

Review Article

Towards a sustainable training on epidemiology and public health in Tamil Nadu, South India: a narrative review

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ABSTRACT

Aiming to improve public health, with the science of epidemiology, Tamil Nadu Dr. MGR Medical University established the department of epidemiology in February 1997 and began its two year Master's degree program in Epidemiology and Public Health. A core mission of the department is to provide high quality education in epidemiology, translate epidemiologic research findings into clinical practice, and advance epidemiology research. In order to ensure that epidemiological research and practice continue to be of high quality, we aim to establish principles, activities, and successful outcomes of graduates contributing to the reduction of disease burden in human populations through research, education, and service. The description of courses was based on internal discussions and reviewing documents. The central components of the courses were divided into input, process and outcomes. A total of 55 students were enrolled in epidemiology from 2001-2004 and 75 in public health from 2017-2024 with Faculty-to-student ratio ranging from 4 to 5. Learning methods include lectures, technology-based learning, and group and individual instruction. In the field, students spend 75% of their time in state/central government institutions, and are required to submit a field report upon completion. There are 250 publications, 200 projects, 30 abstracts and 7 chapters, graduates working under state health departments of India, ICMR institutes, and pursuing additional degrees at John Hopkins and universities of France. With our guiding principles of think big, go far, learn together, and inspire change our goal is to provide evidence of sustainable epidemiological training.

Keywords: Epidemiology, Public health, TN MGR Medical University, Tamil Nadu

INTRODUCTION

Epidemiology is the scientific basis for public health efforts, which involve prevention of disease, injury, and promotion of health.¹ As part of a public health system, epidemiology contributes to the conduct of etiologic research, the planning and evaluation of interventions, and the development of health policies.² The COVID-19 pandemic has resulted in increased demand for epidemiologists and public health professionals, and employers' expectations about the mix of skills required

for these different roles have increased. Schools and programs in public health have a new opportunity to recruit, train, and sustain the public health workforce. Academic public health can further educate the public and prepare students for meaningful careers through inter-professional education and practice-based learning.³ Within the last 10 years, schools of public health and health professions schools have made substantial efforts to enhance the capabilities of the public health workforce.⁴ With a rapidly evolving field where new methods abound, it is prudent to align teaching with

professional competencies as a result of these challenges. Developing and updating programs that prepare students to address modern public health challenges is important for educational institutions.

To apply epidemiology science to 'better health care' and help individuals and populations improve their health, in February 1997, the Tamil Nadu Dr. MGR medical university established a department of epidemiology and started a two year Master of Science in Epidemiology course in 2001, master of science in public health in 2017 with its base in Chennai, and assistance from the government of Tamil Nadu.⁵ An expert panel of teachers of epidemiology was convened to discuss emerging challenges faced in teaching epidemiology. This resulted in broad core and advanced concepts being proposed for students enrolled in the department.

The goals of the department include, a) to provide the highest quality education in epidemiology, b) applying the findings of epidemiologic research and influence the formulation of public policy, c) translating epidemiologic research findings into clinical practice, d) advance the science of epidemiology. By establishing the principles, activities, and successful outcomes of graduates contributing to the reduction of disease burden in human populations through research, education, and service, we aim to ensure that high-quality epidemiological research and practice continues to be conducted.

ANALYSIS OF THE COURSES

The analysis of the courses offered by the department of epidemiology at the Tamil Nadu Dr. MGR Medical University was conducted using multiple sources. Structured internal discussions with faculty members and administrative staff provided qualitative insights into the curriculum, teaching methods, and student experiences. Additionally, a comprehensive review of official university documents, including course syllabi, program guidelines, and annual reports, was performed to gather detailed information about the courses. These methods helped in identifying the core components of the M. Sc. Epidemiology and M.Sc. Public Health programs, categorized into inputs, processes, and outcomes. Inputs included data on student eligibility and enrolment, faculty credentials, faculty-to-student ratio, and institutional links.

Processes were analyzed by documenting curricular procedures, teaching methods, and fieldwork assignments. Outcomes were assessed by examining the proficiency of graduates, the quality of supervision and guidance, and the scholarly output in terms of publications and research projects. This multi-faceted approach, utilizing both internal discussions and document review, ensured a thorough understanding of the course structure and its impact on public health education and practice.

COURSE DESCRIPTION

Educational mission of department includes the training of students to generate and interpret epidemiologic information, to synthesize it with other information, and to apply it to reduction of disease burden.

M. Sc. Epidemiology

Master of Science in Epidemiology is a 2 year full time programme. Candidates will spend the 1st year at the Tamil Nadu Dr. MGR Medical University, Chennai undergoing training courses and would be involved in ongoing research programmes. During the second year candidates will work on their thesis. The number of seats is limited to four.

M. Sc. Public Health

Master of Science in Public Health is a 2-year full time programme with a total seat of 16 per year, with key objectives: 1. To identify and prioritize the key public health issues. 2. To understand the principals involved in the management of health service organizations and capable of contributing to development of health services/systems 3. To conduct critical assessment in specific domains of public Health 4. To do research relevant to public health as per scientific and ethical principles.

