EXHIBIT 4

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

HAPCO, *Plaintiff,*	:	
v.	:	**Civil Action No. 20-3300-CMR**
CITY OF PHILADELPHIA, and THE HONORABLE JAMES KENNEY, *Defendants.*	:	

DECLARATION OF MICHAEL Z. LEVY

I, Michael Z. Levy, declare as follows:

I. Introduction

1. The City of Philadelphia has asked me to model the effect of resuming evictions on the spread of SARS-CoV-2 in the city generally and in the event future interventions to control the spread are implemented.

2. **Overview of Conclusion.** In my expert opinion, resumption of evictions would significantly impede the City of Philadelphia's ability to control transmission of SARS-CoV-2 by implementing measures to reduce contact among residents.

II. Professional Background

3. I am a tenured Associate Professor of Epidemiology in the Perelman School of Medicine of the University of Pennsylvania. My area of expertise is in the modeling and control of infectious diseases in urban environments. I have focused specifically on the relationship between municipal housing policy and the dynamics of infectious agents. I came to Penn Medicine from the National Institutes of Health (NIH), where I completed a postdoctoral fellowship in infectious disease modelling. Prior to that I was guest researcher at the Centers for Disease Control and Prevention (CDC) and, concurrently, obtained my PhD from Emory University in Population Biology, Ecology and Evolution. I have authored over 75 peer-reviewed articles and have served as Principal investigator of numerous federally-funded research projects. My curriculum vitae, attached to this declaration, lists my credentials in greater detail.

III. Overview of the COVID-19 epidemic to date in Philadelphia

4. Philadelphia, like many urban centers in the United States, experienced a significant COVID-19 epidemic in the spring of 2020. The city relied on interventions, including a stay-at-home order in March, to decrease contact among residents. These

interventions worked, as they have elsewhere (Pan 2020, Cowling 2020, Prague 2020). Following a lag period (Nande 2020), daily cases peaked in April, and then steadily declined throughout May. The epidemic was not fully controlled, however, and case counts remained low, but steady, through June and much of July. Philadelphia Health Commissioner Thomas Farley has advised that the epidemic will "likely get worse before it gets better," (McCristal 2020) a view in line with my expectation of repeated outbreaks that require imposing of interventions to decrease contact among residents (Emanuel 2020).

Evictions and the control of COVID-19 in Philadelphia

5. Evictions can alter the course of the COVID-19 epidemic in Philadelphia by exposing evicted individuals and families to shelter and other complex environments and by shifting the distribution of household sizes in the population (Layser 2020). The risk of COVID-19 in shelters is well documented and summarized briefly below. The effect of an increase in the size of households following evictions is the focus of my work and described in greater detail.

IV. Eviction & 'Doubling up'

6. The treatment of eviction in my model is informed by my collaborator, Dr. Andrew Greenlee, Associate Professor of Urban and Regional Planning at the University of Illinois. Dr. Greenlee's recent paper, *Mitigating Housing Instability During a Pandemic*, describes how housing insecure families often 'double-up'—moving in with family members or friends -- in the wake of evictions (Layser, 2020). Doubling up changes the household structure of the population and the relative numbers of contacts within and among households. Previous work demonstrates how the expected prevalence of COVID-19 infection can increase with the number of individuals in a household (Nande 2020).

COVID-19 risk in shelters and encampments

7. The risk of contracting COVID-19 in homeless shelters can be high due to close contact within close quarters, as well as the age structure of the population experiencing homeless (Mosites 2020). Numerous outbreaks in shelters have been documented (Layser 2020), often with very high prevalence of infection among staff and residents (Mosites 2020). The conditions in encampments can also "limit the effectiveness of person-based contact tracing" (CDC 2020).

V. Description of Study

8. Below I demonstrate how increasing household sizes during a Covid-19 epidemic can impede control efforts and increase infections on a population level.

