

The Future of Occupational and Environmental Medicine

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ABSTRACT: Occupational and environmental medicine (OEM) is an ACGME-accredited preventive medicine specialty focused on work as a social determinant of health and population health. OEM providers recognize and mitigate workplace

and environmental hazards, treat resultant injuries and illnesses, and promote the health, wellness and resiliency of workers and communities. Multidisciplinary residency training in clinical medicine, epidemiology, public and population health, toxicology, exposure and risk assessment, and emergency preparedness equips them with the skill set needed for leadership roles in diverse settings. These include clinical practice, academia, corporate settings, and governmental agencies. Despite robust job opportunities, a shortage of formally trained OEM physicians remains and is expected to worsen given a declining number of training programs. We examine root causes of the system-level issues impacting the supply of OEM physicians and potential solutions.

Occupational and environmental medicine physicians work to improve the health, well-being, and safety of employees and their communities, locally and globally.

The historic and catastrophic severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) pandemic has required rapid interpretation of complex public health data and timely development and implementation of public health and workplace guidelines. Physicians with multidisciplinary OEM expertise have been essential to the pandemic response. With their training, the OEM physician understands the risks our workforce faces from infectious and environmental hazards and how to identify, manage, mitigate, and prevent them. The ability to keep employees safe and healthy is of optimum importance and enables our society and economy to continue to function and flourish. The OEM physician is critical to this mission. This article addresses the value of OEM, the current state of OEM practice and education and the challenges faced regarding the training of future OEM physicians.

Keywords: American College of Occupational and Environmental Medicine, funding, graduate medical education, Health Resources and Services Administration, National Institute of Occupational Safety and Health, occupational and environmental medicine, residency training, Veterans Administration

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Occupational and environmental medicine (OEM) has been practiced since at least 3000 BC when injured pyramid workers were offered care and compensation, as documented in the Edwin Smith Papyrus.^{1,2} Bernardino Ramazzini (1633 to 1714), who identified numerous workplace hazards and associated diseases, documented in *Diseases of Workers*, 1632, is considered the father of occupational medicine. Alice Hamilton (1869 to 1970) was one of the first physicians to bring attention to the health hazards that workers in the newly industrialized United States endured, paving the way for OEM as we know it today. Occupational and environmental medicine is the field where medicine and public health intersect. Emphasizing work and the environment as important social determinants of health, OEM professionals use a multidisciplinary approach to recognize, diagnose, treat, and prevent injury and illness that arise from exposures at work, home, and the environ-

VALUE OF OEM

The value of OEM as a specialty is broad-reaching. Occupational and environmental medicine physicians possess the comprehensive skillset essential to protecting the health and well-being of employees and the broader public. They routinely work in multidisciplinary teams with the task of integrating the expertise of the various stakeholders to recognize, manage, and prevent work-related injury and illness effectively, as well as provide guidance on complex causation determinations and return-to-work issues.

OEM residency training involves education in clinical medicine, epidemiology, biostatistics, risk assessment, industrial hygiene, safety, toxicology, and organizational management. Essential competencies for board certification in OEM include clinical OEM, OEM-related law and regulations,

TABLE 1. Ten Core Competencies of Training of an Occupational and Environmental Medicine Physician

Clinical OEM	Hazard recognition, evaluation, and control
OEM-related law and regulations	Disaster preparedness and emergency management
Environmental health	Health and productivity
Work fitness and disability Management	Public health, surveillance, and disease prevention
Toxicology	OEM-related management and administration

OEM, occupational and environmental medicine.

environmental health, disaster preparedness and emergency management, public health, surveillance and disease prevention, and OEM-related management and administration.³ Occupational and environmental medicine physicians learn to recognize occupational and environmental hazards, develop strategies to mitigate such hazards, and also manage those who are impacted by hazardous exposures, whether from work or from the general environment (Table 1).³ In addition, OEM physicians are trained to conduct workplace site visits, where hazards can be identified and mitigated. This can lead to improvements in worker health and safety. This interaction and immersion can also result in improved communication with employers and employees. Such workplace engagement is uncommon for by physicians of other specialties.

