

The COVID-19 Pandemic Unmasked the Challenges Faced by Early-Stage Faculty in Infectious Diseases: A Call to Action

Infectious Diseases Clinical Research Consortium (IDCRC) Mentorship Program Writing Group

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(https://academic.oup.com/journals/pages/open_access/funder_policies/chorus/standard_publication_model)

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26
27 **Key points**

- 28 • The COVID-19 pandemic has exacerbated challenges faced by early-stage faculty and
29 highlighted gender, racial, and ethnic gaps.

30 This viewpoint summarizes the evidence and proposes recommendations to improve
31 recruitment and retention of early-stage infectious diseases faculty.

32
33 **Running Title**

34 Early-stage faculty pandemic challenges
35

1 **Abstract**

2 The COVID-19 pandemic and associated increase in family care responsibilities resulted in
3 unsustainable personal and professional workloads for Infectious Diseases (ID) faculty on the
4 front lines. This was especially true for early-stage faculty (ESF), many of whom had caregiving
5 responsibilities. In addition, women faculty, underrepresented in medicine and science faculty,
6 and particularly ESF experienced marked declines in research productivity, which significantly
7 impacts career trajectories. When combined with staffing shortages due to an aging workforce
8 and suboptimal recruitment and retention in ID, these work-life imbalances have brought the
9 field to an inflection point. We propose actionable recommendations and call on ID leaders to
10 act to close the gender, racial, and ethnic gaps to improve the recruitment, retention, and
11 advancement of ESF in ID. By investing in systemic change to make the ID workforce more
12 equitable, we can embody the shared ideals of diversity and inclusion and prepare for the next
13 pandemic.

14
15 **Keywords**

16 Early-stage faculty
17 COVID-19
18 Family
19 Women
20 URiM

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1 **The Problem**

2 During the COVID-19 pandemic, the infectious diseases (ID) community responded to a public
3 health emergency with incredible speed. Concurrently, the pandemic response severely
4 impacted, and continues to impact, the careers of ID early-stage faculty (ESF) by increasing
5 workloads in both personal and professional spheres; decreasing productivity by traditional
6 metrics; halting or delaying existing research projects and switching to pandemic-related
7 research priorities; disrupting in-person networking and community building opportunities;
8 shifting education delivery methods; and blurring work-life boundaries [1, 2]. Moreover, the
9 pandemic further bared existing gender and racial inequities in our society and in academia and
10 made it clear that working while caregiving is a major challenge to scientific productivity and
11 well-being [1, 3].

12
13 **Pre-pandemic Challenges**

14 Despite the critical need for infectious diseases research to understand the pathogenesis,
15 diagnosis, and treatment of infections and to develop and deploy prevention strategies, many
16 shortcomings have been identified in the pipeline of infectious disease scientists. In the U.S.,
17 some of the challenges include limited funding for research, especially among physician-
18 scientist trainees who also have restricted time to pursue research due to demanding clinical
19 responsibilities. Highly competitive NIH pay-lines have resulted in increasing gaps between the
20 number of applications and the number of funded awards [4]. Studies from Europe have
21 identified quality-of-life concerns related to workload, interpersonal challenges at the

1 workplace, and limited access to high-quality, structured mentorship, as further challenges for
2 early-career microbiology and ID specialists [5, 6].

3
4 Additionally, well-documented gender and racial gaps existed in academia in ID prior to the
5 pandemic [7]. In 2016, only 37% of academic ID physicians were women (48% of assistant
6 professors, 40% of associate professors, and 19% of full professors) [8]. Despite a <10% pay gap
7 in younger academic ID physician incomes by gender, after 50 years of age the incomes of
8 women ID physicians are nearly 20% lower than those of men [9]. Men ESF also receive
9 significantly higher start-up packages than women [10]. Furthermore, inequities exist in peer
10 review, grant allocation, and institutional service demands, with persistent bias against women,
11 despite equivalent annual publication rates and impact [11-14]. These challenges are even
12 greater for women encountering intersecting systems of inequity (e.g., ethnicity, race, sexual
13 orientation, economic class, gender identity, age, ability, and dependent status) [15]. For
14 example, women of Black/African American, Hispanic/Latino, and American Indian/Alaska
15 Native groups comprise <2% of U.S. medical school faculty at the rank of Professor (341, 341,
16 and 15 of 39,646, respectively) [16]. Although these gender data are generally presented as
17 binary, we recognize gender is non-binary and fluid.

