The Future Supply and Demand for Infectious Disease Physicians

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The Infectious Diseases Society of America

March 2017

The views and findings in this report reflect the work of the George Washington University Health Workforce Institute (GW HWI) and do not necessarily reflect the views of the Infectious Diseases Society of America or George Washington University.

GW HWI and IDSA welcome comments and feedback on this report.

Summary

The George Washington University Health Workforce Institute (GW-HWI), in collaboration with the Infectious Diseases Society of America (IDSA), undertook a series of studies of the infectious disease (ID) physician workforce in 2016, including a survey of ID fellows who completed training in 2016 and focus groups with practicing ID physicians. The Institute also reviewed available data including data from the ACGME, the AMA and the NRMP to better understand the supply, distribution and recent trends related to the ID workforce.

Based on the information gathered, this report explores the factors that are likely to influence the future supply and demand for ID physicians and presents projections of future supply and demand. While the factors influencing adult and pediatric ID physicians are similar, there are some significant differences in both supply and demand. As such, this report presents separate data and projections wherever possible.

Adult Infectious Disease Physicians: The supply of adult ID specialists has been growing steadily over the past decade. Based on the survey of ID fellows completing training in 2016 and the focus groups with practicing ID physicians, it appears that supply of adult ID physicians may be exceeding demand in urban areas where ID training programs are located but there may be shortages in other parts of the country, including smaller communities.

Several key factors are likely to increase demand and need for ID physicians. This includes the potential impact of emerging infectious diseases, growing global travel, antibiotic resistant strains, the expansion of stewardship responsibilities, and overall population growth especially the growing number of elderly. On the other hand, there is downward pressure on demand from the decline over the past decade in new HIV diagnoses at the same time that primary care physicians are taking on a greater role in managing patients with HIV as care becomes more standardized.[1] Furthermore, nurse practitioners (NPs), physician assistants (PAs) and pharmacists could take on some roles that might otherwise be provided by ID physicians, further slowing the increase in demand for ID physicians. For example, NPs and PAs can assist with patient follow-up care allowing ID specialists to concentrate on more complex care needs and pharmacists could assume responsibility for stewardship in some facilities.

On the supply side, key factors influencing the future supply include: the number of entrants coming through the GME pipeline; retention/retirements; and work patterns and work hours. While the number of adult ID physicians has been growing steadily, increasing some 33% between 2008 and 2015[2], the rate of future growth of adult ID physician numbers is uncertain. After many years of increases in GME positions for ID, the number of completers has recently decreased. In addition, many ID physicians are 55 years of age and older and their retirement patterns will have an impact on future supply. Furthermore, many ID fellows are non-US citizens with temporary visas; changes in immigration policies and the uncertainty around those policies could lead to decreases in trainee numbers and increases in the number of graduates leaving the country after completing training.

With the available data we modeled through 2035 three supply scenarios based on the number of fellows being trained and two demand/need scenarios based on current levels of use and an increase in

[1] http://emedicine.medscape.com/article/2061054-overview?pa=4yz4F%2BGjCQlziP1FsfsyFD2ZZHrgckztFpYhqWf6A4b1%2FNJtng2U6PC0zEuCyFACXJCfY7bOunL9QwclcZi5IZkQX8%2BpKxaTdQdy9ZGt7Vc%3D

[2] AAMC Specialty Data Books; includes adult and pediatric ID physicians.

demand/need. If the number of new adult ID physicians completing training each year stays about the same as it was in 2015 (354)[3], the supply would be slightly lower than demand *under current use/practice patterns* although mal-distribution is likely to continue to be a problem. If completers were to drop to a level of 300 per year over the next 5 years, the nation would likely face a shortage; if the GME pipeline rises to 400 per year, supply is likely to exceed demand under *current use/practice patterns*. If the level of demand for ID physicians nationally were to rise to the level of IDs in ID-rich communities (3.0 ID physicians per 100,000 population compared to the national average of 2.7 in 2016), then the nation would be facing a general shortage of ID physicians under all 3 supply scenarios that were modeled.

Pediatric ID: The picture for the future supply and demand for pediatric infectious disease (PID) physicians is different than for adult ID. The supply has been growing rapidly: the number of training positions has increased over the past 20 years and the specialty is very young, indicating that future growth is likely to be significant. On the need and demand side, the places where PIDs can work are generally limited to academic medical centers and children's hospitals. Based on the survey of PIDs completing training in 2016, it appears that there are already limited job opportunities for PID physicians. While the number of children in the US is not expected to grow significantly in the coming years, many children with ID needs who are not in academic centers or children's hospitals may be being seen by adult ID physicians or other physicians. If these children were seen by PIDs demand would be higher but in all likelihood few communities may be able to support a full time PID. PIDs in these communities might have to also provide general pediatric services if they want to work full time.

While emerging infectious diseases, growing global travel, and antibiotic resistant strains could also increase demand, it is unlikely to exceed the rate of growth in the supply if the number of PIDs being trained continues at the current level of about 60 per year. A surplus of PIDs is likely over the next decade if the current level of PID fellows continues.

Framing the Discussion: Factors Likely to Influence Future Supply and Demand

There are 3 key factors that will directly impact the future supply of ID physicians.

The inflow: This will reflect the number coming through the GME pipeline, adjusted for the numbers that do not go on into ID patient care in the U.S.

The rate of attrition: This primarily reflects retirement from practice although some physicians may decide to stop providing patient care or ID services before retiring from medicine.

Hours worked per week: While data on hours worked by specialty is limited, we do know that there are generational and gender differences that can impact on the hours worked in medicine.

There are also several important indirect factors that could influence the supply. These include: organization and reimbursement policies that could encourage or discourage both retirement and work hours; competing job opportunities, such as hospitalist positions; and immigration policies and patterns of migration.

[3] ACGME Data Resource Book, Academic Year 2015-2016

On the demand/need side, there are also a number of factors that could impact on demand for ID physicians.

- **Prevalence of infectious diseases:** Emerging infectious diseases, growing global travel and antibiotic resistant strains, could all contribute to a growth in future demand.
- **Population growth, especially the growing number of elderly:** This is likely to increase the demand for ID physicians.
- **Organizational, regulatory and reimbursement policies**: Changes in the role of ID physicians, including the expansion of stewardship responsibilities, will impact on the demand for ID physicians.
- **Use of other providers**: Other practitioners, including physicians in other specialties, NPs, PAs and pharmacists, can provide some of the services provided by ID physicians. The extent to which this happens may depend on the availability and relative costs of alternatives, reimbursement policies and evidence related to outcomes.

Projecting Supply and Demand for Adult ID Physicians

The Current Supply/Demand

Based on the survey of fellows who completed training in 2016 as well as the focus groups of practicing ID physicians, it appears the current supply may exceed demand in urban areas with fellowship programs but that there are other communities with a need for ID physicians.