Employers gain multiple benefits from engaging with OEM physicians, not the least of which is returning employees to work safely and minimizing workers' compensation (WC) costs. Occupational and environmental medicine physicians appreciate that illness and injury—whether work related or not—can have social, practical, and financial impact on employers.^{4,5} Returning an employee to work, for example, even in a restricted fashion, reduces WC costs, both medical and indemnity, and can reduce long-term disability. This may not be generally appreciated or managed well outside of OEM. Occupational and environmental medicine physicians, expert in disability management, know how to manage such work-related injury and illness and understand how claims are handled, what is compensable, and how disputes are resolved. They can lead a team of key stakeholders, which include physician specialists, nonphysician providers, human resources, safety specialists, case managers, adjusters, insurers, and employers.⁶

The WC is a parallel and independent insurance system in the United States. Although unfamiliar to many physicians of other disciplines, OEM physicians are intimately familiar with this system.⁶ The WC is one of the oldest forms of social insurance in the United States and the third-largest source of support for disabled workers after Social Security and Medicare.⁷ It is not one unified system but consists of multiple different compensation systems governed by various laws, depending on the state, federal, or employer jurisdiction. This no-fault system provides compensation for medical and rehabilitation costs for certain work-related injuries and illnesses to employees.⁷

Insurers that handle WC and other types of claims and benefits (eg, medical, social security disability, or personal injury) appreciate the OEM physicians' expertise in public health, population health, disability, and medical causation. Occupational and environmental medicine physicians can criti-

cally review claims, Occupational Safety and Health Administration reports, and other data to identify risk factors for workplace injuries or illnesses that are amenable to intervention. Outcomes of this analysis can result in significant cost savings for the employer.⁸ Occupational and environmental medicine physicians are ever cognizant that workplace injuries may impact insurance rates, affect worker productivity and morale, and trigger regulatory action and as such can help mitigate these effects. Insurers also have a need for medical review of complex injuries or illnesses, which OEM physicians can provide, including preparing evidence-based expert causation reports.⁹

Attorneys rely on OEM physicians to provide medical expertise regarding issues of causation and disability, even outside of WC, which can be contentious. The OEM focus on functional outcomes can provide useful input in resolving these issues.^{10,11} In particular, the complexities of WC law, which varies by state, territory, or federal work setting, merit OEM expertise, which is necessary for certain work tasks such as assigning disability ratings to particular medical impairments.

The workplace can be an effective environment for preventive health interventions, and workplace wellness and prevention initiatives, which are often developed by or in conjunction with OEM physicians. Such population health programs are designed to prevent and control chronic disease as well as improve worker physical and emotional well-being. Recognizing the interplay between work, home, and community exposures and health is important toward achieving improved health outcomes.^{12,13}

Occupational and environmental medicine physicians are also poised to deliver efficient, value-based leadership, especially in times of crisis, which became apparent during the SARS-CoV-2 pandemic. The pandemic has exposed organizational deficiencies and shown where improvements in structure and communication are needed. The pandemic brought a clearer vision to organizations of the role of OEM in protecting their employees' health. The pandemic has also forced organizations to look for public health expertise to help contain the virus and has demonstrated the value of occupational safety and health (OSH) professionals, in particular OEM physicians. With public health, employee health, population management, and epidemiology skills, as well as already forming strong relationships with key stakeholders within the institutions they serve, OEM expertise has been sought out and highly valued.

Throughout the pandemic, OEM physicians have provided invaluable assistance in multiple arenas, including exposure management, workplace safety practices, personal protective equipment allocation, COVID-19 surveillance and testing, and return-to-work guidance in accordance with local, state, and

federal public health guidance.^{14–18} The beneficial impact of OEM physicians has indelibly underscored the need for more OEM physician specialists in multiple sectors of our society. One of the features of highly reliable organization is harnessing expertise, which is possessed by OEM physicians around public health and population management.¹⁹