9. The specific question I address is: *Under different scenarios of the resurgence or continued transmission of the virus, how will evictions and doubling-up affect the city of Philadelphia's ability to control the virus?*

Model of SARS-CoV-2 transmission

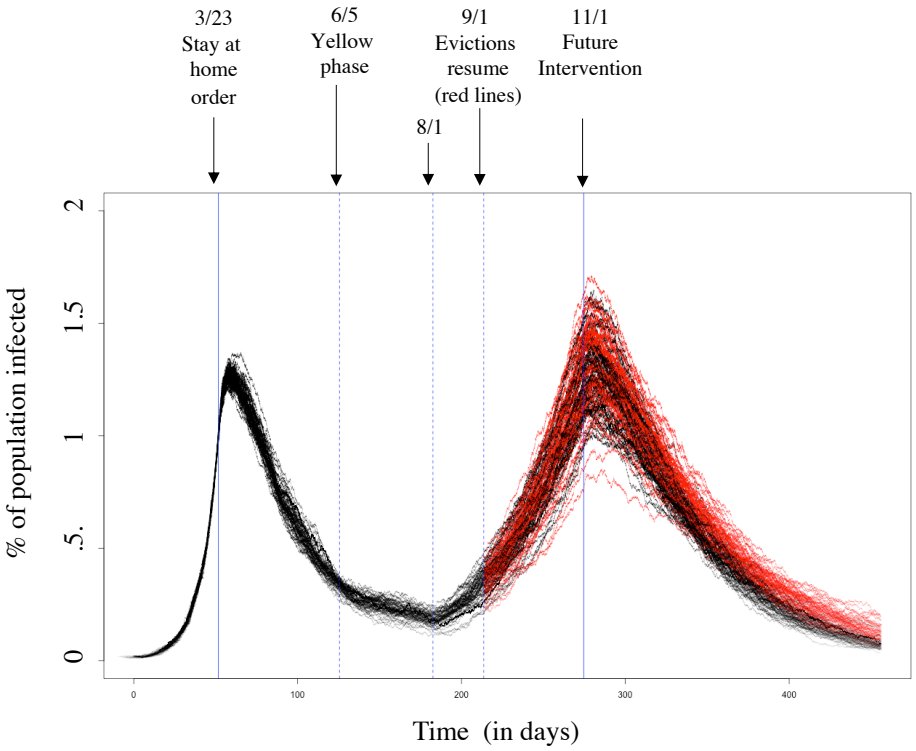
10. I use an epidemiological model to examine the effects of resumption of evictions on the transmission of SARS-CoV-2 in communities of the city of Philadelphia. The model is a network version of a Susceptible, Exposed, Infectious, Recovered (SEIR) model, which is a widely-used and accepted means of modeling SARS-CoV-2 (Nande 2020), and other infectious agents (Bansal 2007) for which transmission occurs through close contact among individuals. The specific formalism is described in *Mathematics of Epidemics on Networks* (Kiss 2017). To capture the effects of evictions and doubling-up, we use a dynamic network, in which the contact structure changes over time (Volz 2007).

11. **Details of the model.** The model represents 100,000 individuals in a metro area in which evictions are common, such as Philadelphia. It considers two types of contacts, those among all individuals who share a household (household contacts), and those between individuals living in different households (community contacts). Transmission of the virus occurs, probabilistically, between an infectious and susceptible individual connected in the network. The probability of transmission of the virus among household contacts is around 2.3 times higher than the probability of transmission between community contacts (Jing 2020).

12. **Simulations, and timeline of the epidemic to date.** The model simulates the initial exponential rise of the epidemic, a subsequent fall after stay-at-home orders and other social distancing measures were implemented in the city in March, and a plateau period during which prevalence has remained stable following relaxation of these measures. I evaluate a scenario of resurgence in the late summer and fall leading to an epidemic of similar size as the epidemic in the spring. I note that the model is not a forecast, but rather an assessment of the effect of evictions under this scenario.

13. **Estimating the effect of evictions on the future course of epidemics** Each simulation splits in two on September 1st, 2020. At this split one trajectory tracks the epidemic if evictions were allowed to resume; the other tracks the epidemic without evictions. The difference in the number of individuals infected with SARS-CoV-2 through May 1st, 2021, under these two counterfactual trajectories, is the outcome of interest.