STUDENTS

The eligibility for students to enrol in the courses are-

M. Sc. Epidemiology

MBBS/ BDS/ BAMS/ BUMS/ BHMS/ BSMS/ B. V. Sc./ MPT/ MOT/ M. Pharmacy/ M. Sc (Nursing)/ M. Sc. Biostatistics/ Statistics/ M. Sc. nutrition/ biochemistry/ physiology/ anatomy/ pharmacology/ microbiology or other equivalent medical related M. Sc. degrees. From 2001 to 2024 the total number students enrolled were 55.

M. Sc. Public Health

Bachelor of science in life sciences (including food tech, dairy), statistics, nutrition, social work, communications or equivalent* from a recognized university acquired as a full-time student bachelor degree in health or health-related programs such as medicine (MBBS), dentistry (BDS), AYUSH (BAMS, BUMS, BSMS, BNYS and BHMS), veterinary, nursing, physio/occupational therapy and pharmacy, bachelor in engineering (Civil) work experience in a health-related field is desirable. the total number of enrolments from 2017-2024 were 75.

CURRICULUM

The core competencies of the courses are-principles of epidemiology including fundamentals of research design

and evidence based health, principles of bio-statistics, diseases of public health importance and control, and health management.

Year 1

Candidates will spend the first six months at DoE-The Tamil Nadu Dr. MGR Medical University, Chennai/ collaborating institutes of directorate of public health and preventive medicine undergoing first semester training in core courses and would be involved in developing a project application based on their electives for their five field training. They would be involved in in-field project/research programmes upon written approval by the on- and off-campus supervisors/guide for the next 4 months (7th to 10th month). During 11th month they would return to DoE and submit the in-field project report and take first semester examinations.

Year 2

Candidates will spend the first three months at DoE undergoing second semester training in core course and would be involved in developing a protocol for their capstone project/ Thesis based on their elective topic. During the next 4 months (16th to 19th month) they work on data collection, data entry, analysis for their thesis (with an approved e-field movement plan and maintaining log book). Subsequently, candidates will return to the DoE to write the second semester examinations as well to finalise thesis work. The candidate will submit a proof of manuscript submission for publication to a peer-reviewed, index journal and defend their thesis in a viva-voce examination at 24th month.

FACULTY

The department practices epidemiology as a broad scientific discipline, addressing the occurrence of disease and the distribution of health status in populations. By integrating causal concepts at the molecular, cellular, clinical, and socio-environmental levels, our faculty work to maintain an intellectual environment that facilitates the integration of biological, social, and analytic approaches. With this environment, faculty and students are able to develop the breadth of knowledge necessary to appreciate fully the complexities of the biosocial systems that we seek to understand.

Core members of the faculty were department staff. The faculty-to-student ratio ranges from four to five. In addition, we have a total of one hundred and forty visiting faculties who are experts in their domain subjects. Our teaching methods include lecture and technology based learning and also group and individual learning.

FIELD-BASED TRAINING

All students have the mandate to deliver public health service through field practice. Students spend 75% of

their time in the field. At the directorate of public health and preventive medicine exposure to public health programmes that includes national health mission, disease control/surveillance programmes will be provided. The extended facilities include institute of public health (IPH), Poonamalle, institute of vector control and zoonoses, Hosur, ICMR-national institute for revised tuberculosis, Chennai, regional labour institute, Chennai, the Greater Chennai corporation, medical colleges and its clinic facilities.

Students have to choose any one of the electives for practicum (field project report) among outbreak investigations, secondary data analysis at state level, secondary data analysis with appropriate qualitative research, health communication modules, infectious disease epidemiology, non-communicable disease and injury epidemiology.

OUTCOME

The focus of our work is most closely linked to SDG goals mainly on, to ensure healthy lives and promote well-being for all at all ages (goal 3),: ‘By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases (Target 3.3), By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being (Target 3.4), and By 2020, halve the number of global deaths and injuries from road traffic accidents (Target 3.6). The paediatric age group, newer tools/technologies would be crosscutting in these areas. However, the holistic nature of our work means our programmes link closely to 16 of the 17 SDGs.

The completed research projects by our postgraduate scholars are more than 150 projects with additional 30 ongoing projects and 6 PhD research projects which is categorized into adolescent health, mental health, dental health, maternal health, alternative health, infectious health, geriatric health and the non-communicable diseases.

There are also 20 completed external projects through grants from UNICEF, TNHSRP-IIT, ICMR and directorate of public health, INCLEN and world bank, the department has more than 250 publications, 30 abstracts, and 7 chapters in book/manuals, newspaper publications, with 15 conference and seminars providing shareable evidence of the use of epidemiological data to make public health decisions.

All the graduates of our courses were recruited by well reputed institutes and organisations. They work in state health departments in India, as programme managers at the district/sub-district levels, research assistants at JIPMER, Pondicherry, and in different ICMR institutes. Many shifted to other nations to advance their career like enrolling in John Hopkins university, university of Paris, France etc.

