



## Public Health and General Preventive Medicine Training: A National Survey

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### ABSTRACT

Little is known about the current experiences of Public Health/General Preventive Medicine (PH/GPM) residents and graduates in the United States. This cross-sectional study of PH/GPM residents and graduates examined their knowledge of the field and career choices after graduation. We developed a questionnaire to address medical education, graduate medical training prior to Preventive Medicine (PM), current PM training, and post-graduation goals. Data was stratified by residency status (resident vs graduate), and board-eligibility (dual-eligible vs solely PH/GPM). Bivariate analysis of quantitative data was performed using Fisher's test. Qualitative data were organized into themes and analyzed quantitatively. Of those invited to participate, a total of 153 (18.25%) PH/GPM residents and graduates responded to the survey. We found diversity in prior medical education/training among respondents. Overall, debt burden at the start of training was low compared to national trends. Compared to residents, a higher proportion of graduates were board-eligible in another specialty ( $p < 0.001$ ). Most respondents felt that their programs provided them with opportunities to acquire skills essential for a career in PM. Ninety-one percent of graduates were board-certified in PH/GPM. Respondents expressed a wide range of career interests, including government work and academia. Difficulty with marketing themselves as PM physicians was frequently cited as a reason for the difficulty in securing a PM job. The results inform the PM community with current trends in PH/GPM training and career obstacles faced by PM graduates.

### 1. Introduction

Since the inception of Preventive Medicine (PM) specialty certification in 1949, over 7,500 physicians have been certified by the American Board of Preventive Medicine (ABPM) (Lane, 2000). As a specialty, PM focuses on both clinical care and public health. PM physicians are not only trained in personalized patient care, but also in population health, a training perspective unique to the specialty.

There are three main specialties currently recognized and certified by ABPM: Aerospace Medicine, Occupational Medicine, and Public Health and General Preventive Medicine (PH/GPM) (Become Certified – American Board of Preventive Medicine, 2019). In the United States, 42 of the 72 accredited PM residency programs (Programs and American College, 2019) are PH/GPM programs with approximately 188

graduates annually (Residency Directory, 2020). Various pathways into PH/GPM training exist based on prior graduate medical education. For those entering PM directly from medical school, PH/GPM training is a three-year program comprising clinical, academic and practicum training (ACGME, 2020; Salive and Parkinson, 1991). Medical graduates may also train in a combined program with a clinical (usually primary care) specialty or enter PH/GPM training after completion of another specialty.

Core competencies of PM training include communication, biostatistics/epidemiology, management/administration, clinical preventive medicine, and occupational and environmental health (Lane, 1999). With core competencies that span both clinical medicine and population health, PM physicians are uniquely positioned to address health system challenges through careers in a variety of sectors (ACGME, 2020; Flower

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et al., 2019).

National surveys of PM residents and graduates were done in 1991 and 1997 (Salive and Parkinson, 1991; Salive, 1997; Liang et al., 1995). Little is known about how the PM resident and graduate experiences have changed over the last two decades. We administered an online survey to both PH/GPM residents and graduates to examine medical education, previous graduate medical training, current/recent PM training, and post-graduation goals. Our aim is to provide the PM community (e.g., residency faculty, residents, and graduates) with current knowledge of the field, learning needs, training gaps and career choices post-graduation.

## 2. Methods

### 2.1. Study sample

This is a national cross-sectional study of PH/GPM residents and graduates. We sent a total of 838 invitation emails to the targeted population, through the American College of Preventive Medicine (ACPM) database. The initial email included an anonymous link to an electronic informed consent form, and study questionnaire, followed by two reminder emails, at least 2 weeks apart.

### 2.2. Measures

We developed an online questionnaire using Qualtrics software® with 22 core questions, in addition to 18 conditional follow-up questions. The questionnaire was piloted on a small group of PM residents in a single program. The questionnaire was designed to address the following content areas: medical education, previous graduate medical training, current/recent PM training, and post-graduation goals. Voluntary responses were collected anonymously and stored securely on the same platform.

### 2.3. Statistical analysis

Descriptive and bivariate analysis of quantitative data was performed. Free text responses were illustrated in themes and analysed quantitatively. In the main analysis, data were stratified by training status: resident vs graduate. Graduates were analysed as one group because the small number of respondents who graduated >10 years before the survey was administered (n = 5) prohibited stratified analysis of graduates into recent vs remote graduate groups.

We performed a sub-analysis with data stratified by board-eligibility status to compare those who are board-eligible in a primary clinical specialty (dual board-eligible) with those who are not (solely PH/GPM board-eligible). Survey data were tabulated, and bivariate analysis was performed using Fisher's test with an alpha level of 0.05. SPSS version 27.0. Data were collected in 2020 and analysis was completed in 2021. The study was approved by the Institutional Review board at Case Western Reserve University School of Medicine in Cleveland, Ohio.

## 3. Results

A total of 153 residents and graduates invited to complete the survey answered at least one question and were included in the analysis (response rate 18.25%).

### 3.1. Demographics

Most residents were 31–35 years old (36.9%), female (47.6%) and less than half identified as white, (36.9%) compared to graduates who were mostly 36–40 years old (47.7%), female (44.7%) and white (52.3%). Most respondents were United States citizens and spoke one language and there was no statistically significant difference in citizenship or language for residents and graduates (Table 1).

**Table 1**

Responses to survey questions on demographics stratified by resident and graduate.