In 2016, 45.5% of ID fellows had a difficult time finding a satisfactory position (Exhibit 1). This is high compared to results of surveys of physicians in other specialties[4]. Graduates of foreign medical schools (IMGs) had an even more difficult time. The most commonly cited primary reason for difficulty was a lack of opportunities in desired locations, cited by 49% of the US medical school graduates who had a difficult time and 30.5% of IMGs; 28.8% of the IMGs cited a lack of opportunities that meet visa/status requirements. (Exhibit 2)

Exhibit 1: Difficulty Finding a Satisfactory Position: 2016 Fellows Survey, Adult ID

Difficulty Finding a Satisfactory Position			
	USMG	**IMG**	**Total**
	Percent (N=117)	Percent (N=94)	Percent (N=211)
No	68.4	37.2	54.5
Yes	31.6	62.8	45.5
Total	100	100	100

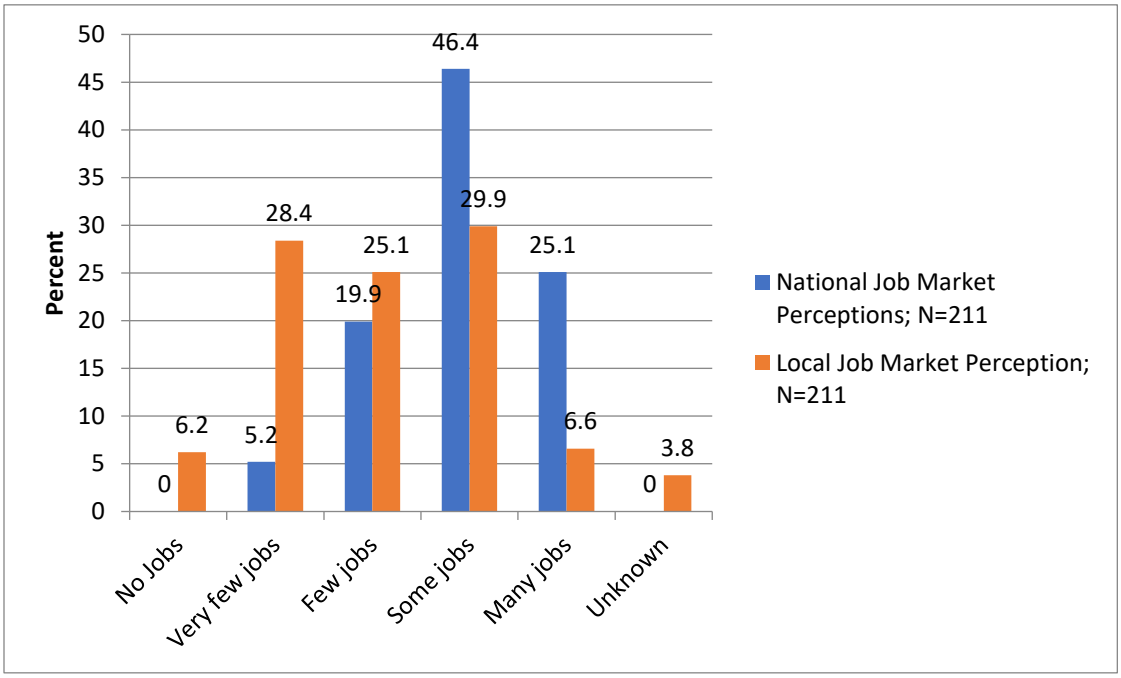
[4]Armstrong, DP, Liu Y, Forte GJ. 2015 New York Residency Training Outcomes: A summary of Responses on the 2014 New York State Resident Exit Survey. Rensselaer, NY: Center for Health Workforce Studies, School of Public Health SUNY Albany 2016

Exhibit 2: Reason for Having a Difficult Time, Adult ID

Primary Reason			
	USMG	**IMG**	**Total**
	Percent (N=37)	Percent (N=59)	Percent (N=96)
Lack of jobs/practice opportunities in desired locations	48.6	30.5	37.5
Lack of jobs/practice opportunities that meet visa status requirements	0.0	28.8	17.7
Inadequate salary/compensation offered	10.8	16.9	14.6
Lack of jobs/practice opportunities in desired practice setting (e.g., hospital, group practice, etc.)	16.2	8.5	11.5
Overall lack of jobs/practice opportunities	2.7	8.5	6.3
Undesirable mix of clinical activities	5.4	3.4	4.2
Lack of expert ID senior mentorship available	5.4	0	2.1
Lack of employment opportunities for spouse/partner	2.7	0.0	1.0

The perceptions of all graduates regarding the local and national job market (Exhibit 3) indicate that local opportunities near training programs are limited: 60% indicated there were “no”, “very few” or “few” jobs within 50 miles of their training site. The national job market was perceived as far more favorable with 71.5% of the respondents indicating some or many jobs. Despite the availability of jobs nationally, it appears that many graduates may prefer the local job market given the percent having a difficult time finding jobs in their desired locations as seen in Exhibit 2.

Exhibit 3: Views of the Local and National Job Market, Adult ID



Consistent with the idea that areas around training sites may be facing a surplus but there are job opportunities in other areas, Exhibit 4 shows that salaries for new ID fellows entering practice in small cities and rural areas were higher than those entering practice in major cities or suburbs. It would appear that in urban areas, the supply of ID physicians is high enough that employers can recruit adult ID physicians even while offering relatively low salaries. Conversely, it appears that small cities and rural areas must offer enhanced compensation to draw ID physicians to those communities.

Exhibit 4: Income by Practice Location: 2016 Fellows

Practice Location	'Average' Income
Inner city	$166,000
Other area within major city	$183,000
Suburban	$191,000
Small city (population less than 50,000)	$211,000
Rural	$222,000

In the focus groups, participants were of mixed opinion about whether there was a shortage or surplus of ID specialists, and many believed there was more of a maldistribution versus having too many or too few in aggregate.

Mal-distribution

While the focus here is on the overall supply and demand, mal-distribution has been a persistent challenge in the US. The reality is we can simultaneously have a shortage and surplus in different parts of the country and even within states. As Exhibits 5 and 6 show, ID physicians are very unevenly distributed around the country. Even when population is taken into account (Exhibit 6) the density of ID physicians per 100,000 population in different Hospital Referral Regions (HRRs)[5] varies from 0 to over 9. Some focus group participants expressed concern that in areas of low ID supply, other specialties were less likely to consult ID specialists appropriately, such as when a patient has a prosthetic joint infection.

