats, workload allocations, group decision-making, and employee assistance programs as potentially useful interventions (Ohadomere and Ogamba, 2020),. However, the study concluded that there was limited information on the results of such top-down well-being and mental health interventions. Promising practices identified for future study included establishing routine mental health assessments. Of course, a priority is also effectively and continuously communicating available supports. An earlier study similarly found that while there was ample documentation of the challenges academics face, there was very limited evidence for what worked to protect academics' mental health. Recommendations included creating (and studying) targeted psychosocial interventions and providing more opportunities for faculty to be listened to (Urbina-Garcia, 2020).

Networking, Mentorship and Community Building

Research on social supports in STEMM is overwhelmingly focused on women or historically underrepresented racial groups, with little attention paid to distinctions between faculty who are caregiving or not. That said, given the high rate of correlation between these identities and caregiver status, it is important to consider the degree to which networking,

mentorship, and community-building programs for these underrepresented groups may also assist caregivers in STEMM.

Women's unequal access to social capital is a problem underpinning STEMM career inequalities. This applies to caregivers, too. Male faculty have an easier time establishing research collaboration networks and more knowledge of funding opportunities. Women faculty in STEMM "report a lack of formal mentoring, limited ability to network and collaborate on research projects, lack of guidance and expectations on how to achieve tenure, and feelings of isolation within their departments" (Casad et al., 2021). Historically, few policies have prioritized mentoring of female faculty (Carr et al., 2017).

Universities supported by the National Science Foundation's ADVANCE initiative have made significant progress in supporting networking, community building, mentorship, and sponsorship. For example, several ADVANCE institutions have created speakers' series that bring outside lecturers to campus with the specific aim of networking with women faculty (Tower and Latimer, 2016). A number of universities pair faculty, particularly new faculty, with mentors. Through the University of Michigan's Launch Program, a committee of five senior faculty members mentor first-year hires (Thomas, 2005). The program was started in the College of Engineering and was so successful that it was expanded for faculty university-wide. The University of Texas Rio Grande Valley instituted a women's faculty network to advertise women's achievements and empower faculty to advance their professional and personal development (Casad et al., 2021). Stanford School of Medicine holds monthly networking lunch meetings for faculty (Ibrahim et al., 2017).

One large research institution in the mid-Atlantic designed a unique sponsorship program. It offers career development for faculty by pairing them with external sponsors who are

leaders in their field and facilitating their work on a project together (Tower and Latimer, 2016). The idea is that sponsors provide mentorship, feedback, and even training around grant writing, patenting, and other specific skills, as well as facilitating further research collaborations and identifying new opportunities. Additional research is needed to assess whether similar interventions are useful for addressing the needs of caregivers.

CONCLUSIONS

This review highlights the varied promising practices for retaining unpaid caregivers throughout the STEMM pipeline. These practices, largely at the postsecondary institution level, strive to systematize family-responsive benefits, communicate them effectively, and address the harsh financial and practical burdens associated with caregiving. While more research is needed, widespread adoption of these practices would undoubtedly make a significant impact on the recruitment and retention of caregivers in STEMM.

Even as we advance these proven and promising practices, there is a strong need for research centered on caregiving status rather than conflating women's needs with those of caregivers generally. This need reflects a historical shift from policies designed, often from the 1970s onward, primarily to support women faculty, to the need for policies that support anyone providing care irrespective of gender—which increasingly and ideally includes men and non-birthing people. More research is also needed around other intersectional identities—race, national origin, sexual orientation, and class—and caregiving status. This paper reflects some of those overlaps, but future research could shed more light on the particular forms of support that would be most beneficial.

The knowledge and policy gaps exposed herein also reflect a lack of federal intervention to fund family-responsive policies through legal mandates or research funding. For example, paid family leave and childcare or eldercare subsidies could radically transform the realm of possibility for caregivers in STEMM. In the meantime, we hope that this review will aid states and institutions in taking their next steps to recruit and retain unpaid caregivers, and—hopefully—allow them to thrive in STEMM.