	Graduation Status <sup>1</sup>		p
	Residents n = 84 (%)	Graduates n = 65 (%)	
<b>Age (years)</b>	14	4	0.098
25 – 30	(16.7)31	(6.2)20	
31 – 35	(36.9)27	(30.8)31	
36 – 40	(32.1)	(47.7)	
<b>Race/Ethnicity</b>	31	34	0.126
White	(36.9)12	(52.3)9	
Black/African American	(14.3)2	(13.8)2	
Hispanic/Latinx	(2.4)20	(3.1)9	
Asian	(23.8)3	(13.8)	
Others	(3.6)6	-2	
Prefer not to answer	(7.1)	(3.1)	
<b>Gender</b>	40	29	0.513
Female	(47.6)32	(44.6)23	
Male	(38.1)	(35.4)2	
Other	-2	(3.1)1	
Prefer not to respond	(2.4)	(1.5)	
<b>Number of Languages</b>	39	36	0.657
One	(46.4)	(55.4)	
Two	25 (29.8)9	15 (23.1)5	
Three	(10.7)1	(7.7)	
Four or more	(1.2)	-	
<b>Citizenship Status</b>	71	54	0.070
US Citizen/Permanent Resident	(84.5)	(83.1)2	
Canadian Citizen/Permanent Resident	(6.0)	(3.1)	
Citizen/Permanent Resident of another	-	-	
	-	-	

<sup>1</sup> There is variation in total respondents for survey items because some respondents did not respond to every survey item. Some column percentages do not total 100% due to missing values for variables.

### 3.2. Medical education and prior training

Most respondents were graduated from a U.S. medical school. Completion of medical education outside of the U.S. was more common amongst residents (22.6%) than graduates (7.7%) (p = 0.014). Forty-six percent of residents completed only one year of clinical training, compared to 55.4% of graduates who reported three or more years of training (p = 0.022) (Table 2). Similarly, a higher percentage of graduates reported being board-eligible in a non-PM clinical specialty (63% vs 32%; p = <0.001). The most common specialties among both residents and graduates respectively were primary care specialties- family medicine (33.3% vs 24.4%), internal medicine (33.3% vs 34.1%), and pediatrics (11.1% vs 17.1%) (p < 0.009). Ninety one percent of graduates who answered the question about board-certification in PH/GPM were board-certified. Almost all respondents (residents and graduates) were introduced to PM as a specialty through an informal source including a colleague, friend, or mentor.

### 3.3. Economic environment

Debt at the start of PM training differed for respondents; with 23.8% of residents compared to 3.1% of graduates reporting more than \$300,000 debt (p < 0.001). Both residents and graduates reported most financial support during training was through a salary/stipend (Table 2). Most residents and graduates reported total annual income during training was \$50,000-\$100,000.

### 3.4. PM training environment

Within PM, residents and graduates reported the greatest interest in clinical preventive medicine (78.6% vs 66.2%, p = 0.391) and the least interest in financial management (8.3% vs 13.8%, p = 0.160).

**Table 2**  
Responses to survey questions on medical education, prior training and economic environment stratified by resident and graduate.

	Graduation Status <sup>1</sup>		p
	Residents n = 84 (%)	Graduates n = 65 (%)	
<b>Medical School Location</b>	19	5	
Outside of the US/Canada	(22.6)65	(7.7)60	<b>0.014</b>
United States/Canada	(77.4)	(92.3)	
<b>Year of Medical School Graduation</b>	17	21	
2008 or earlier	(20.2)22	(32.3)28	<b>0.02</b>
2009–2013	(26.2)44	(43.1)16	
2014–2018	(52.4)	(24.6)	
<b>Years of Clinical non-PM Training</b>	39	20	
1	(46.4)19	(30.8)9	<b>0.022</b>
2	(22.6)18	(13.8)25	
3	(21.4)7	(38.5)11	
4 or more	(8.3)	(16.9)	
<b>Board Eligibility</b>	57	24	
No	(67.9)27	(36.9)41	<b>&lt;0.001</b>
Yes	(32.1)	(63.1)	
<b>Specialty of Board Eligibility</b>	9	10	
Family Medicine	(33.3)9	(24.4)14	<b>0.009</b>
Internal Medicine	(33.3)3	(34.1)7	
Pediatrics	(11.1)5	(17.1)8	
Others	(18.5)	(19.5)	
<b>Board Certified</b>	14	5	
No	(51.9)13	(26.3)34	<b>&lt;0.001</b>
Yes	(48.1)	(72.3)	
<b>Board Certified in PH/GPM</b>	-	4	
No	-	(8.7)42	<b>&lt;0.001</b>
Yes	-	(91.3)	
<b>Introduced to PM through:</b>	7	4	
Formal presentation	(63.6)74	(6.2)56	<b>0.494</b>
Informal sources	(56.9)	(86.2)	
<b>Reasons for pursuing PM<sup>2</sup></b>	9	2	
Board-certification	(10.7)11	(3.1)13	<b>0.523</b>
Career advancement	(13.1)17	(20.0)5	
Clinical	(20.2)15	(7.7)10	
Interest in specific areas	(17.9)13	(15.4)13	
Population health	(15.5)3	(20.0)1	
Work-life balance	(3.6)22	(1.5)33	
Public Health/Research	(26.2)	(50.8)	
<b>Educational Debt at the start of PM training</b>	36	22	
None	(42.9)8	(33.8)8	<b>&lt;0.001</b>
1–100,000	(9.5)	(12.3)	
100,001–200,000	7 (8.3)8	14 (21.5)14	
200,001–300,000	(9.5)20	(21.5)2	
> 300,000	(23.8)	(3.1)	
<b>Income Academic Year</b>	5	12	
0–50,000	(6.0)64	(18.5)39	<b>0.035</b>
50,001–100,000	(76.2)9	(60.0)9	
>100,000	(10.7)	(13.8)	
<b>Income Practicum Year</b>	7	13	
0–50,000	(8.3)55	(20.0)38	<b>0.095</b>
50,001–100,000	(65.5)6	(58.5)8	
>100,000	(7.1)	(12.3)	
<b>Sources of Financial Support<sup>2</sup></b>	77	56	
Salary/Stipend	(91.7)12	(86.2)18	<b>0.651</b>
Moonlighting	(14.3)18	(27.7)8	<b>0.038</b>
Other	(21.4)	(12.3)	<b>0.193</b>