Figure 1.



14. **Figure 1.** Sixty simulations of a model on a network that tracks SARS-CoV-2 transmission through an urban population of 100,000 individuals in 40,000 households. Black lines represent simulations in the absence of evictions. Each black line has a corresponding red line, which represents the counterfactual scenario of the same epidemic with continuing evictions. Vertical blue lines represent key timepoints of the epidemic in the city. The first solid vertical line represents the stay at home order issued in March. Subsequent dotted vertical lines mark successive relaxation of social distancing measures. Evictions (in the red simulations) begin on September 1st, when a backlog of 1.5% of households are evicted, and continue, at a rate of 0.5% of households (200 out of 40,000 households) per month. Evicted households 'double-up' with other households. The final vertical line represents the re-imposing of measures to control the resurgence of the virus, in this case on November 1st, 2020.

15. **Results.** Evictions extend the transmission of the virus following control measures. By May 1st of 2021 a median additional 1.30% of the population becomes infected in the scenario with evictions [Interquartile range: 0.79%-1.99%]. The prevalence of infection is consistently higher at the end of the simulations in the eviction scenario, suggesting a prolonged epidemic if evictions resume, even under effective control measures.

Table 1.

Eviction/Doubling-up Rate (Monthly)	Excess Infections Median	Interquartile range (of 60 simulations)
0.5%	1.30%	0.79% – 1.99%
1.0%	2.44%	1.72% - 3.13%

16. **Table 1.** Expected excess infections—defined as cases that are expected to occur with evictions that would not be expected to occur without evictions, expressed as prevalence among 100,000 individuals. Estimates are derived from network SEIR simulations for different eviction rates (0.5% (also shown above in figure 1) & 1.0% per month;with a 3 month backlog evicted on 9/1/2020). Medians of 60 simulations and corresponding interquartile ranges are shown.

I declare under penalty of perjury, pursuant to 28 U.S.C. § 1746, that the foregoing is true and correct, based upon my own knowledge and/or belief.

DATE: August _7, 2020

Michael Z. Levy

APPENDIX A: Endnotes

Layser, M.D., De Barbieri, E.W., Greenlee, A., Kaye, T. and Saito, B.G. (2020). Mitigating Housing Instability During a Pandemic. *Available at SSRN 3613789*.

Nande, A., Adlam, B., Sheen, J., Levy, M. Z., & Hill, A. L. (2020). Dynamics of COVID-19 under social distancing measures are driven by transmission network structure. *medRxiv*.

McCrystal, L. (2020, July 28). Over 30,000 Philly residents have now tested positive for coronavirus. *The Philadelphia Inquirer*. https://www.inquirer.com/health/coronavirus/live/coronavirus-covid19-philadelphia-pa-nj-de-cases-testing-news-schools-trash-20200729.html

Eggers, F., & Moumen, F. (2013). Analysis of trends in household composition using American Housing Survey data. *Available at SSRN 2445473*.

Emanuel, E., S. Ellenberg, and M. Levy. (2020, March 17). The Coronavirus Is Here to Stay, So What Happens Next? *New York Times* https://www.nytimes.com/2020/03/17/opinion/coronavirus-social-distancing-effect.html

Jing, Q.L., Liu, M.J., Zhang, Z.B., Fang, L.Q., Yuan, J., Zhang, A.R., Dean, N.E., Luo, L., Ma, M.M., Longini, I. and Kenah, E., 2020. Household secondary attack rate of COVID-19 and associated determinants in Guangzhou, China: a retrospective cohort study. *The Lancet Infectious Diseases*.

Bansal, S., Grenfell, B.T. and Meyers, L.A., 2007. When individual behaviour matters: homogeneous and network models in epidemiology. *Journal of the Royal Society Interface*, *4*(16): 879-891.

