PROMOTION RECOMMENDATION
The University of Michigan
School of Public Health
Department of Epidemiology

Marisa C. Eisenberg, associate professor of epidemiology, with tenure, School of Public Health, associate professor of complex systems, without tenure, and associate professor of mathematics, without tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of epidemiology, with tenure, School of Public Health, professor of complex systems, without tenure, and associate professor of mathematics, without tenure, College of Literature, Science, and the Arts.

Academic Degrees:
Ph.D.	2009	University of California, Los Angeles, CA
M.S.	2009	University of California, Los Angeles, CA
B.S.	2003	University of California, Los Angeles, CA

Professional Record:
2022 - Present	Director, Center for the Study of Complex Systems, University of Michigan, Ann Arbor, MI
2021 - 2022	Interim Director, Center for the Study of Complex Systems, University of Michigan, Ann Arbor, MI
2018 - Present	Associate Professor, Departments of Epidemiology, Complex Systems, and Mathematics, University of Michigan, Ann Arbor, MI
2012 - 2017	Assistant Professor, Departments of Epidemiology and Mathematics, University of Michigan, Ann Arbor, MI
2009 - 2012	Post-doctoral Fellow, Mathematical Biosciences Institute, Ohio State University, Columbus, OH

Summary of Evaluation:
Teaching: Professor Eisenberg has taught courses in mathematical modeling at both the master's and Ph.D. levels in epidemiology and complex systems (EPID 633, 793, 814; EPID 638/CMPLXSYS 530). These classes generally receive extremely high ratings by students (4.5-5.0 on most measures). Professor Eisenberg also is an extremely active mentor to doctoral, masters, and undergraduate students, as well as junior faculty and fellows. In rank, she has chaired or chairs the dissertation committees for 13 doctoral students in epidemiology, environmental health sciences, applied and interdisciplinary mathematics, and ecology and evolutionary biology, and served on the committees of 17 students across these departments, as well as civil and environmental engineering, health behavior and health education, and health management and policy. Her former students and mentees have gone on to a wide range of successful career paths, including multiple tenure track faculty positions, research scientists in academia and industry, and careers at the Centers for Disease Control and Prevention (CDC) or in local public health.

Research: Professor Eisenberg's research on mathematical epidemiology and infectious disease modeling is focused on developing and using identifiability, uncertainty, and parameter estimation methods in mathematical modeling to generate insights into disease mechanisms, forecasting, and intervention design. Professor Eisenberg has made substantial contributions to the development of methods and theory in both structural and practical identifiability. Her work was the first to examine

how practical identifiability causes complications when estimating model parameters for environmental pathogens, multistage models in cancer, and other health-related outcomes. Given her expertise, Professor Eisenberg was well positioned to make substantial contributions to public health during the Coronavirus Disease (COVID-19) pandemic, where she used a variety of methods to develop high-quality predictions of disease transmission during critical periods of the pandemic and worked with teams to produce a variety of software tools for use by government officials and health researchers. Her work in COVID-19 has since been extended to help develop general methods for wastewater monitoring for pathogens. More recently, she has focused on developing methods to assess transmission of Human Papillomavirus (HPV) and oropharyngeal cancer using innovative network models.

Professor Eisenberg has an excellent level of research productivity. She has 3,829 citations on Google Scholar (as of November 22, 2023), an h-index of 33, and 90 peer-reviewed publications total (49 at current rank). She is first author on 12 of these papers (one at rank) and is a senior or co-author with her students as first author on 46 more (28 at rank). She has published in top-ranked journals across the public health and health research fields, including *Science*, *Proceedings of the National Academy of Sciences*, *Cancer*, *American Journal of Epidemiology*, and *Epidemiology*. She has also written one peer-reviewed book chapter (at current rank) and five journal commentaries and letters to the editor.

Professor Eisenberg has an excellent funding record. She serves or has served as a multiple principal investigator (MPI) for a U01 grant and three major CDC grants, as well as on two National Science Foundation (NSF) grants and a Rockefeller Foundation grant. In addition, she is or has been the principal investigator (PI) on two smaller grants, and a co-investigator on 13 grants (three currently).

Recent and Significant Publications:
Renardy M, Kirschner D, Eisenberg M. 2022. Structural identifiability analysis of age-structured PDE epidemic models. *J. Mathematical Biology* 84(1):1-30.
Brouwer AF, Campredon LP, Walline HM, Marinelli BM, Goudsmit CM, Thomas TB, Delinger RL, Lau YK, Andrus EC, Nair T, Carey TE, Eisenberg MC,
Meza R. 2022. Incidence and clearance of oral and cervicogenital HPV infection: longitudinal analysis of the MHOC cohort study. *BMJ open* 12 (1): e056502.
Havumaki J, Eisenberg JN, Mattison CP, Lopman BA, Ortega-Sanchez IR, Hall AJ, Hutton DW, Eisenberg MC. 2021. Immunologic and epidemiologic drivers of norovirus transmission in daycare and school outbreaks. *Epidemiology* 32 (3): 351-9.
Havumaki J, Meza R, Phares CR, Date K, Eisenberg MC. 2019. Comparing alternative cholera vaccination strategies in Maela refugee camp: using a transmission model in public health practice. *BMC Infectious Diseases* 19(1):1-7.
Brouwer AF, Eisenberg JNS, Pomeroy CD, Shulman LM, Hindiyeh M, Manor Y, Grotto I, Koopman JS, and Eisenberg MC. 2018. Epidemiology of the silent polio outbreak in Rahat, Israel based on modeling of environmental surveillance data. *PNAS*, 115.45 (2018): E10625-E10633.

