

# Synthesis of Responses to NIGMS Request for Information on Strategies to Enhance Physician-Scientist Training Through the Medical Scientist Training Program

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## Introduction

NIGMS has a longstanding commitment to developing the next generation of biomedical scientists through a variety of programs, including the M.D.-Ph.D. dual degree Medical Scientist Training Program (MSTP). This program provides Ruth L. Kirschstein Institutional Predoctoral Training Grant (T32) awards to medical institutions that are responsible for training physician-scientists.

On June 9, 2017, NIGMS published a Request for Information (RFI; [NOT-GM-17-009](#)) to obtain input from the broader community on how to catalyze the modernization of dual degree graduate education through NIGMS' institutional predoctoral training grants program. The RFI, and an accompanying [Feedback Loop blog post](#), asked community members (including current and former MSTP trainees) to provide input on the following broad areas:

- **Trainees** (e.g., time of recruitment to the MSTP, diversity of the applicant pool and selection criteria)
- **Financing/funding** (e.g., how different M.D.-Ph.D. funding models influence the range of institutions that apply for MSTP support, the pool of trainees and the trainees' commitment to research careers)
- **Dual-degree training** (e.g., time-to-degree, integration of curriculum, training areas, mentoring and career advising)
- **NIGMS management of MSTP grants** (e.g., size, number and distribution of training programs; evaluation of outcomes; and peer review)
- **Anything else** specific to MSTP training felt to be important for NIH to consider with respect to enhancing M.D.-Ph.D. training and the persistence of physician-scientist trainees in research careers (note that changes in post-M.D.-Ph.D. training and future research support are outside of the scope of this RFI)

The RFI closed on August 9, 2017. A total of 253 unique responders submitted their comments through an online form, the *Feedback Loop* blog and direct email to NIGMS staff members. The response rates ranged from 41-83% across the seventeen themes raised in the RFI that responders were asked to submit comments about. On average, each respondent provided input on 10 themes resulting in a total of more than 2,500 comments. Most of the responses were anonymous, but the content indicated that they were submitted by current and former M.D.-Ph.D. students, faculty, institutions and professional societies. Stakeholder

organizations, including the Association of American Medical Colleges and the American Physician-Scientist Association provided comments.

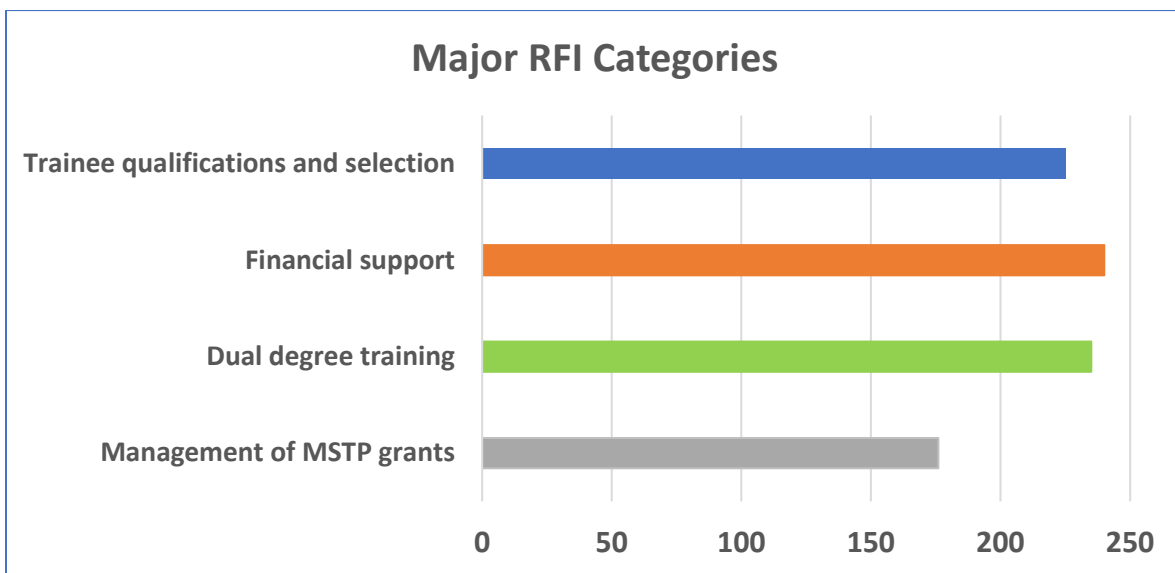
## Analysis Approach

A team of two NIGMS staff independently read all the submitted responses. In addition, a text mining approach was applied for obtaining a quantitative view of sub-categories brought up in the comments. The report below summarizes the responses received to each topic and includes individual quotes.

## Results

The RFI defined four major categories and **Figure 1** shows the distribution and number of responses received for each of the major categories.

