Occupational Health and Safety Training and Education Grant

Final Progress Report

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List of Abbreviations

ABET	ABET, Inc. (formerly Accreditation Board of Engineering and Technology)
AIHCE	American Industrial Hygiene Conference and Exhibition
ANSAC	Applied and Natural Science Accreditation Commission
CIH	Certified industrial hygienist (American Board of Industrial Hygiene)
CSP	Certified safety professional (Board of Certified Safety Professionals)
DL	Distance learning
DOE	US Department of Energy
ENHS	Environmental Health Sciences
GPA	Grade point average
GRE	Graduate Record Examination
GSP	Graduate Safety Professional
IH	Industrial hygiene
MSPH	Master of Science in Public Health
NIOSH	National Institute for Occupational Safety and Health
OC	On-campus
OS&H	occupational safety and health
OSHA	Occupational Safety and Health Administration
SPH&TM	School of Public Health & Tropical Medicine
PhD	Doctor of Philosophy
QAP	Qualified Academic Program
ROH	Registered Occupational Hygienist
URM	Underrepresented minority
USEPA	United States Environmental Protection Agency

Abstract

A significant shortage of occupational health and safety professionals, including industrial hygienists, is projected because of an imbalance between the supply and demand of suitably trained and educated professionals. Additionally, there is a disparity in the numbers of under-represented minority professionals in the occupational safety and health fields. The Tulane University industrial hygiene training program has addressed these issues through its goal of providing support for industrial hygiene graduate students in the School of Public Health & Tropical Medicine MSPH-IH degree program. The MSPH industrial hygiene program began in 1980, a distance learning option was added in the early 1990s, and the program has been ABET accredited since 1996 including both the traditional on-campus and the distance learning options. The Industrial Hygiene graduate program curriculum is comprehensive and includes core courses from various public health disciplines, specialty courses in industrial hygiene, and applied research and practice experience. During the training program period of July 1, 2016 to June 30, 2021, 18 students graduated with the MSPH-IH degree and 5 of these were underrepresented minorities. Eight of the graduates have already obtained professional board certification (8 CIH, 1 CSP, 1 ROH including multiple certifications). Six of the graduates and 9 continuing students during the grant period were appointed as trainees and received financial support through the training grant program for partial tuition reimbursement and/or stipend. Six of the trainee students are still currently in the program working towards completion of their degree requirements. Support for attendance at professional conferences was also provided to select trainees. Of the 15 trainees, 4 were on-campus students and 11 were in distance learning. Seven of the 15 trainees were underrepresented minorities. Of the 6 trainees who graduated, 5 are currently employed as occupational health and safety professionals in industry, consulting, or government and one is pursuing the PhD degree in industrial hygiene. The NIOSH training grant program has significantly contributed to the recruitment, retention, and graduation of students in the Tulane MSPH-IH degree program and has supported our program goal of providing graduate-level training of underrepresented and midcareer students in industrial hygiene.

Background

The Tulane School of Public Health & Tropical Medicine academic industrial hygiene program began in 1980 with the hiring of the first two faculty in the areas of industrial hygiene and environmental toxicology. The IH program offered the MSPH graduate degree and was designed primarily as an on-campus, evening-based program to serve local and regional mid-career professionals who desired advanced education and training in industrial hygiene. In the early 1990s, a distance learning option was developed using teleconference audio-video technology to deliver the program to a cohort of students at the DOE facility in Hanford, WA. As the internet matured and bandwidth increased, the distance learning program transitioned to synchronous, internet-based delivery in the late 1990s. This conversion provided an unlimited expansion in the reach of the program, in effect allowing the matriculation of distance learning students from anywhere in the United States and indeed, the world. The MSPH-IH program was fully accredited by ABET in 1996 and included both on-campus and distance learning options. Our program was the first distance learning program in industrial hygiene to be so accredited. The MSPH industrial hygiene program is currently ABET accredited through 2023. In 2006, we also began offering a graduate certificate in industrial hygiene in response to a need created by new educational requirements instituted by the American Board of Industrial Hygiene for eligibility for the CIH.

- Need for the Program

In a survey of employers and education providers commissioned by NIOSH in 2011,[1] the estimated number of OS&H professionals that employers expect to hire in 2011 and in the following 5 years was 25,000, whereas OS&H training/education programs were anticipated to produce only 13,000 such individuals. The shortfall of new graduates in OS&H in comparison to the estimated need is being exacerbated by the aging of the OS&H workforce with disproportionate rates of retirement among safety and health professionals.