Exhibit 5: Distribution of Adult ID Physicians

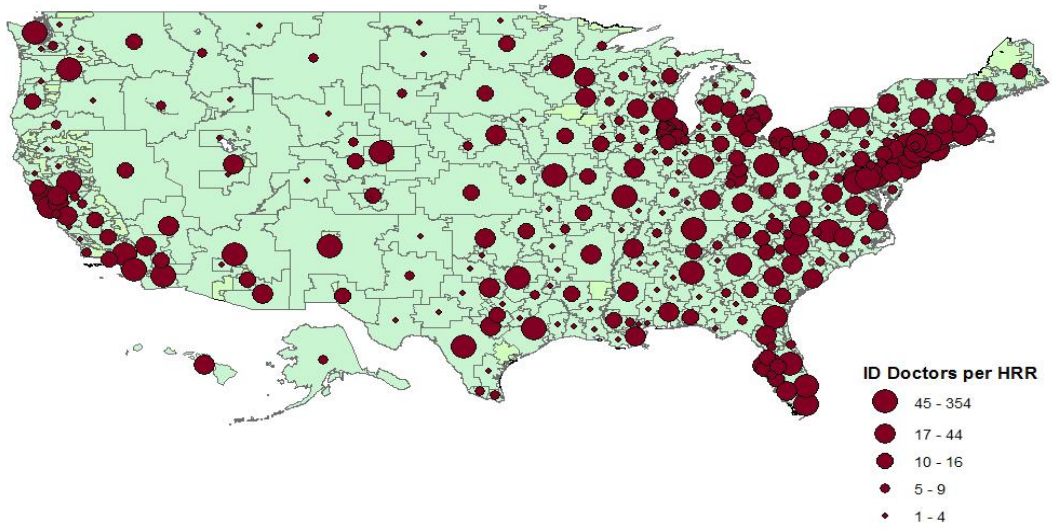
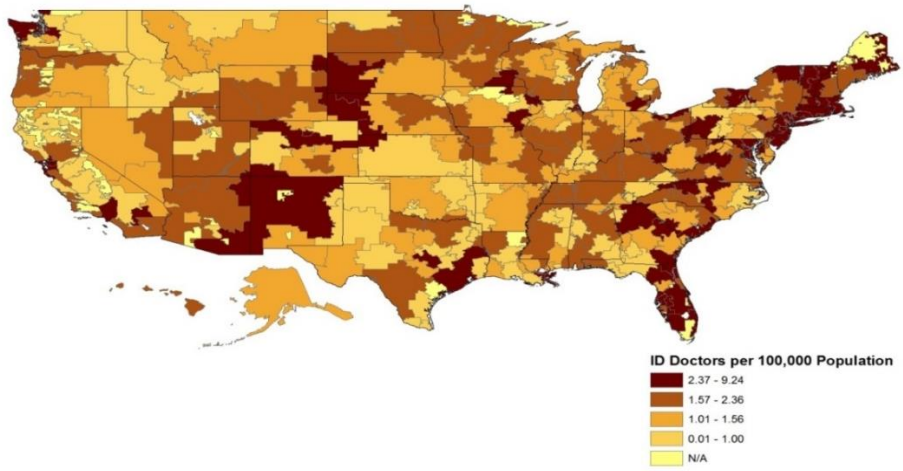


Exhibit 6: Ratio of Adult ID Physicians per 100,000 Population



[5] Hospital Referral Regions were developed by the Dartmouth Atlas of Health Care; see http://www.dartmouthatlas.org/data/region/ for details on the areas and methodology.

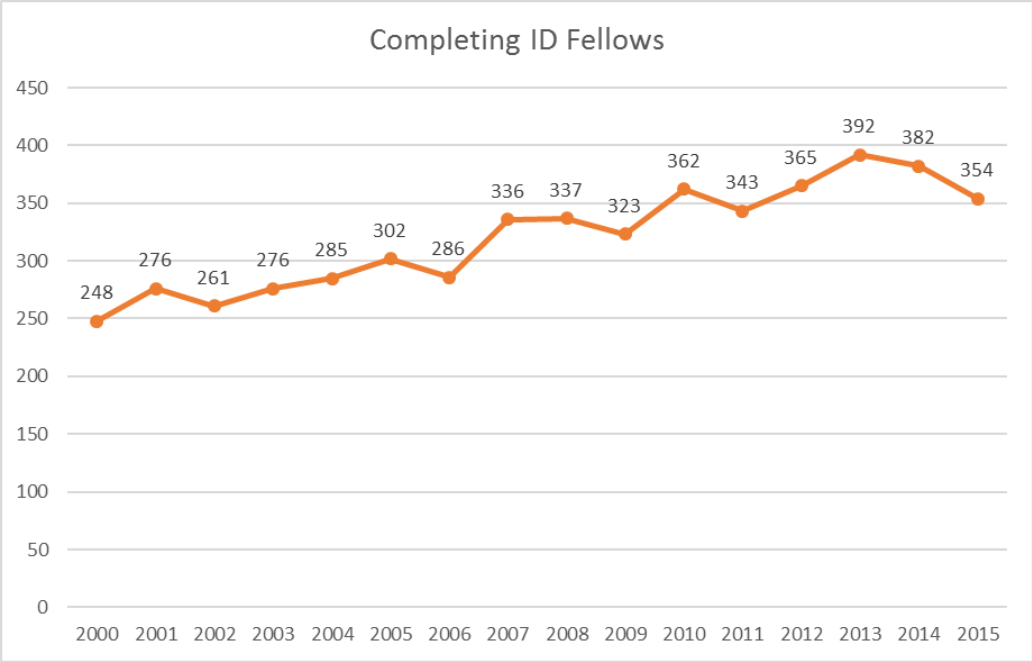
Future Supply and demand for Adult ID Physicians

As noted above, it appears that today there is a slight surplus in communities near training sites but shortages in other areas. In order to assess what the future may look like, we looked at likely supply side and demand trends to see what the future balance of supply and demand may look like.

Supply

The supply has been growing due to an increase in the number of fellows over the past 15 years. As seen in Exhibit 7, the number of new physicians completing adult ID training grew from 248 graduates in 2000 up to 392 in 2013 and then declined to 354 in 2016. As a result, the total number of adult ID physicians has been growing faster than the US population, leading to a decrease in the number of people per ID physician.

Exhibit 7: Number of Adult ID Physicians Completing ACGME Fellowship Training 2000 – 2015



As seen in Exhibits 8 and 9, the total number of active ID patient care physicians (adult and pediatric) grew from 6,424 in 2008 to 8,515 in 2015, an increase of 33%[6]. This led to an increase in the number of ID physicians per 100,000 population from 2.13 in 2008 to 2.65 in 2015. Another way of looking at this is that the number of people per ID physicians dropped from 46,952 to 37,747 people over that period.

[6] AAMC, Center for Workforce Studies, Physician Specialty Data Book, various years.