**Figure 1** shows the distribution and number of responders addressing each of the major categories.

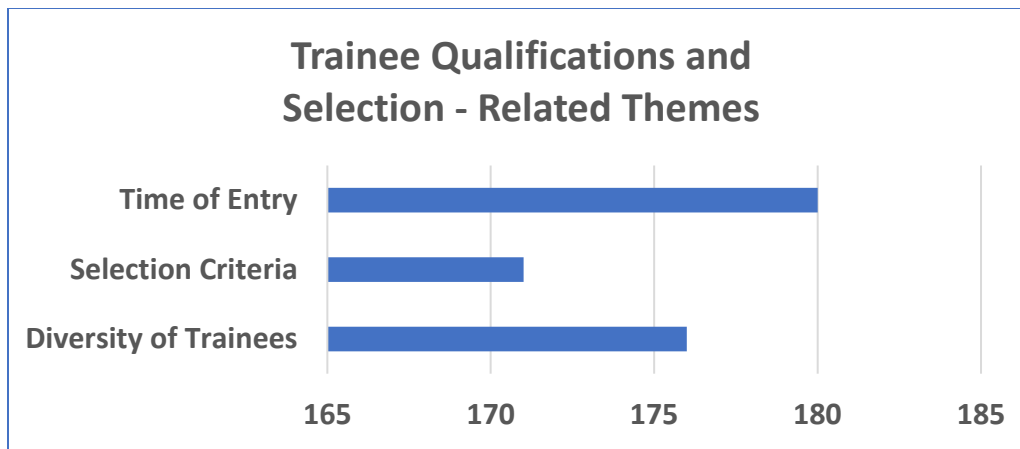


Each category encompassed several themes for which the RFI requested input from the community.

### Category 1: Trainee qualifications and selection:

- A. Time of entry
- B. Selection criteria
- C. Diversity of trainees

**Figure 2** shows the distribution and number of responses received regarding each of the major themes of category 1.



A. **Time of entry:** When it comes to the time of entry into the dual degree program, most responses suggested that trainees should enroll before entering medical school. The main reasons mentioned were:

- trainees really need to be able to choose the school based on both the medical and Ph.D. components. Students already in medical school would be limited to their home institution’s dual degree program.
- Later entry into MSTP would limit opportunity for intervention.
- Students should figure out early during their undergraduate phase if they want to pursue a M.D.-Ph.D. in order to be competitive for the program (for example by gaining additional research experience)

Other responses advocated for the majority of trainees being selected before entering medical school, but allowing for some flexibility for a small number of students to enter during their first or second year of medical school. These comments emphasized that many students are not aware of the existence of the dual degree programs early enough and there should be more outreach to undergraduates.

In addition to entering the M.D.-Ph.D. program before or during the first years of medical school, several responses emphasized there should also be a path for students in Ph.D. training to enter the dual degree program, for example:

*“The key is identifying trainees who are more interested in research than in medicine, and who can be convinced to pursue medicine; an excellent practice in this regard would be to identify promising candidates who are already in Ph.D., but not M.D.-Ph.D. programs.”*

While there are no comparative data about the outcomes of trainees entering before or after starting medical school, several responses described personal experiences noting the ultimate long-term commitment of a trainee to completing the dual degree and staying in research does not seem to be determined by the time point of entrance into the dual-degree program, but by the readiness and knowledge about what a physician-scientist is and what the training entails. These comments support the notion of allowing for multiple on-ramps for entering a M.D.-Ph.D. program towards becoming a physician-scientist.

B. **Selection criteria:** An important criterion utilized for selection of trainees into the MSTP is prior research experience. Many responses highlighted the importance of meaningful exposure to research opportunities before entering the dual-degree training to ensure the students understand the pace and requirements of full-time laboratory research during the Ph.D. phase and to increase the likelihood of a long-term commitment to a research career. While students might be able to gain some research experience while in medical school, several responses pointed out that this is not comparable to that of students entering medical school with significant research experience, such as through a gap year of post-bac research:

*“A year of full time research experience beyond undergraduate years is vital to picking students likely to continue as physician-scientists”*

*“Someone without prior research exposure will have only an idealized concept of what being a physician-scientist means.”*

*“I don't think anyone without prior research exposure should ever enroll in an MSTP. And the research experience should be substantial, not just a single summer.”*

In contrast, others commented that the ever-increasing emphasis on extensive prior research experience can have unintended consequences as it further prolongs the overall time of training and increases the age at which students enter into the dual-degree training program.

*“There is a new phenomenon of “gap” years being practically a prerequisite to be accepted into top tier institutions as well as MSTPs. Unfortunately, these are a disservice for the training program and persistence into a research career: Aptitude, as opposed to accomplishments, should be emphasized.”*

*“One troubling trend is the number of students that are taking several years after graduating college prior to matriculating in a MSTP; should discourage students from seeking multiple years of research experience to be competitive for MSTP”*

Multiple responses stressed the importance of increasing the opportunities for early exposure to research in undergraduate years and high school to enhance the chances of students acquiring the experiences needed to make better career decisions.

#### C. Diversity of trainees:

Several comments indicated the importance of reaching students early to ‘expand the pool,’ such as in high school and middle school, to raise awareness of the existence of these programs and careers. Many current and former MSTP trainees pointed out they had not been aware of the MSTPs until their senior year in college.