18
19 In addition to the gender, racial, and ethnic gaps in academia, women generally assume more
20 domestic responsibilities, including childcare and care of older adults at home, and are
21 approximately four-fold less likely to have a “stay at home” partner as compared with men [17].
22 Family-related reasons are cited as the primary reason why 43% of mothers leave full-time

1 science, technology, engineering, and math (STEM) employment after the birth or adoption of
2 the first child [18]. However, while family care disproportionately affects women, the burden is
3 not limited to mothers alone. Early-stage academic scientific careers overlap with prime
4 reproductive years for all genders, with four of five physician scientists having children during
5 this time [17]. Four to seven years following the birth/adoption of a first child, 23% of fathers
6 leave full-time STEM employment compared to an estimated 15% of men without children [18].

7

8 **Pandemic Exacerbations**

9 ID physicians and scientists served on the front lines of the COVID-19 pandemic in a variety of
10 key functions: caring for patients with COVID-19, leading hospital- and community-based
11 infection prevention efforts, generating and constantly updating management guidance, and
12 leading basic science and clinical research efforts, including conducting pivotal clinical studies to
13 understand transmission and predictors of disease severity and to develop novel diagnostic
14 tools, therapeutics, and vaccines. Although the challenges of outbreaks such as Ebola,
15 multidrug-resistant bacteria, Zika, and pandemic influenza previously existed, none matched
16 the extent to which COVID-19 stressed the system and magnified the gaps of an aging ID
17 workforce and leaky pipeline [4].

18

19 **Career Satisfaction**

20 During the pandemic, ID trainees reported that increased work hours had a substantial negative
21 impact on psychological health and that diversion to COVID-19-related responsibilities
22 disrupted research training [19]. This limited pipeline is further threatened by suboptimal

1 financial compensation [19]. In the US, the median salary of academic ID faculty is 26% lower
2 than those in private practice, and the average salary for an ID physician was 29% lower than
3 the average salary for other medical subspecialists [21]. These are disincentives for trainees
4 considering an academic ID career, which may partially explain why, despite an existing
5 shortage of ID physicians and scientists, only 52% percent of pediatric ID and 82% of adult ID
6 fellowship slots were filled during the 2022 ID fellowship match [20].

7
8 Unfortunately, some academic institutions responded to the changing economics of losses in
9 tuition and healthcare service payments during the pandemic with layoffs, furloughs, pay cuts,
10 and elimination of merit increases and contributions to retirement accounts [2, 15, 22]. For
11 example, one major academic institution temporarily reduced hours of 42% of their employees
12 [23]. As many as one in five physicians reported decreased earnings [24]. These reductions
13 disproportionately affected nontenured faculty who are predominately women and members of
14 underrepresented in medicine and science (URiMS), further exacerbating inequities in lifetime
15 earnings for these groups [2].

16 17 Work-Life Balance and Support Systems

18 Although work-life integration was a pre-pandemic concern [5], the pandemic magnified it
19 further as daycares and schools closed initially and then continued to close intermittently.
20 Women physicians were more likely than men physicians to be responsible for childcare or
21 schooling (25% vs 0.8%) and household tasks (31% vs 7%) during the pandemic [30].
22 Furthermore, early reports found that mothers were 23% more likely to have left paid work

1 after the start of the pandemic and experienced more interruptions when working at home
2 than fathers [31]. In the US, ~29% of healthcare workers require childcare for children aged 3-
3 12 years [32]. The true estimate of childcare needs is likely much higher, if children < 3 years of
4 age or special needs children aged 13 years or older are included.

5
6 As COVID-19 has disproportionately affected racially and ethnically marginalized communities,
7 faculty belonging to those communities have shouldered additional challenges [34]. For
8 example, one study found that a major ongoing concern to URiMS physicians was the threat of
9 COVID-19 exposure to them or their families [35]. Many URiMS women faculty play major roles
10 in academia as primary mentors for URiMS trainees, serve as the primary economic provider for
11 their families, and are the primary caretakers of children, parents, and older family members [2,
12 36].