Exhibit 8: Number of Active ID Physicians and Number /100,000 (Adult and Pediatric), 2008 - 2015[7]

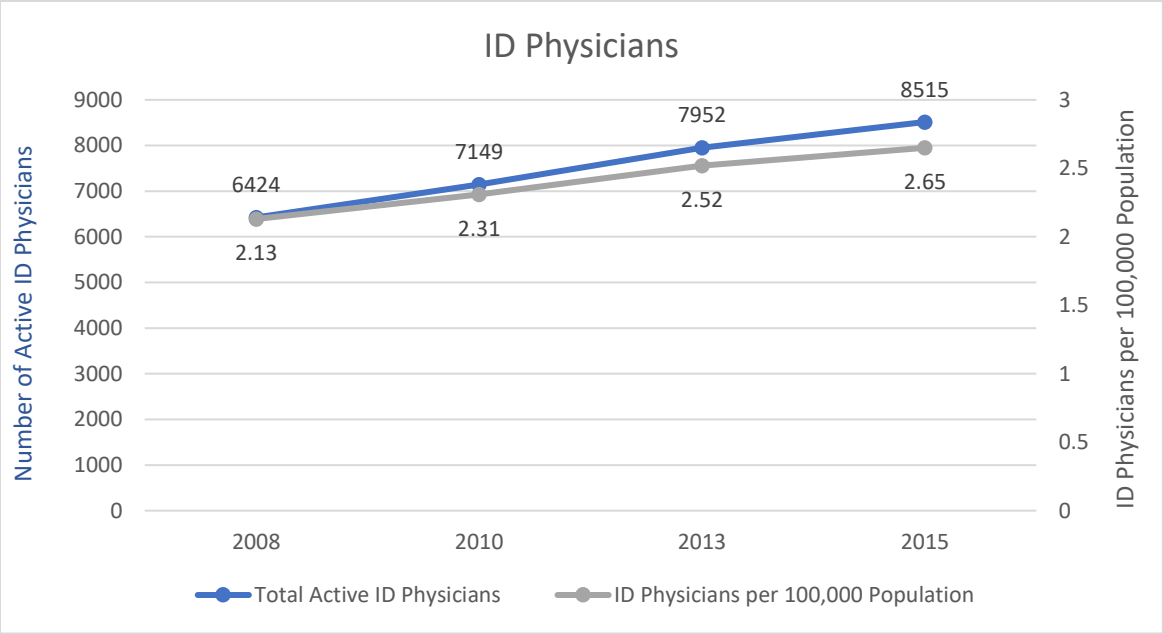


Exhibit 9: Growth in Supply of ID Physicians 2008- 2015 (Adult and Pediatric)

	Year			
	2008	**2010**	**2013**	**2015**
Total Active ID Physicians	6424	7149	7952	8515
People Per ID Physician	46952	43230	39755	37747
ID Physicians per 100,000 Population	2.13	2.31	2.52	2.65

The GME pipeline: As seen in Exhibit 7, the number of fellows completing training has been between 323 and 392 over the past 9 years with a slight decrease in the past 2 years. If the job market continues to be weak and/or if immigration policies discourage foreign medical school graduates from staying in the US after training (or from coming at all), the number of graduates entering practice could decrease although it would still likely be at a level higher than in the early 2000s.

As indicated in Exhibit 10, 23.5% of the 2016 Fellows Survey respondents had temporary (H and J type) visas. It is unclear whether the policies being promoted by the new administration related to immigration and travel by non-citizens will impact the number of physicians training in ID or whether some will choose to return to their country of origin after completion of training.

[7] Exhibits 8 and 9 include all active ID physicians - adult and pediatric - and the total US population.

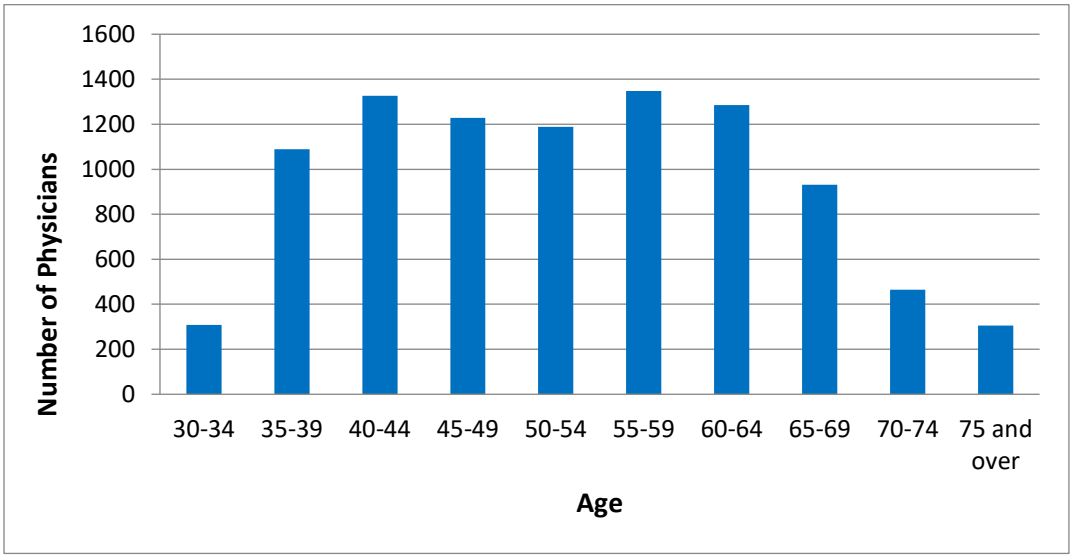
Exhibit 10: Citizenship Status of 2016 Fellow Survey Respondents

Citizenship Status: What is your current citizenship status?		
	Frequency	**Percent**
Native born U.S.	157	56.9
Naturalized U.S.	40	14.5
Permanent Resident	14	5.1
H-1, H-2, H-3 Temporary Worker	18	6.5
J-1, J-2 Exchange Visitor	47	17.0
Total	276	100

Retirements

As seen in Exhibit 11, there is a significant cohort of physicians over the age of 55. Some of these physicians would have entered the specialty in the 1980s and 90s at the height of the HIV/AIDS epidemic when ID physicians were leading in the care and treatment of these patients. Their decisions around work hours and retirement will have a major impact on the future supply of ID physicians. Many of the focus group participants discussed the challenging work schedule in ID and the relatively low compensation for the field which could impact how long ID specialists remain in the workforce. Efforts to identify and implement practice models that improve work life balance and create more sustainable funding streams for ID specialists, particularly in academic settings where ID specialists often need subsidies from other departments to break even, could be a way to keep providers in the workforce longer.