*“Program/degree advisors at undergraduate institutions, especially at institutions that have a more diverse student body, should be made more aware that MSTP programs exist so that they can guide students with the interests and intelligence towards the program.”*

*“Most folks at institutions not affiliated with a medical school with an MSTP are not aware of MSTPs.”*

*“High-school and college students are continuously exposed to athlete careers, but not to physician-scientist careers”*

The costs involved for applying to medical schools can also be a barrier to recruit a diverse pool of students; one respondent wrote: *“Most students spend thousands of dollars on applications - this is an absurd commitment. I have multiple medical school classmates who had to take on thousands of dollars of loans to apply to medical school.”*

Responses also stressed the critical importance of role models when aiming to enhance the diversity of MSTP trainees.

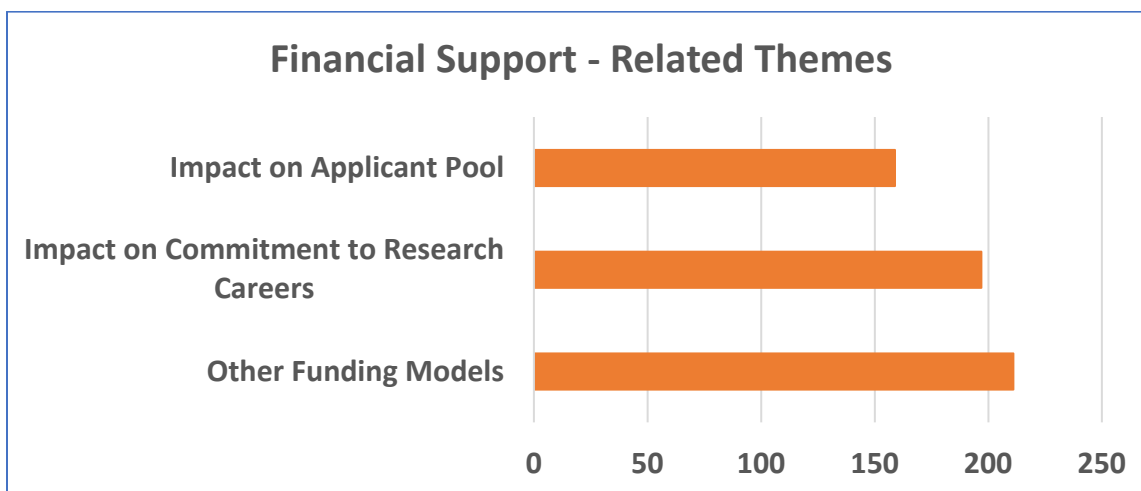
*“Identify individuals who are demographically matched to the trainees to be recruited, who have successful physician-scientist careers, and who have the time and interest in serving in a mentoring role for predoctoral trainees”*

Trainee pool diversity may also be enhanced through further expansion of the fields of study available for thesis research as described in a professional society’s response: *“Supporting graduate degrees in various areas of study: social sciences and humanities, decision analytics, biostatistics, etc. would, in turn, diversify the population of dual degree applicants.”*

### Category 2: Financial Support:

The RFI requested input on how the current system of trainee financial support influences the pool of applicants to the M.D.-Ph.D. programs (A. Impact on applicant pool), the impact of the support on the trainee’s persistence in research (B. Impact on commitment to research careers), and how other funding models might influence these parameters (C. Other funding models).

**Figure 3** shows the distribution and number of responses received for each of the major themes of the financial support category.



A. Impact on Applicant Pool: (as it relates to the current financial support for MSTP trainees)

A large number of comments stressed the importance of the currently practiced full support throughout the dual-degree training. As one current trainee noted:

*“As someone nearing the end of my program, I really think it was essential that it be fully funded as it was. 1. My M.D. peers are currently becoming attendings, 2. I'm old. 3. I have a very long residency ahead of me as I'm planning to go down a research track in Internal Medicine with a subspecialty 4. Even at the end of all of this I'm going to be in a relatively low-paying primarily research position. If I was in debt from this program as well as for my undergraduate, the sad fact is that I couldn't justify doing what I'm doing.”*

Responses emphasized the considerable opportunity cost of dual-degree training due to the deferral of earning potential and relatively modest academic research salaries: *“Requiring trainees to bear some of the training cost would have a large, negative impact on recruitment and retention given the length of training required.”* Another response noted: *“This is a career path that will provide less income overall and it takes twice as long to finish training. Complete debt forgiveness is an essential component to this career path.”*

A decrease in financial support for trainees throughout the training period might have a particularly negative impact on diversity:

*“If applicants shouldered some of the cost this would negatively impact students from public universities or minority-serving institutions.”*

*“It would weed out low-income, minority, and first-generation applicants without built-up wealth.”*

*“Financial assistance is absolutely critical to encourage socioeconomic diversity among the trainees, to encourage diversity in specialty choice among graduates, and to encourage all graduates to continue with research careers.”*

However, a few responses suggested that if applicants were selected from enrolled medical students who have already assumed the cost of the first year or two of medical school, more students with greater commitment to research would be identified.