13
14 How did academic institutions respond to these challenges during the pandemic? At the start of
15 the pandemic, only 32% of academic institutions that completed an Association of American
16 Medical Colleges (AAMC) survey indicated that they had on-site childcare, with none providing
17 24/7 care, and over half reporting no childcare at all [37]. In response to the pandemic, 62% of
18 institutions that provided childcare prior to the pandemic further expanded childcare options,
19 while 93% of the institutions reporting no childcare support did not institute childcare support
20 during the pandemic [37]. Some of the solutions implemented by academic institutions were
21 subscriptions to organizations that facilitate care for children and elders, organization of
22 student babysitters, and partnerships with YMCA to create fee-based camps for families with

1 secondary school students to support virtual learning [37]. Financial assistance to defer
2 unexpected family care costs was offered by some academic institutions through hardship
3 funds or scholarships. However, most faculty did not utilize these options at the very start of
4 the pandemic, when 70% of faculty met their childcare obligations by splitting time with a
5 partner/co-parent and 15% independently cared for their child(ren)[28]. Only 1.2% utilized a
6 daycare at this time (many of which were closed and re-opened later at reduced capacity to
7 allow for social distancing and thus had limited availability) and 4.9% a nanny/babysitter [28].
8 Many childcare agencies lacked full-time staff during the pandemic further limiting the
9 availability of childcare.

10

11 Academic Productivity

12 Although the number of COVID-19 pandemic related publications increased drastically, the
13 pandemic negatively impacted traditional metrics of academic productivity, particularly among
14 women. First author and corresponding author submissions by women decreased nearly 20%
15 between pre-pandemic and pandemic periods [26-28]. This was even more pronounced for
16 women who were also ESF, URiMS, or mothers of young children [27, 29]. In contrast,
17 manuscript submissions by men in academia without children were least impacted [28, 29]. In
18 addition, women COVID-19 experts were quoted 3-fold less often in the media than men peers
19 [2, 25].

20

21 However, the observed negative impact of the pandemic was not restricted to women, as early-
22 stage scientists of all genders with at least one child five years of age or younger experienced

1 17% declines in research time [33]. In addition, faculty of all genders with children aged five
2 years or younger self-reported the submission of fewer first author papers, reduced acceptance
3 of peer review assignments, and attendance at fewer funding panel meetings during the
4 pandemic compared to pre-pandemic times [28].

5
6 In summary, in addition to the increased burden on ID faculty posed by the COVID-19
7 pandemic, especially for ESF, gender and dependent status intersected with ethnic and racial
8 inequities and exacerbated existing gaps during this time.

9 10 **Incentive for Intervention**

11 There are many reasons that academic institutions should equitably recruit and retain early-
12 stage investigators. Beyond a moral imperative to generate equal opportunities, economic
13 forecasts predict that if gender gaps in employment exacerbated by the pandemic are not
14 addressed, the global gross domestic product (GDP) could be \$1 trillion lower in 2030.

15 Conversely, if gender gaps are addressed, this could add \$13 trillion to global GDP by 2030 [38].

16 Moreover, a financial incentive exists for medical schools to address gender inequities, as
17 companies with the greatest gender diversity are more likely to have improved profitability
18 than those with the least [38]. Modeling studies have also found it would be less expensive to

19 provide childcare for healthcare workers than to bear the cost of healthcare worker

20 absenteeism during school closures [39]. Furthermore, it is more cost-effective to retain

21 existing ESF than to replace them [40]. In addition to financial incentives, recruitment and

22 retention of early-stage investigators bring innovative ideas, new skill sets, and diversity of

1 thought to research teams and foster mentoring relationships that are rewarding for both
2 early-stage and more senior investigators (authors' unpublished data). Retention and growth of
3 ESF are critical to the future of academic biomedical science.

5 **Pandemic Silver Linings**

6 Although the pre-pandemic workplace culture prioritized in-person accountability, overlapping
7 family care and work priorities during the pandemic led to expanded access to technologies
8 that enabled remote work. This change brought several benefits. First, it demonstrated
9 innovation on the part of institutions who were historically reticent to support remote, flexible
10 schedules for fear of reduced productivity. Second, it expanded access for early-stage
11 investigators, faculty with disabilities, women, and URiMS and lowered the cost of attendance
12 of scientific meetings for physicians and scientists in low- and middle-income countries [2].
13 Third, flexible hours and asynchronous schedules enabled a departure from rigid 9-to-5 office
14 schedules, allowing employees to tailor their work schedule to accommodate scheduling
15 conflicts, travel, and personal commitments, as well as to maximize their most productive
16 hours. This approach adapts well to academic work including grant and manuscript writing that
17 can easily occur off-campus. Furthermore, remote work offers expanded support to early-stage
18 investigators via support groups [41]. Regarding support groups for early-stage investigators,
19 our Infectious Diseases Clinical Research Consortium (IDCRC) Mentorship Program virtual
20 monthly meetings have allowed us to discuss common problems and provide solutions. They
21 also enabled us to generate this manuscript outlining the challenges to ESF during the
22 pandemic with proposed recommendations.