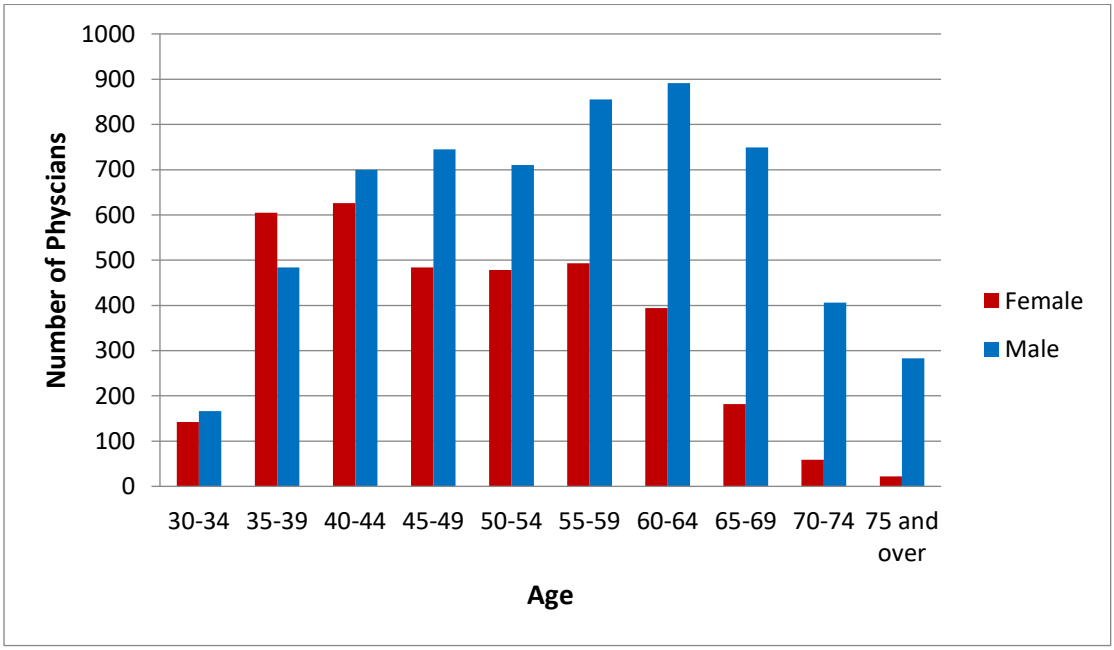
Exhibit 11: Age Distribution of Active Adult ID Physicians



A simple cohort analysis suggests that adult ID supply is on track for continued growth. None of the 5 year cohorts exceeds 1,400 physicians. Over the past six years, however, ID fellowship programs have been training in the range of 343 to 392 new fellows per year which would lead to a 5-year cohort of 1,715 to 1,960. While some may not practice ID or may move to another country, the current inflow into the specialty appears to be well above the historical levels. While we lack good data on the age of retirement, these numbers indicate that the overall national supply is growing and, if training cohorts continue at their current size, the national supply will continue to grow for many years into the future.

Overall, 63% of active adult ID physicians are males; however, as indicated in Exhibit 12, the percent by age cohort varies greatly, with males representing the vast majority of older ID physicians (80% of ID physicians between 65 and 69) while making up only a minority of the physicians between 35 and 39 (44%). According to the ACGME, 52% of adult ID fellows in 2015-16[8] were female indicating this shift toward more females is likely to continue in the future.

Exhibit 12: Distribution of Adult ID Physicians by Age and Gender



This represents a major change, with workforce implications if male and female ID physicians have different practice and work patterns. Analysis of physician work hours using U.S. Census data (which does not include physician specialty) shows that female physicians work fewer hours on average than their male counterparts; it is also important to note that male work hours on average have declined significantly over the past three decades, further decreasing average headcount contributions to FTE over time,[9] perhaps as part of a trend by which the younger generation of physicians may not work as many hours as their age counterparts in earlier generations. Collecting data on ID work hours by age group over time could provide important insight into changes in FTE for the ID workforce.

[8] *ACGME Annual Data Resource Book 2015-16*
[9] http://jama.jamanetwork.com/article.aspx?articleid=185433

Changes in retirement rates can typically have a large impact on the overall supply. For example, in the 2016 AAMC Workforce Projections, increasing or decreasing the average retirement age by two years in alternative scenarios led to much larger changes in the supply projections compared to scenarios with increases in residency positions or reductions in workhours.[10] However, retirement rates may have less impact on ID given it has a slightly younger workforce than average (with 37.4% aged 55 or older compared to 42.6 for all specialties[11]).

In the focus groups, many pointed to the growing number of internal medicine residents pursuing careers as hospitalists as a reason for declining student interest in ID careers. Hospitalists have higher salary opportunities combined with good work life balance which makes the field attractive to internal medicine residents. Overall, the average first-year income for 2016 ID fellows completing training was $183,000 (base salary plus incentives). This compares to an average compensation of $249,000 for newly recruited hospitalists[12] who do not need the additional 2 years of fellowship training. However, it is important to keep in mind that students are also very interested in finding a career that is a good match for their personal interests, which, along with mentorship, is one of the most important factors influencing specialty choice decisions.[13] Focus group participants suggested there has been a decline in recent years of student exposure to ID specialists and that more 'brown bags' with medical students, along with increased ID exposure during internal medicine residency training, could create new mentorship opportunities that might increase interest in the field.

Factors Influencing Future Demand for Adult ID

- Growth and aging of the population.
- Increased stewardship. During the focus groups with ID specialists and practice managers, participants indicated that new stewardship roles in antibiotic usage were placing significant demands on ID specialist time and were often uncompensated. This increased effort further can further ID specialists who already reported concerns about work life balance due to a demanding call schedules, which can involve traveling to multiple hospitals for inpatient consultations.
- Disease and infection patterns:
    - Decreasing burden of HIV/AIDS
    - Increasing burden of antibiotic resistant diseases
- Use of NPs, PAs, pharmacists and other health workers. During the focus groups, participants who worked with NPs and PAs reported they could delegate routine patient care and follow-up to NPs and PAs, thereby creating more time for them to focus on complex patients. Several also pointed to how this increased quality of care while improving work life balance.
- Move to value-based reimbursement: a challenge, creating a need to find ways to be paid for what ID physicians. Some of the focus group participants felt that ID specialists could play a

[10] https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.pdf
[11] AAMC 2014 Physician Specialty Data Book
[12] Merritt Hawkins: 2016 Review of Physician and Advanced Practitioner Recruiting Incentives; Dallas, Texas; 2016; Since this reflects hospitalists who were recruited and placed by Merritt Hawkins, it may be higher than the actual national average and likely includes some experienced hospitalists.
[13] AAMC Graduate Student Questionnaire

greater role in helping to reduce hospital readmissions if used more appropriately, potentially leading to increased demand for their services. However, they also indicated that their role was still fairly unclear in new payment models such as ACOs and bundled payments for joint replacement making it uncertain how quickly increased demand might take hold. They pointed to the need for additional information on how to measure the return on investment and best strategies for valuing and compensating ID specialists in value based payment models.

- The use and role of ID physicians versus physicians in other specialties.

Projecting Supply and Demand for Adult ID Physicians 2015 -2035

Supply Scenarios

We model the impact of 3 possible scenarios bases on the GME pipeline:

- Continue graduating 354 fellows per year (based on the 2015 number of completers);
- Increase the number to 400 per year over next 5 years; and
- Decrease fellows graduating per year to 300 fellows per year.