#### B. Impact on commitment to research careers:

The probability of trainees staying in a research career is influenced by numerous factors, especially the existence or lack of opportunities and grant support post-graduation, as several responses highlighted. When it comes to the dual-degree training phase, the availability of financial support throughout training was frequently cited as a critical factor for the decision to pursue a physician-scientist career and for being able to persist in a research career.

Several responses noted student debt is an established driver of leakiness in the physician-scientist pipeline and cited the following references as examples: Ley & Rosenberg, *N Engl J Med*, 2002; Tong et al., *J Am Coll Cardiol*, 2014; Weinert et al., *Am J Respir Crit Care Med* 2006; Keswani et al., *Ann Surg* 2017.

#### Others commented:

*“My biggest concern is that in the future I will be more lucrative to my department as a clinician than as a researcher and get pushed out of research. I am also afraid that I will have a hard time finding enough grant money to support my salary as a clinician.”*

*“There is a psychological impact of receiving a subsidized education that encourages the trainees to continue on a research track. There should be some kind of nonbinding form to sign making this commitment / expectation more explicit.”*

*“Long term commitment to a research career is more dependent on a person’s engagement in the scientific area, strong mentorship, strong institutional support, and strong skills to maintain competitiveness when competing for grant funding which all contribute to ‘confidence’ that they can be successful in research and not ‘quit’ with the first unfunded grant or rejected manuscript.”*

#### C. Other funding models:

Responses addressing the theme of current versus other possible funding models predominantly stressed that any model other than full training support would likely have a detrimental impact on the physician scientist workforce. One response noted: *“There can be no reasonable expectation to sacrifice this much time and potential income and be asked to take out loans to pay part of my tuition.”*

At the same time, several responses commented on instituting some form of payback agreement, in case a trainee does not complete the dual-degree, would be a reasonable expectation:

*“Post-grad service requirements would be interesting to explore.”*

*“I would favor some type of disincentive for trainees choosing to leave research for lucrative careers in clinical practice.”*

*“Post-graduate service requirement is potentially interesting and may be feasible if it were to further confine trainees to stay in a research track, though I would think further funding would need to become available for supporting those trainees that stayed in research.”*

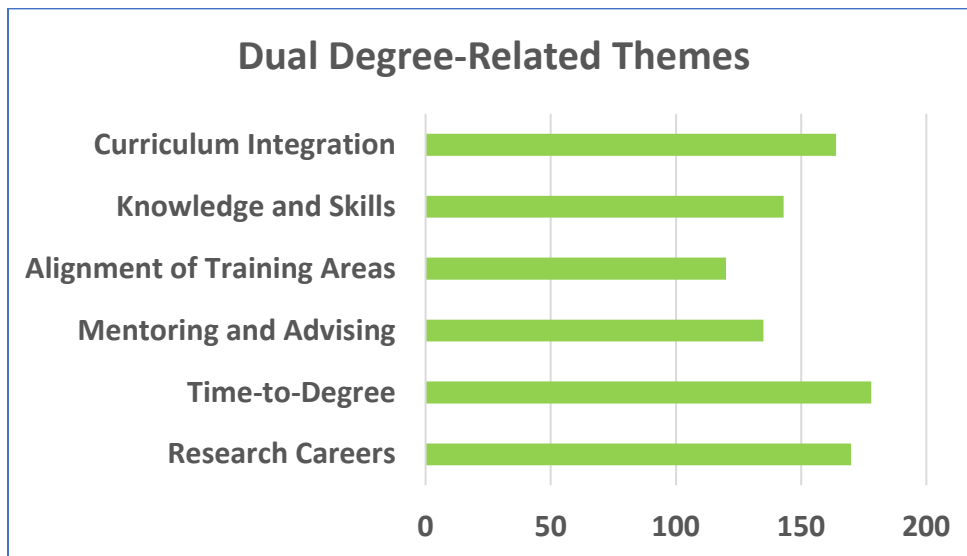
*“Postgraduate service requirements seem more reasonable, less likely to present barriers to the financially disadvantaged, and could create a clearer pathway back to research at the completion of residency.”*

*“Post-graduation service requirements could be implemented at the residency level on a trial basis to encourage MSTP graduates to pursue research projects while in residency training. However, service requirements should not be applied post-residency to early career investigators due to widespread problems with funding of early career individuals.”*

### Category 3: Dual-degree training:

- A. Integration of curriculum
- B. Essential knowledge and skills
- C. Alignment of training areas with future career options
- D. Improving mentoring and advising
- E. Decreasing time-to-degree
- F. Encouraging research careers

Figure 4 illustrates the number of responses to each theme under category 3.