Tulane's program meets both regional and national needs for training in Industrial Hygiene. Tulane is located in the center of the petrochemical industry in the gulf south region of the country. The industrial corridor along the Mississippi River between New Orleans and Baton Rouge houses over 100 petrochemical plants and facilities. In addition, the Gulf of Mexico coast from the Texas/Louisiana border to the panhandle of Florida is heavily industrialized with petrochemical and fossil fuel-related industries. Oil and gas production is a major industry involving both offshore Gulf of Mexico and on-shore activities. Other major industries in the region include shipbuilding, pulp, paper and timber, agriculture, particularly rice and sugarcane, and fisheries. This is one of the few programs in the gulf south region and is the only graduate level IH program in the lower Mississippi Delta Region. Furthermore, the distance learning, evening-only program has been extremely successful in providing graduate level education in IH

[1]M.T. McAdams, J.J. Kerwin,V. Olivo, H.A. Goksel: National Assessment of the Occupational Safety and Health Workforce. Westat: Rockville, MD. October 3, 2011. Available at http://www.cdc.gov/niosh/oshworkforce/pdfs/NASHW_Final_Report.pdf

to mid-career students throughout the United States and other countries who would otherwise not have access to such educational opportunities due to location or work obligations.

- MSPH-IH Program Admissions, Curriculum, and Graduation Requirements

The overall goal of the industrial hygiene program is the education and practical training of scientists and engineers as professional industrial hygienists. Graduates are prepared to enter careers in industry, government, academia, and other areas where the skills and competencies of an industrial hygienist are required. The MSPH program is also designed to provide graduates with the academic preparation needed to qualify for and pass the certification examination administered by the American Board of Industrial Hygiene. As such, graduates are provided with classroom and field training in the anticipation, recognition, evaluation and control of chemical, biological, and physical health stressors in the workplace and indoor environments. The MSPH-IH program is accredited by the Applied Natural Science Accreditation Commission of ABET through 2023.

Candidates for admission into the industrial hygiene MSPH degree program must hold a baccalaureate degree based on a minimum of 120 semester hours or the equivalent, that shall include 60 or more credits in undergraduate or graduate level courses in mathematics, engineering, science, and technology, with at least 15 of those at the upper (junior, senior, graduate) level. The undergraduate GPA should be at least 3.0 or the equivalent. Graduate Record Examination is required, with scores in the upper percentiles preferred. However, the Tulane School of Public Health & Tropical Medicine waived the GRE requirement for admission into all graduate degree programs for academic years 2020 – 2022 because of the COVID pandemic and the attendant difficulties for program applicants. Those students applying for admission in the distance learning format should also have several years of professional experience in industrial hygiene or closely related field. Applicants must submit career statements as well as a minimum of 3 references. Applications are submitted and managed through the Association of Schools and Programs of Public Health Admissions System (SOPHAS) http://sophas.org/.

Graduation requirements and curriculum are identical for both on-campus and distance learning options. Students participating in the distance learning option are required to attend a one-week, on-campus session to perform the laboratory exercises in ENHS 7500 Air Sampling & Analysis. This is usually in their second summer in the program - otherwise their entire curriculum is delivered via DL with most of the coursework being delivered in synchronous mode.

The MSPH – Industrial Hygiene degree requires the completion of 46 credits with at least a 3.0 overall grade point average. The curriculum is composed of a series of carefully designed courses to provide a breadth and depth of knowledge, as well as field experiences, practica, and other activities to integrate this knowledge and practice experience. The required coursework

consists of the public health core (18 credits required for all students in SPH&TM), the departmental core (6 credits required for all ENHS students), and the industrial hygiene core (22 credits required for all MSPH-IH students) for a total of 46 credit hours. In addition to the required coursework, graduates of the MSPH-IH program must perform a practicum, complete a Public Health Analysis (thesis) on an applied research topic, and successfully pass an industrial hygiene comprehensive exam.

The practicum is a planned and supervised practice experience or internship which applies measurable learning objectives to real-world public health practice and includes a minimum of 200 contact hours. The practicum includes an initial student plan and placement agreement and incorporates student activities that are coordinated and evaluated in writing by the student's preceptor and faculty advisor. At the conclusion of the practicum, there is a final student evaluation by the preceptor and the advisor, a student self-assessment of the accomplishment of the practicum goals and objectives, and a final written report and an abstract prepared by the student assessing the activities and the attainment of the learning objectives. Mid-career students may satisfy the practicum requirement by preparing a report demonstrating how they have integrated and utilized the knowledge and skills gained in the degree program into their current job performance and practice.