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While there are many benefits to working remotely, there are also unique challenges. For instance, remote work could hinder team building and collaboration among researchers and contribute to social isolation [42]. In addition, the working at home role could become embedded in the family structure and lead to the inability to separate work-life boundaries. This is exemplified by multitasking from switching between work-family roles and failure to disengage from work [2].

Actionable Recommendations

Although the impact of the COVID-19 pandemic on ESF careers will be long-lasting due to loss of productivity, resulting in shortened career trajectories and ESF exiting academia, institutional memory may not be. It is important to capture these impacts now so that their detrimental nature can be understood, and subsequent pandemic or disaster-related responses can be more carefully planned. Indeed, every person lost to the field embodies a decade of wasted training. Moreover, although it may be tempting to diminish the urgency of equity discussions because of the perceived short-term nature of the COVID-19 pandemic, ESF routinely face life circumstances that have long-term career impacts (e.g., family care, personal disabilities, natural disasters). To increase recruitment and retention to the ID pipeline and ensure the competitiveness of academic institutions and funding agencies, we propose the following goals and actionable recommendations to achieve those goals (**Table 1**): 1.Track data and conduct needs assessments; 2. Implement modern and equitable tenure and promotion guidelines; 3. Create family-friendly leave policies and flexible work schedules; 4. Expand institutional

1 caregiving provisions; 5. Implement and grow targeted mentorship and sponsorship
2 opportunities; 6. Increase visibility and access to ID-related careers; 7. Expand grant programs
3 designed to recruit and retain early-stage talent. We further encourage institutions that make
4 such changes to conduct impact studies to learn what works.

6 **Conclusion**

7 We and others cited herein have highlighted challenges and suggested actionable
8 recommendations to existing inequities exacerbated by the COVID-19 pandemic. With
9 thoughtful and systematic changes, we can make the ID workforce more robust, equitable and
10 diverse. These investments will not only have a profound and positive impact on all genders,
11 races, and ethnicities, but will also, in time, help resolve the leaky ID pipeline by attracting
12 talented ESF and shoring up staffing in our strained field. The pandemic has taught us that we
13 can find creative solutions during times of duress. Just as ID leaders have shone over the past
14 two years of the pandemic for their work on diagnostics, vaccines, and therapeutics, we can
15 again take the lead by revolutionizing the recruitment, retention, and advancement of ID ESF.
16 We hope to inspire change and promote policies and programs that exemplify the shared ideals
17 of diversity and inclusion to prepare us for the next pandemic or disaster-associated public
18 health crisis.

19

20

1 **Notes**

2

3 **Acknowledgments**

4 The authors would like to sincerely thank IDCRC Leadership for their support on this topic.

5

6 **Funding:** This work was supported by the Infectious Diseases Clinical Research Consortium
7 through the National Institute of Allergy and Infectious Diseases, part of the National Institutes
8 of Health [grant number UM1AI148684 (IDCRC Leadership Group) and UM1AI148685 (SF)]. The
9 content is solely the responsibility of the authors and does not necessarily represent the official
10 views of the National Institutes of Health. KME reports support from NIH (support for
11 mentoring investigators). LDI reports NIH/NIAID (paid to institution). AW reports support from
12 NIH. TBR reports support from U19 AI144133, UW STI CRC Developmental Research Project and
13 T32 AI07140, UW STD/AIDS Research Training Grant. No author has a potential conflict of
14 interest related to the content of this manuscript.