<sup>1</sup> There is variation in total respondents for survey items because some respondents did not respond to every survey item. Some column percentages do not total 100% due to missing values for variables.

<sup>2</sup> Respondents could select more than one response. Total responses are greater than the total of survey respondents for survey items for which a respondent could select more than one response.

Communication, quality improvement and clinical skills were reported as important skills for a PM career across both groups, but there was a statistically significant difference between the groups only for the importance of leadership skills (52.4% vs 86.2%, p = 0.026). Residents

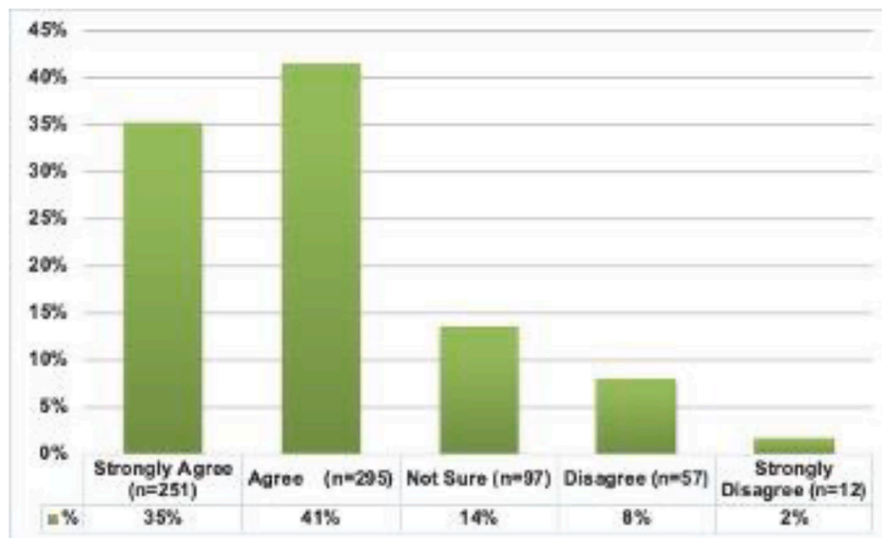
identified communication skills as most important for a PM career, while graduates identified leadership skills as most important (Table 3). Overall, more than three-fourths of respondents either strongly agreed or agreed that their program provided them with opportunities to acquire the skills they identified as important for a career in PM, 14% were unsure and 10% either disagreed or strongly disagreed (Fig. 1).

When asked to expound on skills or knowledge desired for a career that were not obtained during residency; one graduate responded “I wish we had more training in healthcare costs and healthcare systems. With the shift of payment systems for health care around the country this topic comes up very frequently” (Table 4). Several graduates desired more clinical training, with one responding “I think it should be dual board residency.” Some graduates would have liked “more grant writing exposure” and “data analysis skills beyond multivariable regression.” Graduates also wanted more career preparation including “how to succinctly explain preventive medicine to others who aren’t aware of the training” and “more connection to marketable skills, professional networks, and potential work opportunities during training.”

**Table 3**  
Responses to survey questions on PM training environment and post-graduation goals stratified by resident and graduate.<sup>1</sup>