THE STATE OF THE OEM PHYSICIAN RESIDENCY TRAINING

Occupational medicine physicians report one of the highest satisfaction indices and lowest burnout among medical specialties^{20–22} and enjoy a robust market of available positions,^{23,24} yet there is a long-standing shortage of formally trained OEM physicians, well-documented by the National Academy of Medicine.^{25–30} There is also a paucity of public training funds.^{27,31} Occupational and environmental medicine residency training programs are typically two years in length after applicants have completed a minimum of one postgraduate clinical year. Occupational and environmental medicine is listed as a preventive medicine specialty. The Centers for Medicare & Medicaid Services, which funds most residency programs in the United States proportional to time spent in clinical settings, does not fund OEM residencies to the same degree because of necessary time spent in non-clinical settings, such as pursuing a master's in public health, working in public health departments, visiting/evaluating worksites, and consulting with attorneys and insurers. Funding is needed to support resident stipends, benefits, tuition for master's degree in public health, and other expenses related to training OEM residents. Currently, the main funding sources for OEM residency training programs are the National Institute for Occupational Safety and Health (NIOSH) within the Centers for Disease Control and Prevention, the Health Resources and Services Administration (HRSA), the Veterans Administration, and individual institutional support.

Overall, funding for OEM residencies has decreased over the past 20 years. The NIOSH funds have been reduced, whereas resident stipends and benefits have increased year by year. For example, in the Association of American Medical Colleges national 1994 to 1995 survey year, the mean annual actual stipend was \$30,753. In contrast to that in 2020, the mean actual annual stipend has almost doubled at \$58,921, an increase of 3.0% over the prior year.³² Although when accounting for inflation, the stipend amount for residents has changed little, there has been an undue hardship to programs as the funding allocations have not grown at the same rate as the stipends paid. Corporate donations and scholarships that used to be available, such as the Occupational Physicians Scholarship Fund (1994 to 2004), have largely disappeared.³³ Although some institutions have received HRSA

and Veterans Administration funding more recently, these newer sources of funding remain inadequate to meet the training needs of the field. Currently, of the 23 existing OEM training programs, 18 receive partial funding support from NIOSH, and three receive funding from HRSA.^{14,34} Subsequent to the reduction in funding and increase in costs, the number of US residency training programs has declined over the past two decades, from a high of 40 programs in the 1970s to currently 23 in the United States. Residency program closures were most notable after the year 2000, comprising 95% of closures.³⁵

In 1991, an Institute of Medicine report noted that “funding is not presently adequate to support graduate training in OEM” and recommended that “a significant infusion of federal monies is needed in a field that is almost exclusively an outpatient specialty and generates relatively few patient care dollars.”²⁷ Today, four decades later, the funding issue remains; approximately one-half of available training positions have had the necessary funding (Fig. 1) (the latest data on the number of filled and unfilled positions in occupational medicine from 2001 to 2019 show underfilling of programs over time; Accreditation Council for Graduate Medical Education [ACGME], e-mail communication, September 2020).

The OEM specialty has pioneered a “Train-in-Place” program approach that allows midcareer physicians from specialties outside preventive medicine to train in the place where they live and work in OEM without incurring a significant loss of income. Supervised training in the community setting is combined with intensive training at an ac-

ademic or governmental institution, and the cost per trainee is reduced as the physician can maintain a salary during OEM residency training. This Train-in-Place program has trained approximately 7% of new American Board of Preventive Medicine–OEM diplomates in the field over the past decade.³⁶

Given that funding has declined over the past several decades, the number of ACGME-approved residency positions has been filled at a little over half capacity (Fig. 1). Whereas other residency positions have increased, over the past couple of decades, for medical specialties such as internal medicine and family medicine, the number of ACGME-accredited residency positions for OEM have remained stagnant (Figs. 1–4) and significantly underfunded, hence the reduced filling of these positions (ACGME, e-mail communication, September 2020).^{36,37} Whereas for other US medical specialties the ability for residency positions to be filled is based on demand by graduating medical students, in OEM the issue is not primarily demand, but rather the inability of OEM training programs to fund positions for which they are accredited. Qualified applicants are turned away. The shrinking number of programs, as well as the inability to fund all accredited positions, is one of the factors affecting the pipeline for residency-trained, board-certified OEM physicians.