The model assumes continuation of historical retirement patterns and work patterns and hours worked. In particular, we estimated that there would be "shrinkage" or loss of practicing physicians at the rate of .05% per year for physicians under the age of 50, 1% for ages 50-54, 2% for ages 55-59, 5% for ages 60-65, 10% for ages 65-59, 12% for ages 70-74, 15% for ages 75-79, and complete retirement at age 80. The attrition probabilities were based on the attrition probabilities developed by HIS Markit[14], and include those leaving the workforce due to career change, retirement, disability and mortality. These are likely high retention rates. In comparison, geriatrics assumes retention rates of less than 60% based on their experience with recertification rates.[15]

Demand Scenarios

We model two demand scenarios:

- Use patterns/visits by age/retirement continue as is while the population grows and ages; or
- The current national number of ID physicians per 100,000 pop (2.74[16]) increases to the level of more ID-rich communities (3.0 per 100,000) while the population grows and ages. To calculate these rates, we assume that adult ID physicians treat all adults above 18 years of age and 50% of the population below age 18. This is a guess based on the assumption that outside of major academic medical centers and children's hospitals, in the absence of PIDs, adult IDs would provide the ID services.

[14] IHS Inc. The Complexities of Physician Supply and Demand-Projections from 2013 to 2025.; 2015

[15] Geriatrics Workforce Policy Studies Center. Projection on Future Number of Geriatricians in the United States, May 2011. http://www.americangeriatrics.org/files/documents/gwps/Table1_4.pdf. Published 2011. Accessed February 5, 2015.

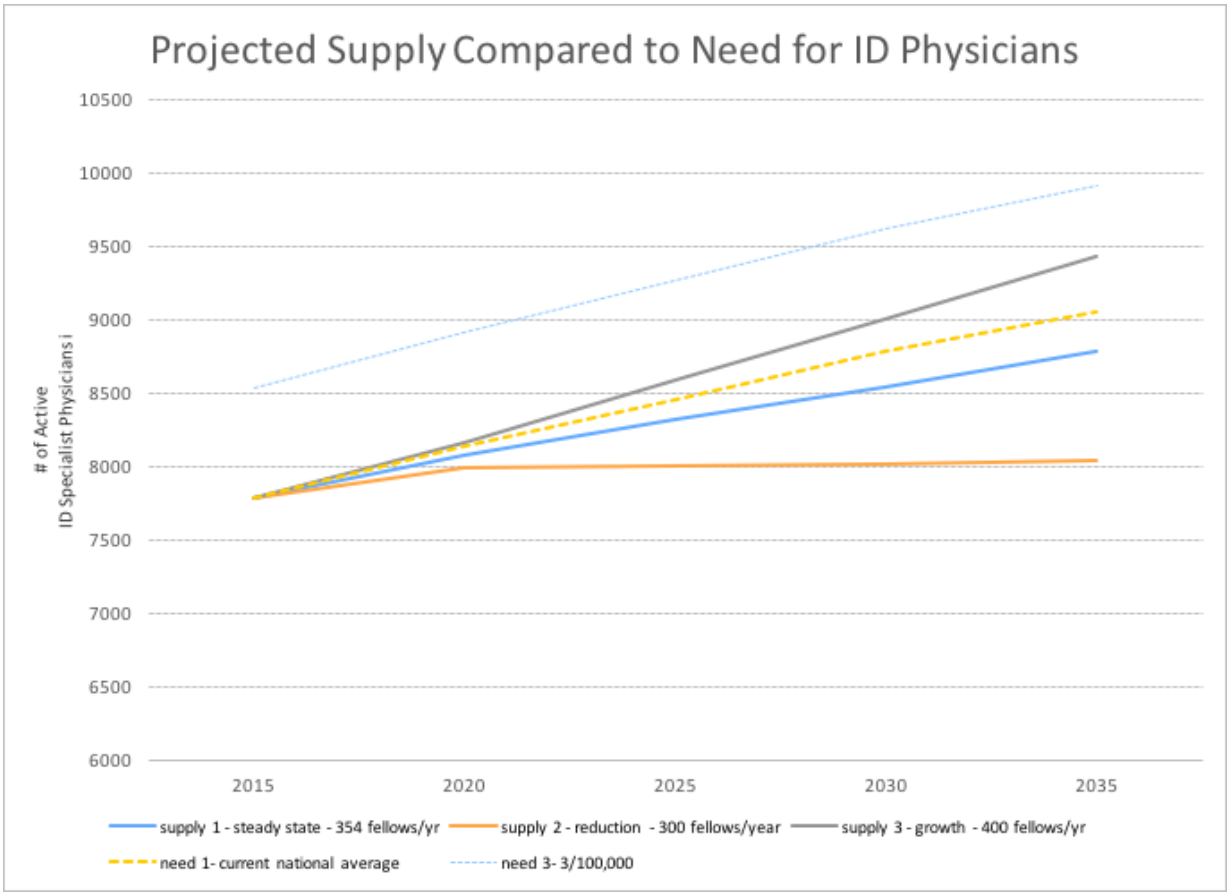
[16] The 2.74 adult ID physicians per 100,000 population reflects only adult ID physicians and the US population over 18 as well as half the US population under age 18 based on the estimate that half the children under 18 are served by PIDs and the other half by adult IDs. This accounts for the difference from the 2.65/100,000 in Exhibits 8 and 9.

For the projections, the model uses the convention of assuming supply equals demand in the base year. Overall this seems reasonable but we know there are some areas that appear to have shortages and others with apparent surpluses.

Findings

In the first of the scenarios for future supply, where the number of new adult ID physicians completing training each year stays about the same as it was in 2015 (354), the supply would be very close to the demand under *current use/practice patterns*, although mal-distribution would continue to be a problem. In the alternative scenario where completers drop to a level of 300 per year over the next 5 years, the nation would face a shortage; if the GME pipeline rises to 400 per year, supply is likely to exceed demand under *current use/practice patterns*. Finally, if the level of use of ID physicians nationally were to rise to the level of IDs in ID rich communities (3.0 ID physicians per 100,000 population) then the nation would face a general shortage of ID physicians under all of the 3 supply scenarios. (Exhibit 13)

Exhibit 13: Projected Supply Compared to Need for ID Physicians



Pediatric Infectious Disease Physicians

The picture for the future supply and demand for pediatric infectious disease physicians (PID) is different than for adult ID. The supply has been growing rapidly: the number of training positions has increased over the past 20 years and the specialty is very young, indicating that future growth in supply is likely to be significant. On the need and demand side, the places where PIDs can work are generally limited to academic medical centers and children's hospitals. Based on the survey of PIDs completing training in 2016 it appears that there are already limited job opportunities for PID physicians. The number of children in the US is not expected to grow significantly in the coming years. While emerging infectious diseases, growing global travel, and antibiotic resistant strains could increase demand it is unlikely to exceed the rate of growth in the supply if the number of PIDs being trained continues at the current rate of 50 per year. A surplus of PIDs is likely over the next decade.

The Existing Market Place

Results from the Fellows Survey

As indicated in Exhibit 14, PIDs had a very difficult time finding a satisfactory position: 65% of the US graduates reported having a difficult time.