	Graduation Status		p
	Residents n = 84 (%)	Graduates n = 65 (%)	
<b>Areas of Interest within PM</b>	66	43	
Clinical Preventive Medicine	(78.6)7	(66.2)9	<b>0.391</b>
Financial Management	(8.3)31	(13.8)24	<b>0.160</b>
Health Administration	(36.9)25	(36.9)18	<b>0.726</b>
Health Informatics	(29.8)39	(27.7)31	<b>1.000</b>
Health Policy	(46.4)31	(47.7)32	<b>0.604</b>
Academia	(36.9)54	(49.2)38	<b>0.056</b>
Public Health	(64.2)	(58.5)	<b>1.000</b>
<b>Important Skills for PM Career</b>	54	38	
Advocacy	(64.2)	(58.5)	<b>1.000</b>
Clinical	62 (73.8)75	40 (61.5)53	<b>0.313</b>
Communication	(89.3)29	(81.5)22	<b>1.000</b>
Grant Writing	(34.5)28	(33.8)22	<b>0.858</b>
Financial Management	(33.3)44	(33.8)32	<b>0.720</b>
HITS	(57.9)70	(49.2)56	<b>1.000</b>
Leadership skills	(52.4)63	(86.2)48	<b>0.026</b>
Quality Improvement	(75.0)4	(73.8)3	<b>0.510</b>
Other	(4.8)	(4.6)	<b>1.000</b>
<b>Desired/Current Career Setting</b>	35	31	
for Work	(41.7)14	(47.7)13	<b>0.487</b>
Academic	(16.7)31	(20.0)16	<b>0.666</b>
Military	(36.9)32	(24.6)14	<b>0.143</b>
Government Agency-Fed	(38.1)34	(21.5)13	<b>0.029</b>
Government Agency-State	(40.5)27	(20.0)11	<b>0.010</b>
Government Agency-Local	(32.14)18	(16.9)8	<b>0.035</b>
Global Health	(21.4)19	(12.3)9	<b>0.187</b>
Health Technology	(22.6)32	(13.8)8	<b>0.202</b>
Health Systems Administration	(38.1)8	(12.3)2	<b>0.001</b>
Private Practice	(9.5)	(3.1)	<b>0.185</b>
Insurance Industry	6 (7.1)9	3 (4.6)5	<b>0.731</b>
Pharmaceutical Industry	(10.7)	(7.7)	<b>0.582</b>
Other			
<b>Motivations for Seeking Desired Career</b>	8	9	
Financial	(9.5)42	(13.8)23	<b>0.446</b>
Career advancement opportunities	(50.0)48	(35.4)36	<b>0.057</b>
Work/Life balance	(57.1)66	(55.4)49	<b>0.857</b>
Opportunities to improve health of a large group	(78.6)6	(75.4)4	<b>0.461</b>
Other	(7.1)	(6.2)	<b>1.000</b>

<sup>1</sup> Respondents could select more than one response. Total responses are greater than the total of survey respondents for survey items for which a respondent could select more than one response.



Footnotes- The survey logic allowed respondents to rate only those skills they identified as important. Skills included: Advocacy, clinical (direct patient), communication, grant writing. Financial management, Health Information Technology, Leadership, Quality Improvement and Other. Figure data reflect summary of responses for each category across all skills.

Fig. 1. Respondents report on whether their training provided opportunity to acquire the skills they identified as important for a career in Preventive Medicine.

### 3.5. Post-graduate goals

Employment in government was chosen as a current or desired career setting for most residents and graduates followed by academia. There was a statistically significant difference reported for local ( $p = 0.01$ ) and state ( $p = 0.03$ ) government. However, there was no statistically significant difference in current or desired employment in federal government ( $p = 0.14$ ) and academia ( $p = 0.49$ ). The primary motivation for respondents' seeking a career in PM was the opportunity to improve the health of a large group of people (residents (78.6%), graduates (75.4%)  $p = 0.46$ ). Sixty percent of graduates reported difficulty with marketing themselves as a PM physician, 12% had difficulty obtaining a job due to inability to demonstrate a specifically required skill or certification and none reported difficulty in obtaining a license after graduating (Table 5). Reasons graduates cited for difficulty in obtaining a job included "Businesses did not view it as a real residency/clinical training," "Difficulty obtaining primary care jobs requiring BC [board certification]" and "no formal experience, they required some sort of certification or MBA" for a quality improvement/administrative position (Supplemental Table 1).

### 3.6. Sub-analysis

In the sub-analysis comparing respondents who were board-eligible solely in PH/GPM ( $n = 83$ ) to those who were eligible in an additional clinical specialty (dual board-eligibility;  $n = 68$ ); the demographic characteristics were similar (Table 6). At the start of PM training, more solely PH/GPM board-eligible respondents (39.8%) had greater than \$200,000 debt compared to dual-board-eligible respondents (17.7%) ( $p = 0.003$ ). Clinical PM was the most common area of interest for both solely PH/GPM board-eligible (72.3%) and dual board-eligible (73.5%) respondents followed by public health practice; 62.7% vs 61.8% respectively. Both groups considered communication and leadership skills most important for a PM career. Like the results for residents and graduates, government employment at any level (local, state, or federal) was the most common current or desired career setting for both solely PH/GPM board-eligible and dual board-eligible respondents followed by academia. Amongst the solely PH/GPM board-eligible group, private

practice was also a strong area of interest (38.6% vs 14.7%,  $p = 0.002$ ).

Compared to dual-board-eligible respondents, a larger proportion of solely PH/GPM board-eligible respondents reported difficulty with obtaining a job due to inability to demonstrate a specific skill ( $p = 0.003$ ) (Table 7). For both dual board-eligible and solely PH/GPM board-eligible respondents, the greatest proportion of free text responses describing the main reason for pursuing a PM career related to interest in public health/research (Table 6 and Supplemental Table 2). Ninety-one percent of responses describing board-certification as the main reason for pursuing a PM career were from solely PH/GPM board-eligible respondents (Supplemental Table 2). Descriptions of difficulties with marketing oneself as a PM physician was similar for both groups with most responses describing lack of appreciation of PM as a specialty due to limited knowledge of the specialty including limited knowledge of the skillset obtained during PM residency training (Table 6 and Supplemental Table 3).

## 4. Discussion

This national survey provides updates on the background, training environment, and current and future work settings of PM residents and graduates. We found that training environments, interests within PM and post-graduation goals were similar across both groups. PM physicians were mostly female, identify as white, and graduated from a medical school inside the US/Canada. PM residents tend to start their training with lower debt, and their income during training is like other specialties. A higher number of solely PH/GPM participants reported difficulties marketing themselves and finding a job compared to dual board-eligible respondents.