#### A. Integration of curriculum:

Responses regarding additional approaches to further integrate the basic medical education, research experiments, and clinical training, as well as to enhance the M.D.-Ph.D. training, noted that many schools had

and are continuing to take steps to promote integration of the curriculum. Specific programs were cited as good examples, but many comments also noted that opportunities for curriculum integration varied greatly by institution, program, and even individual student and this would be a challenge to developing uniform guidance. Even with these challenges noted, there were multiple comments indicating there could be creative approaches to curriculum integration, but this may involve a radical change from the conventional approach. Quotes reflecting these sentiments are included below:

*“Integrate more of the training across all the years of the training, rather than having them siloed into two years of clinical training, x years of research training, then a final two years of clinical training.”*

*“Unfortunately, I cannot think of a way to accomplish this in a top-down manner- it is so highly dependent on the individual programs, the medical school curriculum, and the labs and students that I think that broad policies addressing this may not be the most advantageous way to deal with these issues.”*

*“Let’s focus more on the outcome. We recruit trainees before start med school and design individualized 7-8 years of training based on each student background, experiences and situation. This early career design allows for the integration of both research and clinical studies, and gives trainees an opportunity to ‘become comfortable’ living a dual lifestyle. This socialization into the researcher clinician life is essential to reduce attrition.”*

#### B. Essential knowledge and skills:

Responses about the essential knowledge and skills required of physician-scientists to be *successful researchers and leaders* were wide-ranging. Many responses focused on professional skills such as communication and leadership. Other responses focused on research skills advocating more training in biostatistics and conducting rigorous research. Grant-writing was also prominently featured and many of the comments reflected the need to develop this skill early as part of the dual-degree program. In addition, learning more about industry and government roles in improving human health were highlighted as ways to provide physician-scientists a more complete view of the full spectrum of the areas of healthcare where they could have an impact.

*“Often overlooked are the knowledge and skills beyond research and critical thinking needed for success in an academic (or other) environment. For example, early exposure to the academic hierarchy and expectations for faculty are essential to retention of M.D.-Ph.D. trainees in the academic arena. Additionally, leadership training as part of the M.D.-Ph.D. curriculum is often overlooked but as physician-scientists hold a special position between research and clinical worlds they are also poised to be leaders in both.”*

*“Grantsmanship - often missing from graduate training”*

*“There is almost no formal required training in the M.D.-Ph.D. route about industry and government. If you want trainees to ultimately bring a new therapy from the bench to bedside, why not require them to experience the process in industry to see how it is done outside of academia or have an experience at the FDA so they gain an understanding of the barriers they will face. In today's world, trainees have to wait until after they complete the entire dual degree before they can*



*do this, and this usually necessitates leaving clinical medicine since it is difficult to take a year off after the end of medical school and the beginning of residency.”*

#### C. Alignment of training areas with future career options:

The need for more people trained in specific areas such as data science was included among the responses about alignment of MSTP research training areas with future needs of the biomedical enterprise. Many responses echoed similar comments as those raised under the topic above about the essential knowledge and skills. Greater exposure to industry given the role of this sector in bringing advances from the laboratory to the clinic was a recurring view. Other comments indicated that focusing on specific research areas was too narrow and the emphasis should continue to be on strong foundational training that has broad applicability.

*“Biomedicine needs to train more students in large scale data analysis. The vast amount of health information is going to change the nature of medical science discovery, and we should be ensuring that computationally oriented students commit those skill sets to analysis of health data.”*

*“More interdisciplinary exposure between industry/government and academia should be considered to meet the future needs of the biomedical enterprise.”*

*“MSTP's should first and foremost learn how to do high quality, carefully controlled, significant reproducible science whatever the field or graduate program. Learning to be an excellent scientist, understanding the bidirectional dependence and enrichment of laboratory (or decision) science and clinical trials/clinical practice and learning to publish and earn support are the core values of MSTP graduate research. These are highly transferrable skills and an attempt to shoehorn these competencies at this stage of training into the service of emerging scientific trends is likely to undernourish the enterprise needed to advance biomedicine.”*

#### D. Improving mentoring and advising:

Comments focused on mentoring and advising emphasized M.D.-Ph.D. students need physician-scientist mentors on their thesis committees, as well as throughout their careers. Multiple mentors and including individuals at different career stages (e.g., peer mentors, early career faculty, and senior faculty) were highlighted. Many comments focused on the length of training and needing mentoring throughout various career transitions. A nation-wide alumni association was also suggested.

*“The duration of this program to career success is SO long, that everything changes between generations. So the technical advice is sometimes outdated, but linking students with successful MSTP grads is helpful.”*

*“Thesis committees should be required to have some M.D. or M.D.-Ph.D. members.”*

*“Nation-wide MSTP Alumni Association”*

*“Programs should try to have longitudinal advising at all stages of students training.”*

*“M.D.-Ph.D. trainees need multiple mentoring sources including mentoring from peers, near peers, residents, early career faculty, and senior mentors. Mentoring should be integrated and multi-modal.”*

#### E. Decreasing time-to-degree:

Responses to the prompt asking about decreasing time-to-degree were varied. Some respondents had suggestions for specific points in the curriculum, such as: shortening or combining the M1 and M2 years, removing duplicate coursework or reducing coursework in graduate school, and considering better use of the M4 year. Beyond the curriculum, factors such as publishing were listed as contributors to length of time in training. Still other respondents indicated M.D.-Ph.D. training should not be shortened unless M.D. and/or Ph.D. training also is shortened. There was concern about maintaining the integrity of both degrees in the dual-degree program.