Exhibit 14: Difficulty Finding a Satisfactory Position, by Citizenship Status

Difficulty Finding a Satisfactory Position			
	USMG	**IMG**	**Total**
	Percent (N=20)	**Percent** (N=9)	**Percent** (N=29)
No	35.0	22.2	31.0
Yes	65.0	77.8	69.0
Total	100	100	100

The main reasons cited for having a difficult time were the lack of jobs in desired locations (45%) and the overall lack of jobs (20%) as seen in Exhibit 15. Furthermore, nearly 90% said there were "none", "very few" or "few" jobs in the local job market (defined as within 50 miles of their training site). While the national job market was viewed more positively, still 75.8% indicated there were "very few" or "few" jobs nationally. (Exhibit 16)

Exhibit 15: Reasons for Difficulty Finding a Satisfactory Position

Primary Reason for Difficulty	Freq.	%
Overall lack of jobs/practice opportunities	4	20.0
Lack of jobs/practice opportunities in desired locations	9	45.0
Lack of jobs/practice opportunities in desired practice setting (e.g., hospital, group practice, etc.)	1	5.0
Inadequate salary/compensation offered	1	5.0
Lack of jobs/practice opportunities that meet visa status requirements	2	10.0
Undesirable mix of clinical activities	2	10.0
Other (i.e., the one you described in the previous question)	1	5.0
Total	20	100.0

Exhibit 16: Local and National Job Market Perception

	Local Job Market Perceptions	National Job Market Perceptions
	Percent (N=29)	Percent (N=29)
No Jobs	27.6	0.0
Very few jobs	44.8	24.1
Few jobs	17.2	51.7
Some jobs	3.4	20.7
Many jobs	0.0	3.4
Unknown	6.9	0.0
Total	100	100

The softness of the job market is also seen in average expected income in Exhibit 17, with the averages being between $117,000 and $144,000 depending on the type of the area. It's worth noting that no PIDs were going to practice in small cities or rural areas, which is not at all surprising but reflects the practical requirement that a viable PID practice needs a community of sufficient size to support a pediatric specialist. Furthermore, as indicated in Exhibit 18, almost all PIDs were going to be working in hospitals or medical schools. Only one PID (5.9% of the 17 respondents to that question) was not going to work in one of those settings.

Exhibit 17: Average Expected Income, by Practice Demographic

Practice Location	Median Base Income
Inner city (N=6)	$117,000
Other area within major city (N=8)	$144,000
Suburban (N=4)	$144,000
Small city (population less than 50,000)	N/A
Rural	N/A

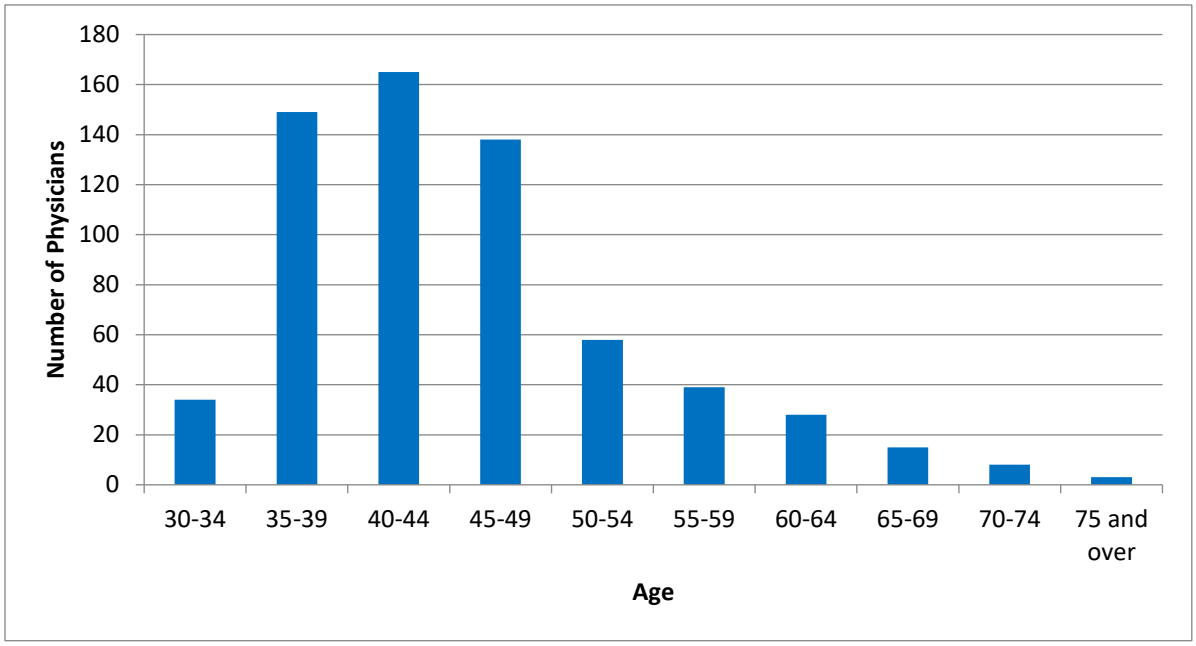
Exhibit 18: Setting of Practice for New Pediatric Infectious Diseases Physicians

	Male	Female	Total
Primary Practice Setting	**Percent** (N=6)	**Percent** (N=11)	**Percent** (N=17)
Multi-specialty group practice	0.0	9.1	5.9
Hospital: working directly as employee of hospital	50.0	72.7	64.7
Medical school	50.0	18.2	29.4
Total	100	100	100

Future Supply and Demand for PIDs

Pediatric Infectious Diseases was first recognized by the American Board of Medical Specialties in 1994. As a result, it is still a relatively young specialty and there are very few PIDS over age 55. As seen in Exhibit 19, the 5-year age cohorts over 55 years of age have less than 50 PIDs in the 5-year cohort. There are currently about 60 new PIDs completing training each year, or 300 for a 5-year cohort. Therefore, the specialty is likely to continue growing rapidly for some time if the range of 60 new PIDs training per year holds steady.