Unsurprisingly, the residents in our study were younger than graduates. More than half of both graduates and residents identified as female, a higher percentage than historical studies reporting a range of 32–36% (Salive and Parkinson, 1991; Salive, 1997; Liang et al., 1995). The higher female response rate in our survey may reflect recent nationwide trends of increasing number of females attending medical school (The Majority of U.S. Medical Students Are Women, New Data Show); and appears to be in keeping with data reported by a recent survey of PM residents (Ricketts et al., 2021). Approximately 16% of our



**Table 4**  
Preventive Medicine Graduates descriptions of skills or knowledge they wish they had that they did not obtain during residency.

Advocacy skills
I wish I had more advocacy opportunities Business of Healthcare/Medicine Deeper understanding of healthcare governance, financial decisions, political maneuvering and market forces driving healthcare consolidation.
I wish we had more training in health care costs and health systems. With the shift of payment systems for health care around the country this topic comes up very frequently. business of Medicine
<b>Clinical (direct patient care) skills</b> More occupational health. I think it should be dual board residency. We did not have clinical PM experience except in smoking cessation; I would have liked a more broad diverse opportunities.
I wanted to acquire both administrative and clinical skills in occupational medicine but there were no opportunities for clinical care in my program. Preventive Medicine and occupational medicine are very valuable specialties however, there seem to be inadequate funding for residents. The federal government does not support a training that is essential! Also there is a discrepancy in the salaries of preventive medicine and occupational medicine. Occ med pays higher wages (sometimes more than \$100,000). Increased clinical experience More clinical hours/more formal outpatient setting procedures (trigger point injections for example).
<b>Grant writing</b> more grant writing More grant writing exposure I wish I had more training in grant writing Grant writing skills Grant writing Grant writing skills
<b>Financial management skills</b> Financial/budget Budgeting Budget analysis (cost-benefit, etc.) Financial management skills more financial management Health Information Technology skills stronger training in healthcare informatics
<b>Leadership skills</b> I wish I had more leadership opportunities
<b>Quality Improvement skills</b> QI
<b>Research/Statistical Skills</b> Day to day statistical analysis, ie Advanced Excel, not full statistical packages I wish I had more training in project management and data analysis skills beyond multivariable regression We had little to no mentorship when conducting research projects; thus I feel unequipped to lead my own research I also wish we had more training in how to handle big data.
<b>Research</b> GIS mapping skills seem to be essential in the health and data world, but are optional as part of MPH, but I think it would be great to have that skill I wish I had some GIS training. This was available, but I did not have capacity during my training for this coursework.
<b>Other</b> Ability actually develop a particular skill in public health. Like I am a QI expert. Or I have epidemiology skills in ID. It is a very broad field. I think every resident graduating with a Prev Med skill that caters to their interest and strengths is a very good way to go.
<b>Social media skills</b> job preparation - specifically, how to succinctly explain prev med to others who aren't aware of the training I picked up many clinical skills doing urgent care work prior to my current job. I think that prev med training should not necessarily include add'l clinical focus unless the length of training is also expanded, since non-clinical training is also extremely valuable.
Additional BC in other area Pharmacovigilance is another huge job market for GPM field, but we get limited exposure or training More connection to marketable skills, professional networks, and potential work opportunities during training

**Table 5**  
Graduates response to survey items relating to licensing and job prospects.<sup>1</sup>

Variable (n = 65)	Frequency	Percent
<b>Difficulty in marketing self</b>		
Yes	39	60
No	19	29.2
<b>Difficulty in obtaining a license after residency</b>		
Yes	0	0
No	59	90.8
<b>Unable to obtain a job you wanted</b>		
Yes	8	12.3
No	36	55.4

<sup>1</sup> There is variation in total respondents for survey items because some respondents did not respond to every survey item. Column percentages do not total 100% due to missing values for those variables.

participants were International Medical Graduates (IMGs), similar to the 13% active PM IMGs reported in the American Association of Medical Colleges 2020 physician specialty data report ([Active Physicians Who Are International Medical Graduates \(IMGs\) by Specialty, 2019](#)).

The number of clinical years of training, board-eligibility, and subsequent board-certification in a non-PM clinical specialty, was higher among graduates compared to residents. Almost all board-eligible graduates reported being board-certified in a non-PM specialty, with the most frequently reported clinical specialties being Internal Medicine and Family Medicine, correlating with historical findings ([Dannenberg et al., 1994](#)). Potential explanations for this trend are alignment of the competencies of these specialties with core competencies of PM as demonstrated by the availability of combined PM training programs ([Programs and American College, 2019](#)) or interest in clinical preventive medicine as demonstrated in our results. Historically, board-certification rates have varied from 45% (PH/GPM) ([Dannenberg et al., 1994](#)) to 47% (all 3 core specialty areas) ([Pearson et al., 1988](#)). However, 91% of graduates in our survey were board-certified. Board-certification rates of up to 93% have been reported, varying with residency sponsor and whether graduates are certified in another specialty ([Dannenberg et al., 1994](#)). The smaller sample size in our study compared to other similar national surveys may explain the high board-certification rate we found. Almost all respondents reported being introduced to the specialty via informal sources, highlighting the importance of networking, but also the potential for growth of the specialty with more formal information sharing.