Other factors contribute to the shrinking OEM physician workforce, not the least of which is limited visibility of OEM among medical students, residents, and practicing physicians. Many physicians are unaware of OEM until after years of practice in another field.^{38,39} They may enter the field

midcareer, having already achieved board certification in other areas of medicine, such as internal medicine and emergency medicine, at a stage of life when return to formal education as a full-time resident is generally not a feasible option.³³ This results in a limited number of applicants to training programs contributing further to the inadequate OEM pipeline. The novel Train-in-Place program is able to somewhat mitigate this issue as physicians are able to train where they work.

The number of newly board-certified OEM specialists declined from a high of 229 in 1997 to 90 in 2021, falling below 100 for the first time in 2001 where it has remained (Fig. 5) (Chris Ondrula, American Board of Preventive Medicine, e-mail communication, April 2021; The American Board of Preventive Medicine, copyright 2020, all rights reserved). Current projections estimate a loss of 1655 OEM-certified physicians over the next 10 years because of retirement. The American College of Occupational and Environmental Medicine projects a net workforce reduction of 891 (33%), from 2015 to 2025.⁴⁰ This shortage of formally trained physicians is reflected in the specialty board certification by the ACOEM members, the professional society for OEM. One-half (Bill Bruce, executive director of the American College of Occupational and Environmental Medicine, e-mail communication, April 2021) of the membership (active and retired, excluding student members) are diplomates of the American Board of Preventive Medicine certified in occupational medicine, and approximately 65% are board-certified in another specialty, many being diplomates of more

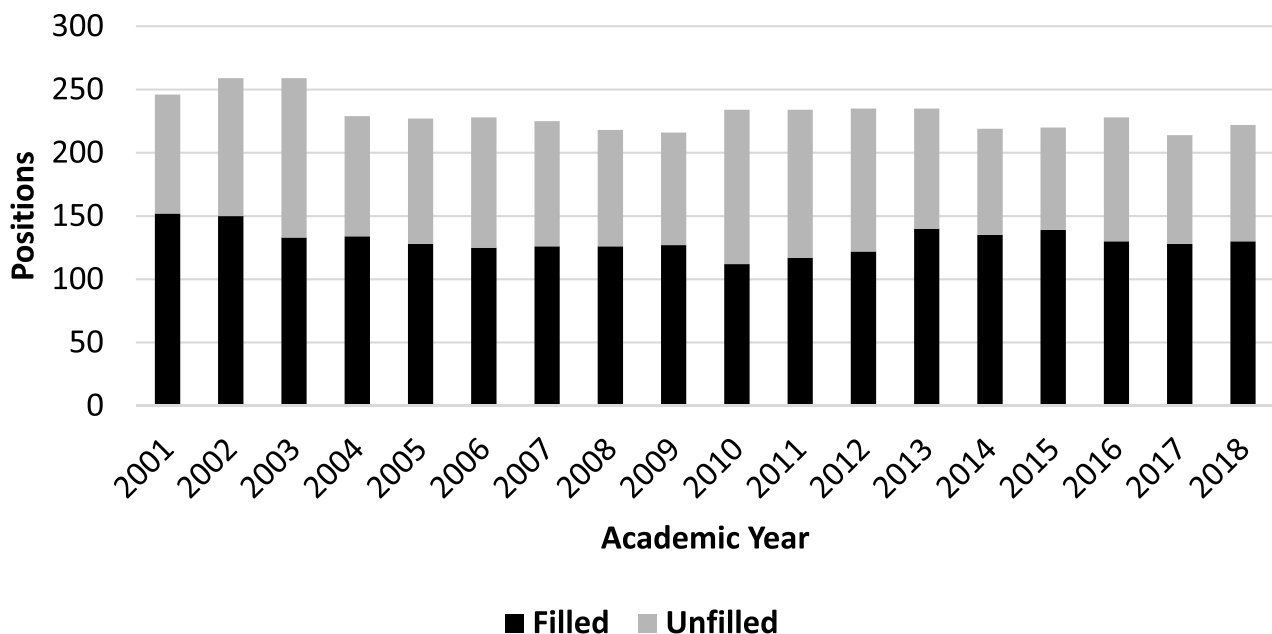


FIGURE 1. Filled and unfilled residency positions in US occupational and environmental medicine training programs, 2001–2019. Data from the Accreditation Council for Graduate Medical Education.