15 **Conflict of Interest:** The authors would like to disclose the following relationships unrelated to
16 the manuscript: grants or contracts: NIH, Sanofi and GSK (AW), CDC for Vaccine safety studies
17 (KME), 1UM1AI148372-01 – NIH (LDI), HHSN272201600016C – NIH (LDI), HHSN272201600014C
18 – NIH (LDI), 5UL1TR000077 – NIH (LDI), 5U101AI163099 – NIH (LDI), Ansun BioPharma (LDI),
19 Astellas (LDI), Merck (LDI and IO), Pfizer (LDI), Takeda (LDI), AiCuris (LDI), HSK is funded by the
20 Research Supplement from the National Cancer Institute at the National Institutes of Health

1 (R01 CA213130-S), the Department of Medicine Diversity Academic Development Scholar
2 Award at the University of Washington, and Bristol Myers Squibb Foundation – National
3 Medical Fellowships; Royalties or licenses: UpToDate (AW); Consulting fees: Bionet and IBM
4 (KME); Takeda (LDI); Aicuris, Crozet, Auritec, Dxnow, Gilead (AW); Payment or honoraria: RMEI
5 (LDI); Support for attending meetings/travel: ID SAFE: Swiss Infectious Disease Meeting (LDI);
6 Innovative Molecules (AW); Participation on a Data Safety Monitoring Board or Advisory Board
7 (Pfizer, Sanofi, Seqirus, Merck, Moderna, Roche, X-4 Pharma (KME); Merck (LDI); Merck, X-Vax,
8 Vir, Curevo (AW); Leadership or fiduciary role: International Society of Heart and Lung
9 Transplantation, Executive Board (LDI). International Society of Heart and Lung Transplantation
10 as Past-President (LDI) and the Chair for Disease Transmission Ad Hoc committee (OPTN/UNOS)
11 (LDI); Research Affairs Committee, PIDS (LMH); Receipt of equipment, materials, drugs, medical
12 writing, gifts, or other services: Merck vaccine for a clinical trial (AW).

13

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TABLE 1 – Proposed Goals and Actionable Recommendations

Goals	Actionable Recommendations
<p>1. Track data and conduct needs assessments</p> <p>– To propose effective solutions, we must first understand factors associated with ESF exit and retention in ID. Some of these metrics might be collected as part of the National Residency and Fellowship Matching Program or through the Infectious Diseases Society of America (IDSA) and the Pediatric Infectious Diseases Society (PIDS).</p>	<ul style="list-style-type: none">• Regularly survey existing ID programs to understand inequities in the following areas on the basis of career-stage, gender, race, ethnicity, and family care obligations:<ul style="list-style-type: none">• Attrition rates due to job loss, resignation, or leave(s) of absence• Wellness and career satisfaction• Tenure and promotion rates• Hire rates among new faculty and trainees• Clinical effort assignments (especially when workforce reduced), bonuses, start-up packages, and career development funds
<p>2. Implement modern and equitable tenure and promotion guidelines – Tenure clock extensions may partially compensate for lost productivity during the pandemic. However, tenure extension applications can be arduous</p>	<ul style="list-style-type: none">• Optional tenure clock extension• Retroactive promotion salary increases when promotion/tenure delayed [44]• Develop frameworks to track new contributions to the pandemic response in

and prone to bias. Implementation of automatic and “gender neutral” tenure extension policies may in fact have the opposite intended effect by reducing tenure rates of women and increasing the tenure rates of men and decreasing life-long earning potentials and opportunities in leadership or research that require tenure [15, 43]. A report from the National Academies of Science, Engineering and Medicine found that instead of tenure clock extensions, some respondents preferred an acknowledgement that pandemic years will result in lower productivity [2].

faculty reviews and curricula vitae [44][15, 45]

- Incorporate new metrics into tenure and promotion committee review criteria [37]

3. Create family-friendly leave policies and flexible work schedules – Pandemic-associated illness, quarantine, and testing requirements highlighted the inadequacy of federal and institutional family and medical leave programs. For example, the family leave allowances for international medical graduates (IMG), who constitute a substantial

- Adoption of universal yearly paid family and medical leave to provide equitable and reliable support in the event of illness or for the extensive physical and emotional demands of a new biological, adopted, or foster child or elder care. However, as gender-neutral leave policies may have differing impacts on men and women’s

portion of the physician work force, is limited by visa status. The pandemic also emphasized the need for flexible work options, which predated COVID-19, but was exacerbated by shifting limitations in family care.

career trajectories, more research is needed on this topic [43, 46]

- Allow for flexible work schedules, including part-time options and block schedules (e.g., four ten-hour work days), to retain faculty who have shifting family care responsibilities

4. Expand institutional caregiving provisions

– Reliable, affordable child and elder care was a major gap for working professionals prior to the pandemic that was further exacerbated during the pandemic, particularly for ESF – who often care for both young and elderly family members. Adequate family care is key to early-stage investigator recruitment and retention [46].