In 2018, the average debt upon graduating from medical school was \$200,000 ([Asch et al., 2020](#)) however, almost half of residents and over a third of graduates in our study reported no debt at the start of their PM training. A systematic review describing the effect of medical student debt on specialty choice found mixed results; some articles in the review showed a correlation between higher debt and higher paying specialties (e.g. surgery, radiology) while others showed higher debt and lower paying specialties (e.g. primary care) were related ([Asch et al., 2020](#)). Most of the respondents graduated from medical school in 2013 or earlier, indicating delayed entry into PM and possible previous career prior to entry, a possible explanation of the comparatively lower student debt load in our population. Income during training was similar to national trends from other specialties ([Report, 2019](#)).

The most common area of PM interest was clinical preventive medicine. In the 1991 national study of 147 PM residents, most of them (76%) desired clinical work as part of their future practice ([Salive and Parkinson, 1991](#)). Furthermore, according to a 1988 survey, a majority of PM physicians report that “clinical prevention” plays an important role in their practice ([Pearson et al., 1988](#)).

The structure of PH/GPM training, has been described as broad and undifferentiated ([Jung and Lushniak, 2020](#)); and alignment of PM training with professional needs is a considerable concern ([Flower et al., 2019](#)). For instance, PM residents identified communication skills as an important skill to learn, while graduates favored leadership skills as

**Table 6**  
Responses to survey questions stratified by Dual board eligibility versus solely General Preventive Medicine and Public Health (PH/GPM) board-eligible.<sup>1</sup>

	Board Eligibility		P
	PH/GPM Only n = 83(%)	Dual Eligible n = 68(%)	
<b>Age (years)</b>	12	6	
25 – 30	(14.5)31	(8.8)20	0.395
31 – 35	(37.3)29	(29.4)31	
36 – 40	(34.9)	(45.6)	
<b>Race/Ethnicity</b>	36	30	
White	(43.4)	(44.1)	0.126
Black/African American	14 (16.9)4	7 (10.3)	
Hispanic/Latinx	(4.8)12	-18	
Asian	(14.5)2	(26.5)1	
Others	(2.4)6	(1.5)2	
Prefer not to answer	(7.2)	(2.9)	
<b>Gender</b>	35	36	
Female	(42.2)35	(52.9)20	0.544
Male	(42.2)2	(29.4)1	
Other	(2.4)2	(1.5)1	
Prefer not to respond	(2.4)	(1.5)	
<b>Number of Languages</b>	41	35	
One	(49.4)22	(51.5)19	0.582
Two	(2.4)10	(27.9)4	
Three	(12.0)1	(5.9)	
Four or more	(1.2)	-	
<b>Citizenship Status</b>	70	56	
US Citizen/Permanent Resident	(84.3)2	(82.4)1	0.431
Canadian Citizen/Permanent Resident	(2.4)4	(1.5)1	
Non US/Canadian Citizen/Permanent Resident	(4.8)	(1.5)	
<b>Medical School Location</b>	18	7	
Outside of the US/Canada	(21.7)65	(10.3)61	0.047
United States/Canada	(78.3)	(89.7)	
<b>Year of MS Graduation</b>	15	23	
2008 or earlier	(18.1)24	(33.8)27	0.002
2009–2013	(28.9)44	(39.7)17	
2014–2018	(53.0)	(25.0)	
<b>Educational Debt</b>	30	28	
None	(36.1)12	(41.2)4	0.003
1–100,000	(14.5)6	(5.9)16	
100,001–200,000	(7.2)15	(23.5)7	
200,001–300,000	(18.1)18	(10.3)5	
> 300,000	(21.7)	(7.4)	
<b>Income Academic Year</b>	6	11	
0–50,000	(7.2)68	(16.2)36	<0.001
50,001–100,000	(81.9)4	(52.9)14	
>100,000	(4.8)	(20.6)	
<b>Income Practicum Year</b>	7	13	
0–50,000	(8.4)60	(19.1)34	<0.001
50,001–100,000	(72.2)2	(50.0)12	
>100,000	(2.4)	(17.6)	
<b>Years of Clinical non-PM</b>	52	8	
1	(62.7)23	(11.8)5	<0.001
2	(27.7)4	(7.4)39	
3	(4.8)2	(57.4)16	
4 or more	(2.4)	(23.5)	
<b>Specialty of Board Eligibility</b>			
Family Medicine	-	19	<0.001
Internal Medicine	-	23	
Pediatrics	-	10	
Others	-	13	
<b>Board Certified</b>			
No	-	19	<0.001
Yes	-	47	
<b>Board Certified in PH/GPM</b>	1	3	
No	(25.0)12	(75.0)30	<0.001
Yes	(28.6)	(71.4)	
<b>Introduced to PM through:</b>	5	6	
Formal presentation	(6.0)72	(54.5)60	0.426
Informal sources	(86.7)	(45.5)	
<b>Reasons for pursuing PM<sup>2</sup></b>	10	1	
Board-certification	(12.0)9	(1.5)15	0.376
Career advancement	(10.8)13	(22.1)9	
Clinical	(15.7)17	(13.2)8	