*"It's pretty integrated already. It would be pretty hard to shorten the training period any more than less than 8 years or 7 at the very least for a select few individuals who are fortunate enough to have projects that succeed quickly."*

*"Reducing redundant classes in medical school and graduate school, making sure that Ph.D. committee members are educated about M.D.-Ph.D. career paths, maybe overlapping graduate school coursework with early medical school clinical rotations so there is not as much clinical time left after graduate school."*

*"I would argue that in many ways the fourth year of medical school is largely wasted and the requirement should be eliminated for MSTP students. I do not think that the Ph.D. should be further shortened."*

*"Reduce MS1 and MS2 into one or 1.5 years. Fast track out of undergrad. The goal of Ph.D. training should be to learn how to think and write like a scientist and develop independent learning skills. Unlike traditional Ph.D. degree holders, our thesis work will be obsolete by the time we are looking for post-doc or faculty positions. Having a viable research project to take away is less important than learning the process. This should take 3-5 years."*

*"A fundamental issue is that in order to be a competitive applicant for NIH grants at the K level and above, trainees need to have a significant number of high quality first author publications from their Ph.D. thesis research. This largely contributes to the longer time to degree now as compared to 20-30 years ago. Research is more complicated; mouse experiments take longer and high quality journals demand more data to merit publication. It is probably a disservice to trainees to push them through programs without obtaining the publication record that will make them competitive applicants for funding at the next level of training, i.e., K08/K23 awards."*

*"I am not in favor of decreasing the time-to-degree, unless it is also decreased for single M.D. and Ph.D. degrees. Much of the credibility of the M.D.-Ph.D. rests on the degrees being equivalent to those earned separately."*

It is possible that more emphasis on individual mentoring and flexible graduation schedules could lead to a shorter time to degree on average as one response highlighted:

*"The desire/necessity of regimenting training to address seemingly rigid requirements for graduation and professional certification has materially contributed to the lengthening of time to*

degree, independence and independent funding. Support for a flexible training format can be found in the case study published by Dzirasa et al. (Acad. Med. 90:176-9, 2015).”

#### F. Encouraging Research Careers:

In response to the prompt about how to encourage MSTP trainees to pursue research careers, many respondents referenced activities post-MSTP training that may determine whether a former student stays in a research career. Some of these factors included subsequent research funding, and suggestions were provided for different mechanisms and M.D.-Ph.D. targeted efforts, and availability of research positions. Many comments were similar to those made under the section on mentoring. Interest in maintaining the sense of community and developing specialized offices to guide the careers of M.D.-Ph.D. trainees were also mentioned.

*“More research residency slots. More economic incentives.”*

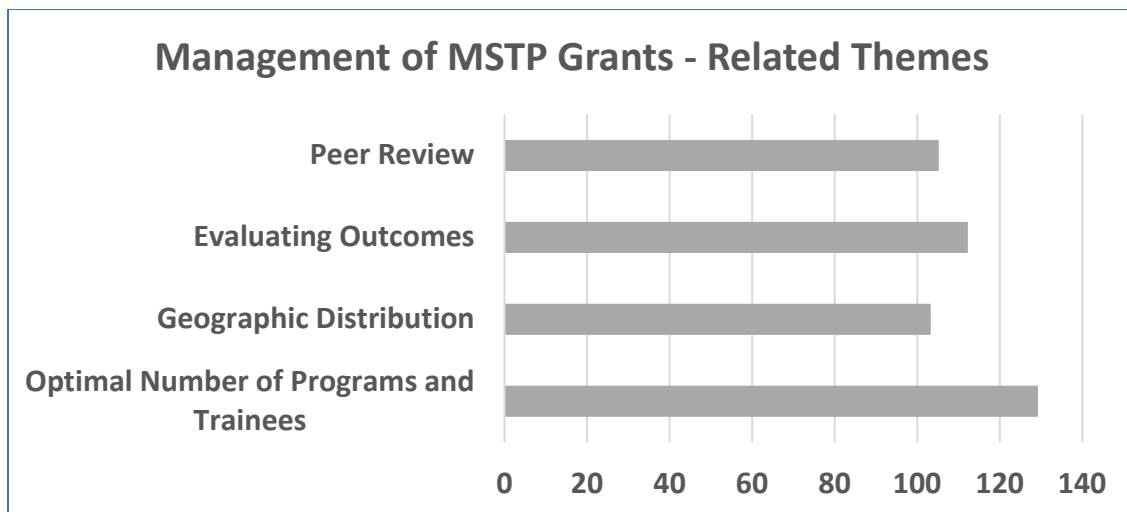
*“PSTP programs seem great. I chose a residency without one for various other reasons, and I missed the community and mentoring of MSTP/PSTP during residency.”*