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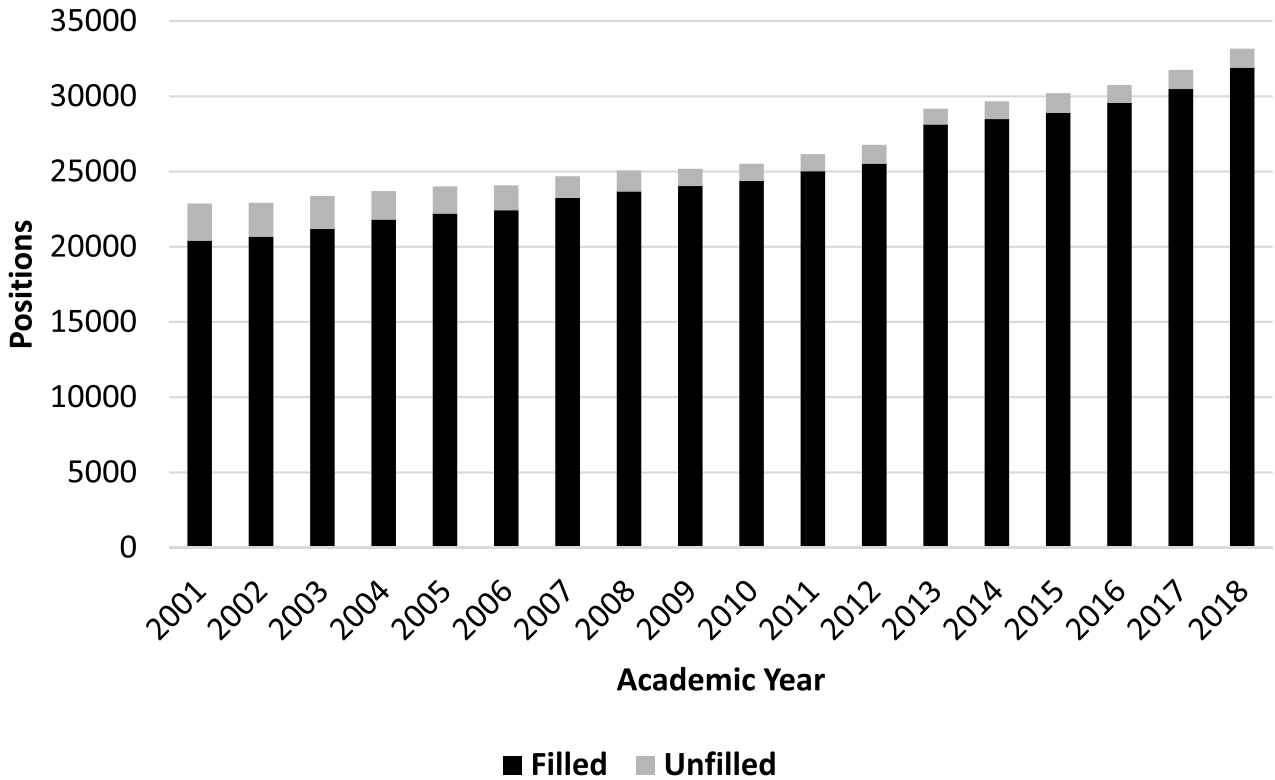


FIGURE 2. Filled and unfilled residency positions in US medical specialty training programs participating in the Match, 2001–2019. Data from the National Resident Matching Program.

than one board (Dr Beth Baker, president of the American College of Occupational and Environmental Medicine, e-mail communication, March 2021). Concerns regarding the supply

and demand for OSH professionals in the United States are not new.