Mosites E, Parker EM, Clarke KE, et al. Assessment of SARS-CoV-2 Infection Prevalence in Homeless Shelters — Four U.S. Cities, March 27–April 15, 2020. *MMWR Morb Mortal Wkly Rep,* 69: 521–522. DOI: http://dx.doi.org/10.15585/mmwr.mm6917
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Curmei, M., Ilyas, A., Evans, O. and Steinhardt, J., 2020. Estimating Household Transmission of SARS-CoV-2. *medRxiv*.

Center for Disease Control. Interim Considerations for Health Departments for SARS-CoV-2 Testing in Homeless Shelters and Encampments. Available: https://www.cdc.gov/coronavirus/2019-ncov/community/homeless-shelters/testing.html

City of Philadelphia. Coronavirus Disease 2019 (COVID-19): Testing and Data. (2020, August 3) Available: https://www.phila.gov/programs/coronavirus-disease-2019-covid-19/testing-and-data/

Cowling BJ, Ali ST, Ng TWY, Tsang TK, Li JCM, Fong MW, et al. Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: an observational study. Lancet Public Health. 2020;5: e279–e288. doi:10.1016/S2468-2667(20)30090-6

Pan A, Liu L, Wang C, Guo H, Hao X, Wang Q, et al. Association of Public Health Interventions With the Epidemiology of the COVID-19 Outbreak in Wuhan, China. JAMA. 2020 [cited 24 Apr 2020]. doi:10.1001/jama.2020.6130

Prague M, Wittkop L, Clairon Q, Dutartre D, Thiebaut R, Hejblum BP. Population modeling

of early COVID-19 epidemic dynamics in French regions and estimation of the lockdown impact on infection rate. medRxiv. 2020; 2020.04.21.20073536. doi:10.1101/2020.04.21.20073536

United States Census Bureau, 2017. American Housing Survey. Available: https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=37980&s_year=2017&s_tablename=TABLE8A&s_bygroup1=1&s_bygroup2=1&s_filtergroup1=3&s_filtergroup2=1

Volz, E. and Meyers, L.A., 2007. Susceptible–infected–recovered epidemics in dynamic contact networks. *Proceedings of the Royal Society B: Biological Sciences*, *274*(1628), pp.2925-2934.

APPENDIX B: CURRICULUM VITAE

Michael Z. Levy

mzlevy@upenn.edu | 215-292-8441 | 4228 Regent Square, Phila, Pa

EDUCATION

Emory University — Atlanta, Ga
PhD in Population Biology, Ecology and Evolution, Advisor: Lance Waller — *2007*

Amherst College — Amherst, Mass
BA, summa cum laude, Interdisciplinary, Advisor: Jyl Gentzler — *1998*

RESEARCH POSITIONS

Associate Professor with Tenure — 2016–
Department of Biostatistics, Epidemiology & Informatics, University of Pennsylvania School of Medicine

Senior Fellow — 2018
Kleinman Center for Energy Policy, University of Pennsylvania, Philadelphia, Pa (While on Sabbatical)

Assistant Professor — 2010–2016
Department of Biostatistics, Epidemiology & Informatics University of Pennsylvania School of Medicine

Investigador Externo Asociado — 2013–
Universidad Peruana Cayetano Heredia, Lima, Peru

Postdoctoral Fellow — 2007–2009
Biology Department, U. of Pennsylvania, Philadelphia, Pa.& Fogarty International Center, National Institutes of Health, Bethesda, Md.

Guest Researcher — 2002–2007
Entomology Branch, Division of Parasitic Diseases, Centers for Disease Control & Prevention, Chamblee, Ga

ACTIVE RESEARCH GRANTS — dates/total cost

An Immune System for the City: a New Paradigm for Urban Vector Control — 2019-2024
National Institutes of Health, PIs: Levy / Paz Soldan — *R01*

The difficulties faced by a community when trying to control a dangerous insect are in many ways analogous to those faced by the body when attacked by a pathogen. This project will develop a new paradigm for the control of dangerous insects patterned after the adaptive immune system, adapting strategies from the scale of cells to that of landscapes, and testing the new methods on surveillance and control of insects of medical importance.