The public health analysis is a formal, professional written document that describes the student's applied research that contributes to the scope of knowledge in the field of public health, addresses a specific or general problem in industrial hygiene, and demonstrates the student's mastery of the program competencies. The research may be conducted at the student's workplace if appropriate. The public health analysis entails a testable hypothesis, a discussion of the background issues and literature related to the hypothesis, a description of the research approach including methods and materials, and presentation of results and analysis including statistical evaluation of data. The importance of the results in relation to public health/industrial hygiene is discussed and recommendations for future interventions and research are included. At the completion of the work, students deliver a 30 minute oral presentation to faculty and students describing their work. DL students do this presentation remotely via Zoom.

The industrial hygiene comprehensive exam is required of all students but can be waived for those who obtain professional certification from the American Board of Industrial Hygiene. The exam format is multiple choice and is administered electronically. The test is formally proctored, either at Tulane (for OC) or at a location chosen by the student (for DL) and approved by Tulane personnel. The exam is closed-book but graphs, formulas and statistics tables are provided with the exam. Students must pass the exam in order to graduate. Passing score is 70% or better. Should a student not pass the exam, they may take it again as many times as necessary until they achieve a passing score. The exam contains questions composed by the industrial hygiene faculty which cover any subject area (rubrics) to the extent of their inclusion in the curriculum.

The MSPH - industrial hygiene program competencies/outcomes are in line with ABET requirements as well as the reported expectations of employers of industrial hygiene professionals.[2,3]

Specific Objectives

The goals of this training grant program were to increase the number of under-represented individuals in industrial hygiene and to expand the availability of the graduate program to mid-career professionals.

Specific objectives to accomplish these goals were to:

1) recruit and retain minority, disadvantaged, and mid-career students;

2) provide financial support to minority students and mid-career students in the form of tuition, stipend, and/or professional travel reimbursement;

3) train and educate minority and mid-career students in the field of industrial hygiene.

Accomplishments and Results

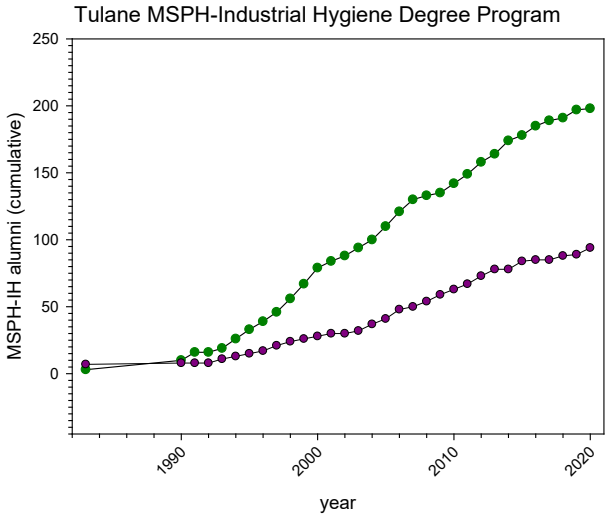
The Tulane MSPH Industrial Hygiene program has had several notable accomplishments and recognitions during the current project period:

- **Reaccredited by ABET**: The program was reviewed by ANSAC of ABET in summer/fall of 2016 and in summer 2017 the commission reaccredited the program with no deficiencies noted. The current accreditation runs through 2023. Tulane's self-study report was subsequently showcased by ABET at their annual convention as an exemplar of self study excellence.
- **Designated a GSP QAP**: The Board of Certified Safety Professionals named the Tulane MSPH-IH program a Graduate Safety Professional Qualified Academic Program (QAP) in November, 2016. Since that time, Tulane has been awarded a BCSP Foundation scholarship annually to support an MSPH-IH student. To date the majority of these scholarships have gone to NIOSH trainees. As a QAP, Tulane's MSPH-IH graduates are automatically entitled to the GSP credential.

[2] Olson DK, Lohman WH, Brosseau LM, et al. Crosscutting competencies for occupational health and safety professionals. J Public Health Manag Pract 11:235-243, 2005.

[3] Brosseau LM, Raynor PC, Lungu C: Employers' expectations of knowledge and skills of master's-trained industrial hygienists. J Occup Environ Hyg 2:1-7, 2005.