In 2011, NIOSH commissioned a National Survey of the Occupational Safety

and Health Workforce, one of the most comprehensive surveys of the OSH workforce. This survey estimated that OEM physicians comprised 3% of all (N = 48,000) OSH

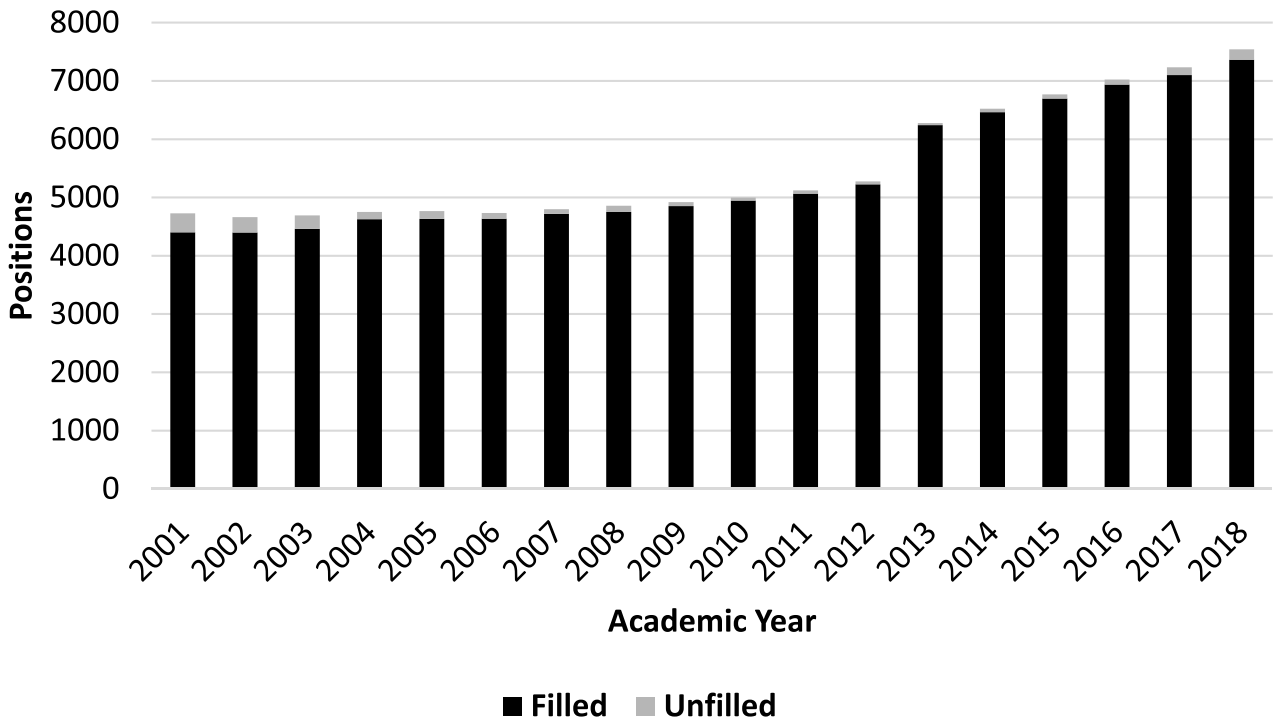


FIGURE 3. Filled and unfilled residency positions in US categorical internal medicine training programs, 2001–2019. Data from the National Resident Matching Program.