Table 1: Central components of the course.

Course components	Students	Curriculum	Faculty	Field work
Input	Approx. 300 applicants	Course recognized by the university	Faculty with university staff status Faculty-to-student ratio ranging from 4 to 5.	Posting within the public health service Institutional links with ICMR and other gov. laboratories 75% of the time spent practicing in the field
Process	Candidates selected through entrance examination	Curricular process documented and available online	Lecture and technology-based learning, group and individual learning.	Field work assignments and field report
Output	Successful graduates	Proficient in all competencies	Good supervision and guidance	250 publications 200 projects 30 abstracts 7 Chapters

DISCUSSION

The comparison of the department of epidemiology at Tamil Nadu Dr. MGR medical university with other significant public health education programs, providing insights and highlights the department's strengths.

The national study on epidemiology training in India highlights a critical gap between the demand for and supply of trained epidemiologists, stressing the need for more capacity-building initiatives. In contrast, the department of epidemiology at Tamil Nadu Dr. MGR medical university addresses this gap through a comprehensive educational program that emphasizes personalized mentorship, extensive fieldwork, and significant research output, thereby directly contributing to bridging the shortage of trained professionals and addressing public health challenges.⁶

Both the government of India's epidemiology training initiative and the department of epidemiology at Tamil Nadu Dr. MGR medical university significantly contribute to advancing public health education. The government initiative, modeled after the US epidemic intelligence service (EIS), excels in real-time skill development and has demonstrated considerable potential for regional impact through its practical, mentor-driven approach. In contrast, the department at Tamil Nadu Dr. MGR medical university offers a well-rounded educational experience, characterized by personalized mentorship, extensive field-based training, and a strong academic foundation. By integrating elements of the government initiative's rapid expansion and adaptive learning, the department has further enhanced its training framework, strengthening its leadership role in public health education and maximizing its overall impact.⁷

The master's in public health (MPH) program at Sri Ramachandra university (SRU) and the department of epidemiology at Tamil Nadu Dr. MGR medical university

both develop essential public health competencies, though with different emphases. SRU's MPH focuses on specialized skills in environmental and occupational health (OEH), addressing specific issues like indoor air pollution and workplace hazards. The Tamil Nadu Dr. MGR medical university's department offers a broader range of competencies, including epidemiology, biostatistics, and health management, preparing graduates for a wide array of public health challenges. Both programs effectively enhance public health capacity through their tailored approaches.⁸

The NIE FETP made significant strides from 2001 to 2007, training 80 trainees and achieving a remarkable 86% success rate in acquiring seven core competencies. The program's emphasis on adaptability and fieldwork is evident in its impressive output, including 158 scientific communications and 29 peer-reviewed manuscripts. Meanwhile, the department of epidemiology at Tamil Nadu Dr. MGR medical university excels with a high faculty-to-student ratio, ensuring personalized guidance and extensive field-based training. The department's strong collaborations with leading public health institutes and its prolific research output, with over 250 publications, reinforce its leadership in epidemiological education. Both programs showcase exceptional contributions to public health training and exemplify dedication to advancing the field.⁹

The ITREOH program's competency-based MPH curriculum, with specialized tracks in applied epidemiology and environmental and occupational health, emphasizes applied practice and research. The program's success is demonstrated by the placements of its graduates in leadership roles across public, private, and academic sectors. Similarly, the department's competency-based programs in epidemiology and public health focus on addressing key public health issues, health service management, and research. The extensive field-based training prepares graduates for impactful roles

in public health, aligning with ITREOH's emphasis on applied practice.¹⁰

WHY TAMIL NADU DR. MGR MEDICAL UNIVERSITY IS A PREMIER CHOICE?

The establishment and success of the department of epidemiology at Tamil Nadu Dr. MGR medical university demonstrate a proactive approach towards addressing public health challenges. By offering a comprehensive Master's program, the department not only cultivates a cadre of skilled epidemiologists and public health professionals but also ensures the translation of research into tangible public health interventions. The emphasis on field experience, coupled with a robust curriculum, prepares graduates to effectively contribute to disease prevention and health promotion efforts. The impressive track record of alumni placements in key health institutions reflects the program's relevance and impact. For policy-makers, this underscores the importance of investing in specialized training programs to enhance epidemiological capacity, ultimately facilitating evidence-based decision-making and improving health outcomes at the population level. Moreover, the university's commitment to sustainability in training reinforces the enduring impact of epidemiological education on public health practice.

CONCLUSION

As the study and application of epidemiological studies in public health setting may continue throughout undergraduate, graduate, doctoral and even working stages, the best practices in improving student learning enthusiasm and leading them to master the knowledge and practical skills has become a tremendous challenge for educators. With our guiding principles like think big where challenges are seen as opportunities, go far where our research, education, practice and service have no boundaries, learn together which says to value all lived experiences and ability to learn from each other, and inspire change that educates students capable not only of bold, out-of-box thinking to create innovative solutions but also have the tools to design and conduct research integrating tools like data science and artificial intelligence, providing a novel evidence for the development of an epidemiological training.

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