- **Top 20 program**: In April 2019, *MPH Online* listed Tulane University in their ranking of the Top 20 Best Industrial Hygiene Degrees in Public Health.
- **200th graduate**: In 2019, the Tulane MSPH-IH program celebrated its 200th graduate. Two NIOSH trainees who graduated that year contributed to our reaching that milestone. Our program's history is illustrated in the figure showing cumulative numbers of students graduating with the MSPH-IH (top line) as well as those obtaining the CIH (bottom line). To date, almost 50% of our program alumni have obtained the CIH credential.



Since the IH program began in 1980 and through summer 2021, we have graduated 206 students with the MSPH in industrial hygiene. Of these graduates, 100 completed the degree in the distance learning format. Forty of our graduates were URM (19.4%). So far, 95 of our graduates have obtained the CIH certification from the American Board of Industrial Hygiene. Many also hold the CSP from the Board of Certified Safety Professionals.

In addition to the MSPH-IH graduates, we have conferred over 40 graduate certificates in industrial hygiene up to this point. Several of the IH certificate students have subsequently matriculated into the MSPH-IH degree program. Such students may apply their graduate certificate credits towards the MSPH-IH degree requirements.

- Program students

During the reporting period, 2016 – 2021, we received 46 applications for admission to the MSPH-IH program (on campus and distance learning). Of these 46, 9 were rejected and the others were offered admission. Nineteen of the 37 who were offered admission matriculated into the program. Six of these were on-campus students and the remaining 31 were DL. There are currently 29 students enrolled in the MSPH-IH program including several part-time DL students who entered the program prior to the current project period start date of 2016. Seven students who enrolled in the program during this project period were URM.

From summer 2016 to 2021, 18 students graduated with the MSPH-IH. Of these, 13 were DL students and 5 were OC. Seven of these 18 graduates have already obtained the CIH from the American Board of Industrial Hygiene. One obtained the CSP from the Board of Certified Safety Professionals and 1 holds the Registered Occupational Hygienist credential.

- Program Trainees

There have been 16 trainees appointed during the current project period; 5 were full-time on campus students and the other 11 were part-time distance learning students. Six of our trainees are URM (1 OC and 5 DL). The 5 full-time OC trainees received both stipend and tuition/fee support, whereas the 11 part-time DL trainees received tuition/fee support only. Several trainees were provided travel support to attend AIHCE during the 5-year project period.

Six of the 16 trainees during the current project period have graduated, 6 others are continuing in the program and are working towards completion of their degree requirements, and 4 withdrew from the program. Our MSPH-IH students are required to do a practicum in order to graduate. Full-time on-campus students do an internship to fulfill this requirement. Internship sites for our OC trainee graduates included Textron Land and Marine Systems in New Orleans, the Indian Health Service in Texas and New Mexico through the NIOSH CoStep program, and the US Environmental Protection Agency in North Carolina. DL students are all early/mid-career and already working in IH or related fields and so are not required to do an internship. Rather, they perform a job analysis in which they demonstrate how they have integrated what they have learned from the program into the enhancement and performance of their current jobs.

Five of the 6 trainee graduates are currently employed in industrial hygiene or closely related positions at a variety of governmental and private organizations, including the USEPA, the Air National Guard, GHD Civil Engineering Consultants, Advansix Resins & Chemicals LLC, and Western Refining Corp. The remaining trainee graduate is currently pursuing the PhD in industrial hygiene at Colorado State University.

Conclusions

Most Americans spend a major part of their adult lives in the workplace and increasingly, the adverse effects of workplace conditions, exposures, and stressors on workers' health are being recognized, while at the same time, there is a shortage of trained occupational health and safety professionals, including industrial hygienists. The Tulane MSPH-IH Program has addressed this public health issue through its goal of training qualified masters-level industrial hygienists - front line professionals engaged in the primary prevention of occupational injury and illness. The NIOSH training grant program has facilitated the achievement of our goal of increasing graduate training of underrepresented minority and mid-career students in industrial hygiene. Our MSPH – Industrial Hygiene program produced 18 graduates during the training grant program period, July 1, 2016- June 30, 2021. Four of our 18 graduates were continuing NIOSH trainees from previous project periods and 2 were newly appointed trainees in this project period. Six of the NIOSH trainees during this project period were underrepresented minorities and eleven were mid-career DL students. All trainees received varying amounts of financial support for tuition, fees, professional travel reimbursement, and/or stipend. Six trainees are continuing the program into the new project period and are working towards the completion of their degrees. Approximately 40% of this project period's trainees have already obtained board certification

from the American Board of Industrial Hygiene. Our program's mid-career students and graduates are now providing needed professional occupational safety and health services to government, industry, and private enterprise in locations across the country and are helping to fill a documented shortage in the number of such professionals needed to meet current and projected demand.