**Table 6 (continued)**

	Board Eligibility		P
	PH/GPM Only n = 83(%)	Dual Eligible n = 68(%)	
Interest in specific areas	(20.5)13	(11.8)13	
Population health	(15.7)4	(19.1)	
Work/Life balance	(4.8)23	-32	
Public Health/Research	(27.7)	(47.1)	
<b>Sources of Financial Support<sup>2</sup></b>	77	57	
Salary/Stipend	(92.8)11	(83.8)19	0.116
Moonlighting	(13.3)16	(27.9)10	0.022
Other	(19.3)	(14.7)	0.662
<b>Areas of Interest within PM<sup>2</sup></b>	60	50	
Clinical Preventive Medicine	(72.3)6	(73.5)10	0.400
Financial Management	(7.2)26	(14.7)29	0.113
Health Administration	(31.3)29	(42.6)14	0.081
Health Informatics	(34.9)	(20.6)	0.065
Health Policy	32 (38.6)32	38 (55.9)31	0.010
Academia	(38.6)52	(45.6)42	0.229
Public Health	(62.7)14	(61.8)8	0.715
Other	(16.9)	(11.8)	0.640
<b>Important Skills for PM Training<sup>2</sup></b>	50	43	
Advocacy	(60.2)61	(63.2)42	0.366
Clinical	(73.5)72	(61.8)57	0.266
Communication	(86.7)31	(83.8)20	0.731
Grant writing	(37.3)25	(29.4)25	0.480
Financial management	(30.1)43	(36.8)33	0.285
HITS	(51.8)72	(48.5)55	1.000
Leadership skills	(86.7)62	(80.9)50	1.000
Quality Improvement	(74.7)3	(73.5)4	0.663
Other	(3.6)	(5.9)	0.468
<b>Desired/Current Career Setting for Work<sup>2</sup></b>	34	32	
Academic	(41.0)14	(47.1)13	0.301
Military	(16.9)28	(19.1)19	0.667
Government Agency-Fed	(33.7)30	(27.9)16	0.591
Government Agency-State	(36.1)31	(23.5)17	0.147
Government Agency-Local	(37.3)	(25.0)	0.205
Global Health	27 (32.5)19	11 (16.2)7	0.035
Health Technology	(22.9)13	(10.3)15	0.078
Health Systems Administration	(15.7)32	(22.1)10	0.287
Private Practice	(38.6)6	(14.7)4	0.002
Insurance Industry	(7.2)8	(5.9)2	1.000
Pharmaceutical Industry	(9.6)8	(2.9)6	0.185
Other	(9.6)	(8.8)	1.000
<b>Motivation for Seeking this Career<sup>2</sup></b>	10	7	
Financial	(12.0)38	(10.3)28	1.000
Career advancement opportunities	(45.8)53	(41.2)32	0.864
Work/Life balance	(63.9)66	(47.1)51	0.108
Opportunities to improve health of a large group	(79.5)4	(75.0)6	1.000
Other	(4.8)	(8.8)	0.330

<sup>1</sup> Total respondents who answered at least 1 survey question is 153. Total respondents who answered survey question 6 (Are you board-eligible based on your clinical non-PM training?) which was used to categorize as dual board-eligible or solely PH/GPM board-eligible was 151. There is variation in total respondents for survey items because some respondents did not respond to every survey item. Total responses are greater than the total of survey respondent for survey items for which a respondent could select more than one response. Some column percentages do not total 100% due to missing values for those variables.

<sup>2</sup> Respondents could select more than one response. Total responses are greater than the total of survey respondents for survey items for which a respondent could select more than one response.

important for a career in PM. Respondents' high agreement that their program provided them with opportunities to acquire the skills they identified as important, may show some improvement from previously reported observations. A small study documented deficiencies in leadership and management skills in PM residency training (Flower et al., 2019). The observations in our study may reflect the growing demand for healthcare leaders with a unique combination of clinical and public

**Table 7**  
Bivariate analysis of being dual board-eligible and inability to get a job.

	Inability to get a job		N	p
	Yes (%)	No (%)		
<b>Dual Board-Eligible</b>	3	25		
Yes	(10.7)	(89.3)	28	<b>0.003</b>
No	(31.3)	(68.7)	16	

health skills, which can be found in PM graduates. A study of 797 graduates published more than two decades ago reported that the overall mean ratings of adequacy of training were between 2.2 and 3.1 (out of 4-point Likert-type scale) (Stein and Salive, 1996). The same study called for training improvements in health administration, health education, environmental health and occupational medicine.

Similar to our findings on current/desired career settings, the 1991 PM resident survey found 54% of respondents desired work in government and 33% in academia (Salive and Parkinson, 1991). A survey of 241 general PM graduates (1981–1986) on career choices revealed the top career choices were program activities, teaching, clinical services, and research (Baca et al., 1990). Like our study findings, a more recent study reported among eighty PM physicians surveyed, 44% worked in academia and 25% in government (Flower et al., 2019). Among our study respondents, the main motivation for seeking a career in PM was the opportunity to improve the health of a large group of people.

Our finding that less than half of survey respondents were dual board-eligible is low compared to a survey of a single PM training program which found 88% of program graduates had completed a clinical residency before PM training (Flower et al., 2019). The difference is likely due to the comparison of a national survey like ours with respondents representing various programs and a single program survey. The true proportion of PM residents and graduates who are dual board-eligible likely falls between the national and single program survey findings. We also found that dual board-eligible respondents started PM training with less debt than respondents who were solely PH/GPM board-eligible. Some of the survey respondents had graduated medical school before 2008 and had worked in a clinical specialty before pursuing PM training. It is likely that these dual board-eligible individuals had already begun paying back loans before commencing PM training, thus beginning training with lower debt compared to solely PH/GPM board-eligible respondents who likely entered the specialty directly after medical school or before completing another residency.

