

**Epidemiologic Approaches for Understanding the Urban Exposome:**

**Thinking Big and Thinking Small**

July 10-16, 2019 | Course No: 0158.1267

**Course Instructors:** Jeremy Sarnat (Emory University), Chava Peretz (Tel Aviv University)  
Uri Obolski (Tel Aviv University)

**Date & Time:** July 10-15, 2019 | W, Th, M, 8:30-13:00 / F, S, 8:30-13:30

**Final Exam:** July 16, 2019 | 9:00-11:00

**Location:** Room 200, Sackler Faculty of Medicine

**Teaching Assistant:** Ms. Yulia Maler-Yaron ([maleryaron@mail.tau.tac.il](mailto:maleryaron@mail.tau.tac.il))

**Course Documents:** <https://bit.ly/2KXAjjK>

**Pre-requisites & Intended Audience**

Introductory courses in Biostatistics and Epidemiology.

The course is intended for Master's and PhD level students or above.

**Academic Credit & Course Requirements**

2 Academic Credits (4 ECTS). Participants must pass the final exam with a grade of 60 (D). Noncredit participants are not required to take exam, but are expected to participate in team workshop and presentations.

**Recommended Readings**

- Agache, I., Miller, R., Gern, J.E., Hellings, P.W., Jutel, M., Muraro, A., Phipatanakul, W., Quirce, S. and Peden, D., 2019. Emerging concepts and challenges in implementing the exposome paradigm in allergic diseases and asthma: a Practall document. *Allergy*, 74(3), pp.449-463.
- Cifuentes, P., Reichard, J., Im, W., Smith, S., Colen, C., Giurgescu, C., Williams, K.P., Gillespie, S., Juarez, P.D. and Hood, D.B., 2019. Application of the Public Health Exposome Framework to Estimate Phenotypes of Resilience in a Model Ohio African-American Women's Cohort. *Journal of Urban Health*, pp.1-15.
- Clougherty, J.E., Levy, J.I., Kubzansky, L.D., Ryan, P.B., Suglia, S.F., Canner, M.J. and Wright, R.J., 2007. Synergistic effects of traffic-related air pollution and exposure to violence on urban asthma etiology. *Environmental Health Perspectives*, 115(8), pp.1140-1146.
- Olympio, K.P.K., Salles, F.J., Ferreira, A.P.S.D.S., Pereira, E.C., Oliveira, A.S.D., Leroux, I.N. and Vieira, F.B.A., 2019. The human exposome unraveling the impact of environment on health: promise or reality? *Revista de Saude Publica*, 53, p.6.
- Phillips, C.V., 2003. Quantifying and reporting uncertainty from systematic errors. *Epidemiology*, 14(4), pp.459-466.
- Robinson, O., Tamayo, I., De Castro, M., Valentin, A., Giorgis-Allemand, L., Hjertager Krog, N., Marit Aasvang, G., Ambros, A., Ballester, F., Bird, P. and Chatzi, L., 2018. The urban exposome during pregnancy and its socioeconomic determinants. *Environmental Health Perspectives*, 126(7), p.077005.



School of Public Health

## Summer Institute of Advanced Epidemiology and Preventive Medicine

### Course Description

Individuals are routinely exposed to complex and extremely heterogeneous mixtures of chemical and physical xenobiotic agents over the course of a lifetime. The highly multidimensional nature of both environmental exposure and biological response poses unique challenges for epidemiologists, who have traditionally focused on associations involving exposures to relatively few pollutants and corresponding health. During the past ten years, the 'exposome' has emerged as a powerful theoretical means for addressing the complexities inherent in environmental exposure. Exposomics, a conceptual analogue to the genomics, involves the quantitation of thousands of external and internal exposures, originating from traditional sources (i.e., industrial pollution) as well as those associated with diet and lifestyle.

This course examines traditional and novel approaches for characterizing the *Urban Exposome*, with examples from Israel and abroad. Emphasis will be focused on both external and internal approaches for measuring air pollution exposure and response, but other environmental media will also be covered. Specific attention will be given to the application of these methods in environmental epidemiologic settings. This class will be highly-interactive, and address numerous aspects of the Urban Exposome, from a complete source-to-outcome pathway, through a series of lectures, in-class discussions and paper reviews and student presentations, and hands-on computational modeling exercises.

### Course Faculty

#### **Jeremy Sarnat, ScD**

Dr. Jeremy Sarnat is an Associate Professor of Environmental Health at the Rollins School of Public Health of Emory University. He received a doctorate in Environmental Health from Harvard University (2001). Dr. Sarnat's research focuses primarily on measuring exposures and acute health response to urban air pollution in various populations. Much of his work examines how exposure science informs environmental epidemiology; the impact of exposure misclassification and confounding on air pollution epidemiologic findings; and the development of molecular-level approaches for characterizing personal air pollution exposures. Dr. Sarnat worked as a staff scientist for 4 years at Adam Teva V'din in Tel Aviv, a non-profit organization of scientists and lawyers promoting sustainable development and pollution prevention. He has served on the Science Advisory Boards for Nitrogen Oxides and Particulate Matter within the US Environmental Protection Agency's Clean Air Scientific Advisory Committee and the Technion Center of Excellence in Environmental Health. He is currently the Director of the Southeastern Center for Air Pollution and Epidemiology (SCAPE), a multi-institutional, multi-disciplinary Center addressing critical issues relating to the public health impacts of ambient air pollution.