- Expand institutional investment in on-site daycare with local market rates and sufficient availability, including virtual learning centers during future public health emergencies
- Expand institutional support for accessing and contracting home care for children, including those with special needs, and aging or recovering family members
- Expand income-based dependent care stipend and subsidy programs to support caregiving costs

5. Implement and grow targeted mentorship and sponsorship opportunities – Multiple

- Provide tailored mentoring approaches to consider the need of each mentee and

studies have demonstrated the impact of mentorship on success in academic medicine [47, 48]. Mentorship can benefit ESF in numerous ways, including scholarship productivity, networking, promotion, retention, and career satisfaction.

Nevertheless, gender disparities persist in the access to both formal and informal mentorship. In this way, mentorship represents an actionable intervention that can be implemented both at an institutional, or equally importantly, at an individual level.

Mentorship can take many forms during one's career, from dyad (mentor-mentee) relationships, to peer mentoring, to facilitated groups and formal leadership training programs. Mentors may function as research advisors, sponsors, career development mentors, or identity mentors. Mentors for URiMS are particularly needed, although mentors do not need to match mentees in gender, race, or ethnicity. As a group, we

address them at early-career stages (e.g., facilitate professional and cultural networking opportunities, manuscript and grant writing groups, leadership development training courses) [37][49]

- Include recruitment, retention, and promotion of women and URiMS metrics into departmental or institutional goals

cannot overstate the impact of mentorship on our own career development. Many of us credit our mentors for our sustained productivity and for opportunities during the COVID-19 pandemic and beyond. Closing the gender gap in mentorship could reap enormous benefits, not only for mentees and reciprocally for mentors, but also for our field through the equitable recruitment, retention, and promotion of a diverse, connected group of colleagues.

6. Increase visibility and access to ID-related careers – ID is a vibrant field that now, more than ever, needs sufficient members to respond to pandemic threats and other public health-related emergencies. It is critical to review our pipeline and implement changes that will expand the ID force in the coming years. A growing number of medical schools are implementing innovative ways to reduce compounding economic stresses for first generation physicians and those without

- Advocate and work actively with IDSA, PIDS, and other decision-making organizations to increase the recognition and value of ID specialists who have been under-compensated, particularly during the COVID-19 pandemic [9], and extend higher salaries to ID physicians and scientists
- Increase participation of the ID workforce in national and regional public health campaigns to gain the trust and interest of

options to pay tuition at a time when early-stage investigators are choosing fields of study and starting families. This can be especially beneficial for individuals pursuing careers in ID where the pay is substantially less than most other subspecialties.

the general population

- Offer tuition-free medical education and/or expand loan repayment programs for medical graduates pursuing ID and ID ESF paying student loans
- Address specific needs that IMGs face in becoming an ID faculty; e.g., by expanding visa waiver eligibility criteria to include subspecialties like ID and/or by creating a path that allows academic institutions to retain IMG fellows as faculty

7. Expand grant programs designed to recruit and retain early-stage talent –Although many funding bodies implemented no cost extensions to alleviate the impact of reduced productivity at the start of the pandemic, these measures alone were insufficient to establish equity [2]. The National Institutes of Health also created *funded* grant extensions for early-career investigators whose research was disrupted by the pandemic (e.g., NOT-AI-21-051). While we applaud this initiative, it

- Expand *funded* grant extensions for ESF whose research was disrupted by the pandemic
- Expand funding mechanisms that support ESF with demonstrated family caregiving responsibilities like the Doris Duke Charitable Foundation Fund to Retain Clinical Scientists [50]
- Expand eligibility for ESF funding, for example by addressing age cut-offs or

was too short-lived. Such funding mechanisms should be reinstated and remain until the pandemic has ended. Equitable access to grant funding also requires acknowledgement of ESF challenges such as the realities of family caregiving responsibilities. Some institutions created pilot intramural programs to support those with family care obligations during the pandemic, but eligibility was limited.

time-since-training cut-offs, as some early-stage investigators, particularly women who take maternity leave, are categorized as mid-stage faculty when they are still early-stage academically

- Expand funding mechanisms for non-permanent residents or non-US citizens (e.g., IMG)
- Expand the pool of career development awards including additional T, K, U and F32 awards [4]
- Offer institutional seed grants for preliminary data collection, assistance with grant preparation, and identification of funding opportunities

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