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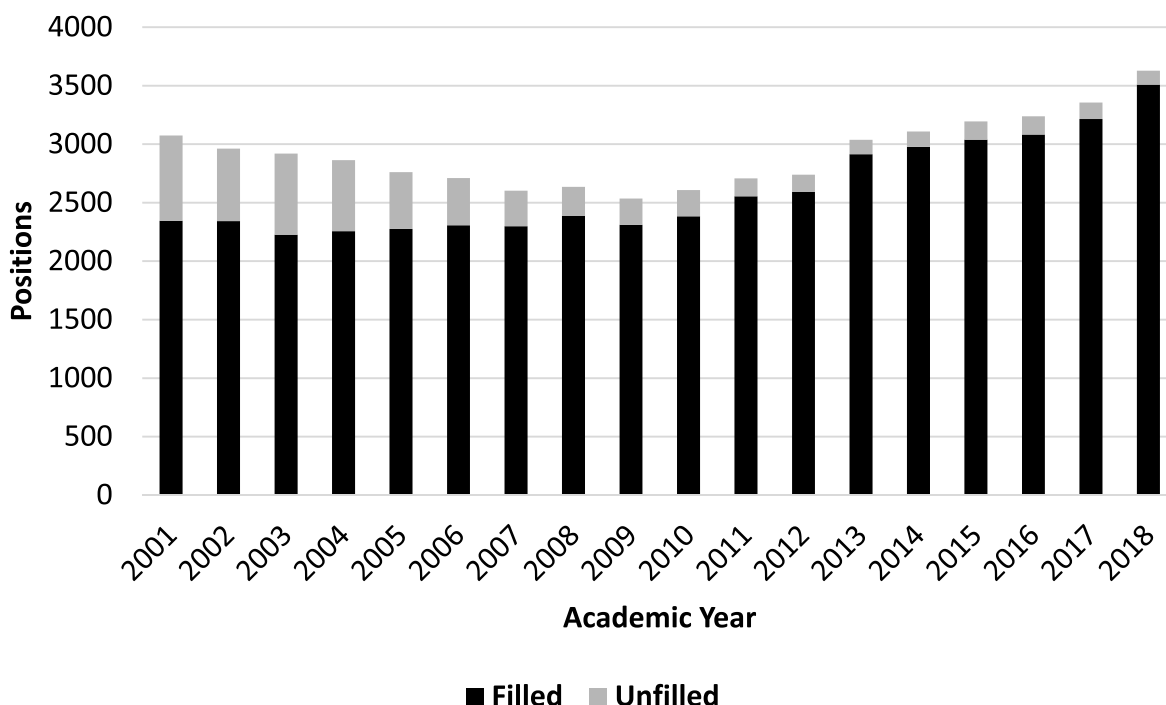


FIGURE 4. Filled and unfilled residency positions in US family medicine training programs, 2001–2019. Data from the National Resident Matching Program.

professionals, an estimated 1,440.⁴¹ The report predicted a bleak forecast of inadequate OSH professionals with the necessary training, education, and experience to meet future national demand for OSH. As the number of US workers continues to grow, from 62 million

people in the labor force in 1950 to 146 million people in 2000 to 160 million at present, the shortage of OEM physicians promises to worsen.^{42,43}

The lack of funding and of visibility have perpetuated the shortage of OEM physi-

cians. Resident surveys suggest that residents are satisfied with their training and that the training meets their needs.³⁹ Residency-trained physicians have more opportunities for advancement and for securing senior leadership and executive