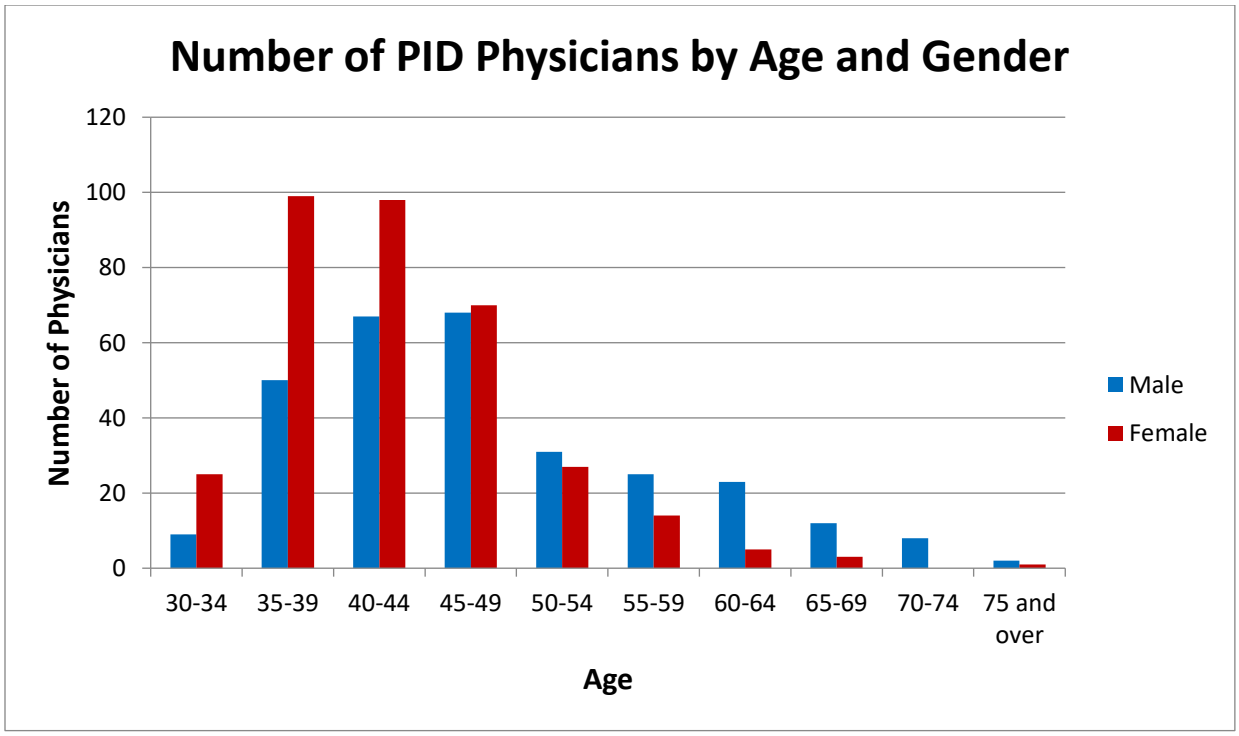
Exhibit 19: Age Distribution of PID Physicians



Source: AMA Masterfile, January 2016

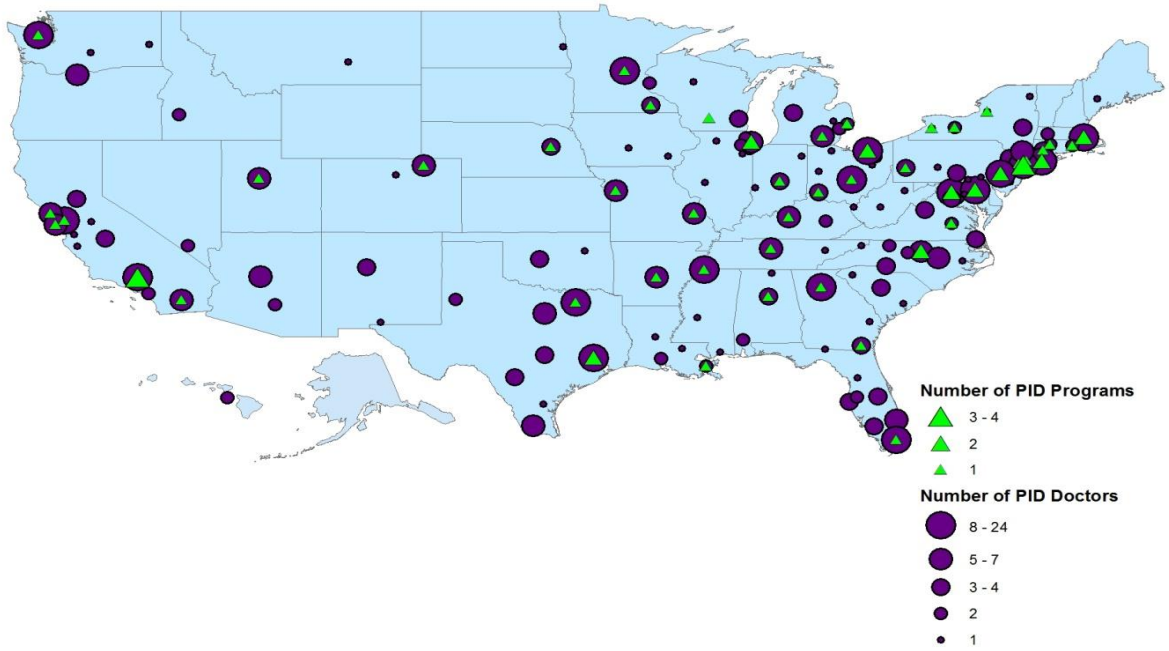
While older cohorts have a majority of males, the more recent younger PIDs are predominantly female. (Exhibit 20)

Exhibit 20: Number of PID Physicians by Age and Gender



Not surprisingly, PIDs tend to be located in the same communities as the training programs, as seen in Exhibit 21 and the facts that most of the programs and PIDs are along the east coast can be expected to contribute to distributional problems for the specialty.

Exhibit 21: Distribution of Active PIDs and Fellowship Programs



Projecting Supply and Demand for PIDs

Based on the data above, it appears that the nation is facing a surplus of PIDs as a result of the rapid growth in the numbers of PIDs entering the specialty with few practitioners at retirement age. Furthermore, the job market is already very poor for new PIDs and jobs appear to be limited to academic medical centers and children's hospitals. The demand could increase if smaller hospitals and group practices (integrated delivery systems) decided there was value added to have a PID and if it can be supported by reimbursement policies. This would open up new employment options.

Discussion and Recommendations: Adult and PID Physicians

ID physicians have an important role given the continued emergence of new infectious diseases, growing global travel, antibiotic resistant strains, the expansion of stewardship responsibilities and overall population growth, especially the growing number of elderly, it will be important to assure an adequate supply to meet the needs of the nation. Given the time needed to increase supply, the field should monitor key indicators to give an early warning to possible shortages or surpluses. This includes the following:

- Numbers entering training; graduating and staying in US: with the NRMP all-in policy, the NRMP SMS match numbers can provide a good early sign of major changes in the pipeline.
- Job market through the graduating fellows survey: continuing to do the survey annually will provide a good early picture of trends and any potential changes in the marketplace both overall and by setting and region.
- Monitoring of attrition: this might be accomplished through the use of membership data and ABMS data on non-renewals of certification.
- Disease patterns: accomplished by tracking common diseases for which input from practicing ID physicians is needed.
- Trends on who has the lead on stewardship

Finally, while the nation may have an adequate overall supply, the problem of mal-distribution is likely to continue in the absence of focused policy interventions. Options to explore include building partnerships and collaborations between providers in small communities and academic health centers and Children's hospitals; and advocating for eligibility of ID for programs like the National Health Service Corps, which provides loan repayment for service in underserved areas.