Service: Professor Eisenberg has served on a variety of department and university committees. These include the Epidemiology Curriculum, Recruitment, and Admissions Committees, and, at rank, she has served as a Diversity, Equity and Inclusion Advocate and Doctoral Committee member and chair.

Professor Eisenberg has undertaken extensive service activities outside of the department and school. She is serving (since 2021) as the director of Complex Systems, a unique university center that seeks

to develop interdisciplinary quantitative and computational research to tackle complex real world problems across a large number of areas in mathematics and statistics, computer and information science, biology, social science, and physics. Complex Systems also has a degree-granting program, which Professor Eisenberg has expanded to include a larger focus on undergraduates. She has also served as a member of the Rackham Pre-doctoral Fellowship Review Committee, UM Integrated Training in Microbial Systems Program Advisory Committee, and the Michigan Center for Applied and Interdisciplinary Mathematics Van Loo Post-doctoral Fellows Selection Committee. She has also organized or co-organized a number of workshops, primarily in her mathematics and complex science roles, and served as grant reviewer for NSF, National Institutes of Health, Los Alamos National Laboratories, and other institutions.

Perhaps her most prominent service work occurred during the COVID-19 pandemic. At the beginning of the pandemic in January 2020, she worked with her research team to develop COVID-19 transmission models and later recovery models for the State of Michigan, multiple hospital systems, and the University of Michigan, as well as models at the national, state, and county level across the U.S. as part of the CDC COVID-19 forecasting ensemble. This work was shown to have accurately predicted both overall trends and key features, such as regional hotspots and the timing of new waves and was used extensively by the State of Michigan leadership. Professor Eisenberg also helped to develop a publicly available suite of applications and dashboards to track a variety of COVID-19 measures that were used extensively by public health officials, businesses, and government agencies in the state. In this capacity she also served on the UM COVID-19 Response and Public Health Advisory Committee as well as the Data and Analytics, and Epidemiology and Surveillance subcommittees. Her current research into wastewater modeling has led to her appointment to the National Academy of Sciences Committee on evaluating the potential for a national wastewater-monitoring system for public health.

External Reviewers:
Reviewer A: "Dr. Eisenberg has made significant contributions to the scientific community in the fields of mathematical epidemiology, infectious disease modeling, parameter identification and estimation and to public health prevention and intervention through her publications and service activities. Overall, Dr. Eisenberg's written and scholarly contributions would make an exceptionally strong case for promotion to Full Professor at my institution."

Reviewer B: "One of the most impressive aspects of Dr. Eisenberg's work is the way in which she integrates the abstract mathematical ideas at the core of complex systems science into highly targeted work in applied public health epidemiology. Dr. Eisenberg would be promoted to full professor [at my institution]…and frankly given her extraordinary record, I'd like to believe that we would have pushed for promotion a couple of years ago. I note that she would be an overwhelmingly strong candidate for one of the elite endowed professorships on campus."

Reviewer C: "Marisa is among the best and brightest mathematical epidemiologists I know. Most impressively, she is recognized for contributing knowledge along the whole spectrum, from mathematical theory to very applied public health solutions. It is without a doubt that Marisa would be promoted to full professor (with tenure) at my institution."

Reviewer D: "Dr. Eisenberg's work is very influential in the area of mathematical epidemiology. This area is growing very quickly in importance as researchers develop and attempt to calibrate new models for emerging diseases. Dr. Eisenberg is a real star…not only does she generate new mathematical results, she also creates code libraries for people to apply her methods, and then goes
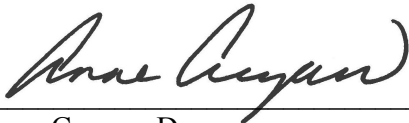
on to make the applications herself so that she has impact in the world of epidemiology. She meets and exceeds the requirements for promotion to full Professor."

Reviewer E: "Marissa is one of the most outstanding scientists in the world…not only does she contribute to science, but she also takes science and has it been implemented in state and national policy. In my time serving on [my department's reappointment and tenure committee], Marissa compares to the best of professors being promoted at [my department]."

<u>Summary of Recommendation:</u> Professor Eisenberg is a highly interdisciplinary researcher who combines expertise in advanced mathematics with expertise in epidemiological methods to develop an understanding of problems with, and solutions to, identifiability and estimation in infection disease modeling. It is with the support of the School of Public Health and College of Literature, Science, and the Arts Executive Committees that we recommend Marisa C. Eisenberg be promoted to the rank of professor of epidemiology, with tenure, School of Public Health, professor of complex systems, without tenure, and professor of mathematics, without tenure, College of Literature, Science, and the Arts.

_____
F. DuBois Bowman, Ph.D.
Dean, School of Public Health

_____
Anne Curzon, Dean
Geneva Smitherman Collegiate Professor of
English Language and Literature, Linguistics,
and Education
Arthur F. Thurnau Professor
College of Literature, Science, and the Arts

May 2024