*“Academic medical centers should be encouraged to have Physician-Scientist Development Offices to help support and encourage trainees at all levels to pursue these careers, which would facilitate near-peer mentoring from former trainees now in residency, fellowship, and junior or senior faculty positions.”*

*“Increase funding or make funding more available for dual degree candidates.”*

#### Category 4: NIGMS Management of MSTP grants:

**Figure 5** shows the distribution and number of responses received regarding each of the major themes of category 4.



#### A. Peer Review:

Regarding factors important for the peer review of MSTP applications, the main emphasis among the responses was on training outcomes, both short-term (such as residency placement, rate of completion of

dual-degree training, and time-to-degree) and long-term (percentage of graduates staying in research careers):

*“Outcomes, outcomes, outcomes -- 10-20 year alumni: how many have real-deal academic jobs as clinician scientists.”*

*“The key is outcomes of the trainees. How many/what proportion of the MSTP graduates continue in careers that combine both research and clinical medicine.”*

*“One thing only - outcome. And outcome measured by record of previous recipients continuing in research. This record must include all MSTP recipients at the school; not just those supported on the T32.”*

It was also noted that reviewers of MSTP applications should include physician-scientists and MSTP directors to ensure the evaluation covers both medical and scientific aspects of the program. However, one comment raised a potential concern:

*“It is rare that a school loses an MSTP grant, or even slots, so the club has become exclusive, fixed, and self-regulated, since MSTP program directors/faculty are often involved in the review of MSTP applications. This can perpetuate existing training formats and stifle innovation.”*

Other areas mentioned frequently regarding review were: Student enthusiasm: *“How about allowing the applicants to actually rate their own programs to the NIGMS much like residents rate their programs to the ACGME?”*, mentorship: *“Percentages of mentors who are themselves M.D.-Ph.D degree holders.”*, and the quality of the science at the institution as well as the number of research opportunities available for trainees both in the clinical and basic science divisions.

## B. Evaluating Outcomes:

Suggestions for evaluation outcomes ranged from those obtained during or immediately following MSTP-training, such as choice of residency program and publications during Ph.D., to more long-term outcomes, such as faculty appointments and subsequent grant funding. Interest in finer understanding of career trajectories and career satisfaction across the different sectors where M.D.-Ph.D. degree holders are likely to be employed were among the responses. Beyond the traditional quantitative measures, there was interest in qualitative feedback from trainees about their experiences and measuring skills attainment rather than focusing on a specific outcome or career path. Making outcomes publicly available on program websites or in other venues was also mentioned. One comment noted the MSTP community would benefit from having a central evaluation center similar to that supported for the NIH Broadening Experiences in Scientific Training (BEST) program. Representative quotes for these topics are included below:

*“We probably need better taxonomy and improved granularity in defining the career outcomes for these trainees who often have multiple responsibilities.”*

*“More qualitative feedback from the trainees on their training experience such as adequacy of mentoring, access to resources, variety of training experiences/exposures to different research topics/settings, plans to continue research, perceived barriers. Need to understand if the goal of MSTP training is to ENTER research careers vs. sustain research career over time--and if sustaining is a goal for how long. There may need to be other metrics for productivity beyond grants and papers, especially for non-academic research careers. Career satisfaction and ‘intent to stay in research’ should be assessed.”*

*“Success could be measured as use of skills obtained in M.D.-Ph.D. training, either medical education and training, clinical or translational research, industry. Rather than focusing on becoming an ROI funded investigator, many possibilities exist for success after training.”*

*“Assemble and publish (web/NIH) the outcome measures listed above -- on a national and program-by-program basis.”*

### C. Geographic distribution:

The current distribution of MSTP funded institutions across the US roughly coincides with population densities and the location of medical schools with large research institutions around them. Many responses were in support of the current distribution:

*“I don't see a strong need to distribute our basic clinician-science workforce equitably across states and cities in the same way that this is important for practicing and especially primary care physicians. Scientific progress in Boston or San Francisco is every bit as useful and rapidly taken up as if the same scientific progress were made in Wyoming.”*

The distribution and concentration of research mentors was highlighted in several responses as a key factor restricting possible locations for M.D.-Ph.D. training:

*“Excellence in research and availability of appropriate mentors is far more important than even geographic distribution of funded programs.”*

*“There should be some geographic distribution, but the primary goal should be quality and outcomes of trainees.”*

*“This is dependent upon the number of well-funded scientists. Medical education has attempted to be standardized since the Flexner report. Basic science training however is incredibly mentor dependent. The location of strong, well-funded mentors dictates this more than anything.”*

Despite broad recognition that there may be valid reasons for the current geographic distribution of MSTP funded programs, commenters pointed out this might negatively impact the diversity of the trainee pool since not all candidates are able to move across the country, especially when committing to a program that will be eight years or more in duration:

*“Many disadvantaged students want to be closer to home, and there are few options in many parts of the country.”*

*“People have geographic constraints on their lifestyle and if MSTP is to be available for all of the best and brightest, then it should accommodate that geographic constraint.”*

*“Not all great candidates can move across the country, there should be MSTP programs in all regions.”*

A few responses took the view that institutional training grants should be replaced by individual fellowships awarded to the dual-degree trainees, thereby removing some of the geographical concentration of MSTP funding.