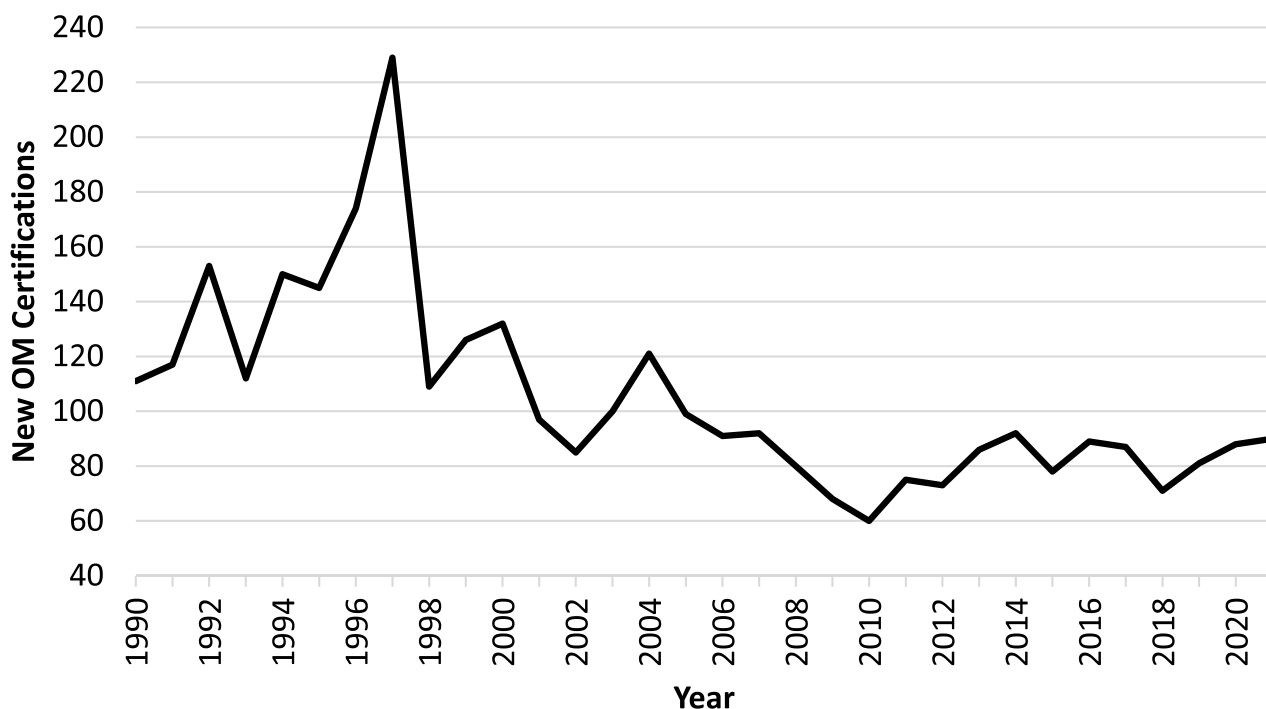


FIGURE 5. Number of new certifications in OM per year, 1990–2021. Data from the American Board of Preventive Medicine. OM, occupational medicine.

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positions than those who practice OEM without formal training.⁴⁴

CONCLUSION AND CALL FOR ACTION

Despite these challenges, OEM residency programs continue to produce highly qualified, well-trained physicians who become leaders in corporate medicine, regulatory agencies, public health departments, governmental agencies, managed care companies, health systems, and academic institutions, providing clinical care and population health management to employees, their families, and their communities.^{38,39,44} Yet, the number of OEM physicians remains limited. The National Academy of Medicine called for US residencies to train physicians to meet the nation's needs.⁴⁵ This charge is not being met as regards OEM physicians in that there is a longstanding and well-documented need for significantly more board-certified OEM physicians than are available today, to secure the health and safety of our current and future workforce, as well as to meet the inevitable public health and environmental health threats. Readiness and preparation are keys to success to this end.

In the midst of the largest pandemic of our lifetime, OEM physicians have been developing and overseeing screening and return-to-work programs for COVID-19 in industries, academic institutions, hospitals, schools, and so on. Unfortunately, many industries and companies lack board-certified OEM physicians and have been left to figure out how to resume safe workplace operations, sometimes with deadly results.⁴⁶ As we have witnessed in this pandemic, it is challenging to have a strong and growing economy without a healthy and well-protected workforce.¹⁴⁻¹⁸ Our employees are a priority.

These challenges at the system level have hampered efforts to address the shortage of OEM physicians. Successful strategies to reduce this shortage can be operationalized by bringing diverse stakeholders together including government, payers, and educators. Potential solutions include integrating OEM into required learning for medical students, increasing the footprint of OEM in US Medical Licensing Examinations, expanding funding to adequately support training programs, improving opportunities, and funding for midcareer professionals to train in the field and greater emphasis on OEM board certification to fill OEM positions. Above all, the increasing demands for OEM physicians in the United States cannot be met by the current inadequately funded OEM residency training programs.

The story of OEM continues to unfold within the changing landscape of industry and public health demands. Qualified trained OEM practitioners remain at the intersection of worker, environment, and public health. With financial resources matched to the task at hand—to train future OEM physicians—

this specialty can continue unencumbered to firmly manage the reins in furthering the occupational and environmental safety and health of our workforce.

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