#### **Chava Peretz, PhD**

Professor Chava Peretz is a researcher in the Department of Epidemiology and Preventive Medicine at TAU's School of Public Health. Prof. Peretz received her bachelor's degree in Mathematics and Statistics from Tel Aviv University (1976) and a PhD in Occupational and Environmental Health from the Institute for Risk Assessment Sciences at Utrecht University in The Netherlands (2003). She has completed her postdoc in the Department of Occupational and Environmental Health at Washington University, Seattle, USA. Today, she cooperates with the Porter School of Environmental studies at Tel Aviv University, the Ministry of Environmental Protection, and the Maccabi (HMO) Healthcare Services on issues in environment and health, and is a member of the editorial board of the Israeli Journal - Ecology and Environment. Prof. Peretz teaches courses on Environmental Epidemiology, Neuro-Epidemiology and Statistics; and chairs the PhD student's forum.

#### **Uri Obolski, PhD**

Uri Obolski is a senior lecturer in the Porter School of Environment and Earth Sciences and the School of Public Health, Tel Aviv University. Dr. Obolski received his bachelor's degree in mathematics, as well as his masters and PhD in computational biology, from Tel Aviv University. He completed his postdoctoral studies in the University of Oxford, in the Ecology and Evolution of Infectious Diseases group, where he is still a research associate. He performs computational research, using mathematical modelling, computer simulations, and advanced statistical methods. His research focuses on infectious diseases and their spread with respect to varying environmental factors, with a special interest in emergence and spread of drug resistance and mosquito-borne diseases.

**Course Timetable**

<b>Wednesday, July 10 (Day 1) - Lecturers: Jeremy Sarnat and Chava Peretz</b>	
<i>Reading:</i> Clougherty, et al., 2007	
08:30-08:45	Course Introduction
08:45-10:15	Environmental Epidemiologic Design for the Urban Exposome Session I: Descriptive, Ecologic, and Etiologic Studies
10:15-10:45	Break
10:45-11:45	Environmental Epidemiologic Design for the Urban Exposome Session II: Spatio-Temporal Studies
11:45-12:00	Break
12:00-13:00	<i>In-class Exercise:</i> Designing an environmental epidemiological study
<b>Thursday, July 11 (Day 2) - Lecturers: Jeremy Sarnat and Chava Peretz</b>	
<i>Reading:</i> Phillips, C.V., 2003	
08:30-8:45	Review and Introduction: Measurement Error and Confounding in Environmental Epidemiology
08:45-10:00	Session I: Measurement Error and the Urban Exposome <b>Lecturer: Jeremy Sarnat</b>
10:00-10:30	Break
10:30-11:45	Session II: Confounding and the Urban Exposome <b>Lecturer: Chava Peretz</b>
11:45-12:00	Break
12:00-13:00	<i>In-class Exercise:</i> Modeling and simulating the effects of exposure misclassification
<b>Friday, July 12 (Day 3) - Lecturers: Chava Peretz and Uri Obolski</b>	
08:30-10:00	The Exposome in Practice; Challenges and Solutions
10:00-10:30	Break
10:30-11:15	Environmental Epidemiology Studies Relating to Urbanity in Israel
11:15-12:00	Analyzing the Exposome's Association with Health
12:00-12:15	Break
12:15-13:30	<i>In-class Exercise:</i> Work with local data to practice an exposome-health project

<b>Sunday, July 14 (Day 4) - Lecturer: Jeremy Sarnat</b>	
08:30-10:00	'Bottom Up' Exposomics: Panel-based and Small Cohort Designs - Methods, Strengths, and Limitations
10:00-10:30	Break
10:30-12:00	'Bottom Up' Exposomics: Environmental Microsensing and the Future of Bottom-up Sensing
12:00-12:15	Break
12:15-13:30	<u>Case study discussion</u> : Atlanta Commuter Exposure (ACE) Studies
<b>Monday, July 15 (Day 5) - Lecturer: Jeremy Sarnat</b>	
<u>Readings</u> : Agache et al., 2019 Cifuentes et al., 2019 Olympio et al., 2019 Robinson et al., 2018	
08:30-10:00	'Top Down' Exposomics: Multi-dimensional and Omics-Based Molecular Epidemiology
10:00-10:15	Break
10:15-11:00	Exposomics and Future Trends in Environmental Epidemiology
11:00-12:40	<u>In-class exercise</u> : Urban Exposome Journal Club
12:40-13:00	Course Summary and Certificate Ceremony
<b>Tuesday, July 16 (Final Exam)</b>	
09:00-11:00	Final Exam (Teaching Assistants will be present)