We observed high desire for academic career setting among both dual board-eligible and solely PH/GPM board-eligible respondents, consistent with previous studies (Salive and Parkinson, 1991; Flower et al., 2019). However, it is surprising that solely PH/GPM board-eligible respondents almost equally desired academia and private practice as a career setting, especially since private practice is often associated with relatively more direct patient care. A 1991 survey found that board-certified PM physicians were more likely to be involved in PH/GPM training programs than graduates without PM board-certification (Dannenberg et al., 1994). Board-certification is regarded as a formal indicator of mastery of knowledge and skills. In our study, reported PH/GPM board-certification rate was high. However, more than three-fourths of solely PH/GPM board-eligible respondents reported difficulties with marketing themselves and finding a job compared to dual board-eligible respondents. Physicians with a known primary clinical specialty that has a distinct identity and clear scope of practice may find a job more easily.

A recent study by Ricketts et al. found <50% of physicians who self-identified as a PM specialist had PM board-certification (Ricketts et al., 2021). In their study, they also reported difficulty in assessing the current PM workforce due to the absence of a clear established definition of the PM specialty. Moreover, after completing two PM job market surveys in 2001, investigators concluded that GPM board-certification had little to no value for success in the GPM job market (Nitzkin et al., 2001).

Despite the seemingly questionable value of PM board-certification in securing a job, the number of physicians with PM board-certification increased from 1999 to 2018 (Ricketts et al., 2021); perhaps indicating increased personal valuation of board-certification by physicians. A respondent in our study also noted that board-certification helped justify dedicated full-time equivalent for public health work. These findings possibly signal improving recognition for PH/GPM board-certification and skillset.

PM is a well-recognized specialty by the ACGME, and PM training fulfills the ACGME requirements for competencies and milestone specifications used to define medical specialties. PM has a breadth of training structure and requirements that some consider advantageous because they allow for career flexibility (Pearson et al., 1988). Others argue that it has resulted in an ill-defined scope of practice and consider the specialty of PM as poorly understood and void of unifying explanation (Jung and Lushniak, 2017). Jung and Lushniak have suggested that PM as a specialty suffers from a lack of definition and the PM training requirements do not equip PM graduates with the skillset that is unique enough to warrant notice when measured against most other specialty training (Jung and Lushniak, 2020; Jung and Lushniak, 2019). Furthermore, reportedly many PM physicians have made one or more career changes (Pearson et al., 1988). This, along with the wide spectrum of career paths among self-designated PM physicians (Lane, 2000; Ricketts et al., 2021) may partially explain why it is complicated to assess the PM workforce in the United States. ( Self-segregation and division among PM specialists further compound the problem and makes distinct recognition of the specialty by other physicians, public health professionals and the public somewhat difficult (Jadotte et al., 2019). However, recent work attempts to address these issues- A 2021 paper by Jadotte et al proposes three core functions and ten essential services unique to the PH/GPM specialty (Jadotte and Lane, 2021). The current pandemic has also served to highlight the importance of the synergy of clinical and public health approaches to population health and provides opportunities for PM graduates to lead and for the field to create a distinct identity for itself.

#### 4.1. Strengths/Limitations

Our study has several strengths. The study sample is from the ACPM national database. The inclusion of both PH/GPM residents and graduates differs from previous national surveys which focused on either residents or graduates (Salive and Parkinson, 1991; Liang et al., 1995; Pearson et al., 1988). This extended eligibility allowed for comparisons of residents and graduates, and of respondents based on board-eligibility status. The survey also gathered both multiple-choice and free text responses which allowed respondents to provide more detailed descriptions of key areas. Despite its strengths, the survey had weaknesses including a low response rate (18.25%) compared to previous national surveys (30–75%) which may limit its generalizability (Salive and Parkinson, 1991; Liang et al., 1995; Pearson et al., 1988). It is possible that a third reminder may have increased response rate since three reminders yielded a 44% response rate in another study (Pearson et al., 1988). Our survey did not provide avenues to probe further on certain qualitative responses. Also, the survey logic did not force respondents to answer all questions so there is partial information collected for some respondents. Finally, the small sample size of graduates who completed PM training than ten years before the survey limited our ability to stratify graduates in to recent and remote groups. A larger sample size allowing for stratification of graduates may have highlighted differences in responses between recent and remote graduates.

## 5. Conclusion

PH/GPM is a specialty recognized by the ACGME, with a set of required core competencies in both clinical medicine and population health. The specialty of PH/GPM attracts diverse physicians, many of

whom ‘stumble’ into the specialty. PM residents tend to start their training with a lower debt burden, but their income during training is similar to other specialties. Generally, recent PH/GPM residents feel they have opportunities to acquire the skills they need for a career in PM, improved compared to their counterparts in previous studies. The wide scope of PM practice offers a variety of career options after graduation, albeit with considerable obstacles. Due to indistinct identity and poor knowledge of the specialty by employers, some PM physicians find it hard to market themselves, higher among solely PH/GPM board-eligible participants. Despite these challenges, PH/GPM remains a desired and viable specialty for physicians, especially those seeking opportunities to make an impact at a large scale through a myriad of career paths. Our findings inform the PM community with areas to improve in the training environment and career planning. Further work is needed to shape a distinct and marketable identity of the PM physician.

#### CRedit authorship contribution statement

**Adeola O. Fakolade:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Assim M. AlAbdulKader:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Dolly P. White:** Methodology, Writing – original draft, Writing – review & editing. **Adeleye Adaralegbe:** Methodology, Writing – review & editing. **Neha S. Burse:** Data analysis, Writing – original draft, Writing – review & editing.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Appendix A. Supplementary data

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