*“Have the students apply to work in a particular lab or program, and fund them if the grant is good. This is a complete re-imagining of the MSTP training program, but personally, I am a much bigger fan of the current HHMI Medical Research Fellows system of funding medical students who*

*are passionate about research than I am about funding 'x' number of slots at an institution to fill with students."*

#### D. Optimal Number of Programs and Trainees:

Responses addressing the optimal size of MSTPs highlighted advantages and disadvantages of having either larger or smaller training programs. With bigger programs and larger cohorts of M.D.-Ph.D. students, the potential upsides noted were:

- broader exposure to diverse Ph.D.-training areas
- stronger sense of community
- critical mass logistically and administratively
- better able to provide peer-mentoring and next-peer-mentoring

One comment: *"Bigger programs add support and network capabilities that smaller programs don't."*

Other responses though raised possible concerns:

- some students fall between the cracks in larger programs
- individual mentoring less likely especially when involving the leaders of the program

One comment: *"Although I was previously a proponent of sizeable institution-based training grants, I have come to question whether schools with a large allocation of MSTP slots, even with a big and strong applicant pool, are capable of selecting 20 plus sure bet future stars each year."*

Some comments suggested that medium-size programs might be optimal: *"With 8-12 students per year, there is enough room for diversity, but it is still small enough for collegiality. The relationships I have with my classmates, who are really the only ones who know what I am going through, have been the single most important factor in my happiness and well-being in this training."*, *"I think you want them large enough so that there aren't people who can't find a friend and small enough so that no-one can hide (or get lost)."*

As several responses pointed out, the number of trainees should take into consideration the opportunities available for career advancement of the students after graduation.

*"We shouldn't keep expanding trainees if there aren't jobs; Everyone I know feels cheated and nobody is doing what they trained for."*

**Finally, the RFI requested input** on anything else as it relates to MSTP training that responders felt important for NIH to consider. Most of the comments of the [117 responses](#) looked at the bigger picture of physician-scientist training, the forces that negatively impact long-term outcomes and suggestions on how to address them. While these factors go beyond the period of dual-degree training encompassed by the MSTPs, they are important for trainees when considering a physician-scientist career, and they have implications for the assessment of the long-term outcomes of MST programs.

Frequently highlighted issues were:

*"I think the biggest deterrent is the lack of job security in the current funding climate."*

*"Almost all of these problems could be improved if the odds of a long-term career as a PI were greater."*

*“They see their mentors struggling to survive and they don't want to set out to fail.”*

*“Most common time for loss of trainees is at the residency and fellowship stage. This is due to lack of sustainable funding and the high uncertainty of academic careers.”*

*“The bottom line is that research positions are not widely available, while clinical positions are, and by the way they pay better too. reforming the current system whereby science is a tournament scheme with a large number of poorly paid 'trainees' at the bottom and a small number of faculty 'winners' at the top.”*

*“Major contributors to dropout include: 1) competing family obligations for 2) lack of formal commitment / institutional support on the research side (technical support, etc.); 3) clinical obligations without formal administrative support.”*

*“One bad mentor or failed project or botched promotion is enough to completely turn someone around and they will leave academics so that they can afford to have a home and family, etc without waiting for that raise.”*

Suggested solutions included:

*“Create permanent research scientist positions that come with reasonable salaries and benefits.”*

*“It is a bit jarring to become an expert in a basic research topic in the middle of medical school, get thrust back into medical school, then become an expert in residency about an often entirely new topic. I'd suggest making a large push to identify research-oriented residents who might be interested in a Ph.D. as part of their fellowship training. make a post-doc unnecessary.”*

*“Although I am appreciative of my MSTP training; I don't think this is the best way to create physician-scientists. Post M.D. graduate programs focused on Ph.D. or just post-doc type experiences would be superior.”*

*“A real focus needs to be on student mental health and mentor-mentee relationships that foster and encourage students to continue in research.”*

*“The choice to pursue a career as a physician-scientist ultimately means choosing to work harder than clinical peers and potentially for lower pay. This needs to be balanced with some formal opportunities for better funding success and unique opportunities for those who choose this route.”*

*“Provide counseling for ‘M.D.-Ph.D.-itis,’ the depression that comes from long delayed gratification.”*

*“NIH should be looking to fund high school programs that identify and nurture physician-scientists.”*

*“Support of institutional incentives for mentor training and recognition. Support infrastructure and mentoring network (at all levels) for MSTP alumni.”*

*“Work with the specialty boards to allow for research track or fast track residency programs; As is, there is a strong disincentive applied by residency programs to residents trying to continue their basic research careers.”*

NIGMS thanks everyone who took the time to respond to the RFI and will take all of this input into consideration when developing the MSTP-FOA.