Improving Participation in Door-to-Door Vector Control Campaigns — 2014-2020
National Institutes of Health, PIs: Levy / Buttenheim — *R01*

This project addresses low participation in door-to-door community health initiatives through three interventions informed by behavioral economics: responsive scheduling with advance commitment, neighbor recruitment, and contingent group lotteries. We assess the effectiveness and cost-effectiveness of these interventions for a Chagas disease vector control campaign in Peru.

Disrupting Vector-borne Disease Transmission in Complex Urban Environments — 2013-2020
National Institutes of Health, PI: Levy — *R01*

The project consists of three specific aims; each addresses a broad challenge to elucidating unseen processes of the spread of vector-borne diseases: 1) Mapping: To create maps of vector infestation that account for imperfect entomological surveys and spatial barriers in a landscape; 2) Modeling Spread: To predict T. infestans dispersal through a city despite imperfect maps of its initial occurrence; and, 3) Spatial Control: To detect foci of T. infestans re-emergence and micro-epidemics of T. cruzi infection through adaptive spatial sampling. Achieving these three interlocking aims will improve control of many vector-borne diseases in urban and other complex environments.

COMPLETED RESEARCH GRANTS — dates/total cost

Socio-spatial Ecology of the Bed Bug and its Control — 2017-2019
National Socio-Ecological Synthesis Center (SESYNC), PIs: Levy / Schneider — *Pursuit*

Ecological consequences of the effects of a zoonotic pathogen on its reservoir host. — 2014-2017
National Science Foundation, PIs: Brisson / Ostfeld/ Keesing / Levy — *NSF*

Phylogeographic Dynamics of a Vector and Pathogen in a Natural Environment. — 2011-2016
National Institutes of Health, PI: Brisson; Role:Co-I — *R01*

Vaccination Status Of Children Exempted From School-Entry Immunization Mandates 2014-2016
National Institutes of Health, PI: Buttenheim; Role:Co-I *R03*

Early Detection of Congenital Chagas Disease. 2010-2015
National Institutes of Health, PI: Gilman; Role: Co-I *R01*

Mathematical Techniques for Control of Epidemic Trypanosoma cruzi Transmission. 2008-2013
National Institutes of Health, PI: Levy *K01*

Administrative supplement to K award. 2010-2011
National Institutes of Health, PI: Levy

Administrative supplement to K award. 2009-2010
National Institutes of Health, PI: Levy

Innovative Approaches to Diagnosis and Control of Chagas Disease (Peru TMRC) 2007-2013
National Institutes of Health, PIs: Naquira/Gilman; Role Subproject Lead *P50*

Transmission of MRSA by Bed bugs, Pilot Studies. 2012-2013
University Research Fund, University of Pennsylvania, PI: Levy

Pilot studies to improve participation in Chagas Disease Control Campaigns. 2012-2013
University Research Fund, University of Pennsylvania, PIs Levy/Buttenheim/Small

Real-time control of re-emerging Chagas disease vectors in Arequipa, Peru. 2012-2013
Center for Global Health University of Pennsylvania, PI: Levy PI

Pilot studies to improve participation in Chagas Disease Control Campaigns. 2012
Center for Global Health University of Pennsylvania, PIs: Levy / Buttenheim

TEACHING EXPERIENCE

- **Mathematical Models for the Control of Infectious Diseases (2019)** : w/ Dr. Gary Smith, Center for Public Health, University of Pennsylvania
- **Insect Epidemiology: Pests Pollinators and Disease Vectors (2014-2018, 2020)** : Undergraduate Program in Health and Societies, University of Pennsylvania
- **Doctoral Seminar: *Epidemiology as an Interdisciplinary Science* (2014, 2019)**: University of Pennsylvania
- **Doctoral Seminar: *Epidemiology in a Changing World* (2016)**: University of Pennsylvania
- **Doctoral Seminar: *This Week in Epidemiology* (2015)**: University of Pennsylvania
- **Disease Ecology (2012-2014)** : Biomedical Graduate School, University of Pennsylvania
- **New Epidemiological Methods in R Workshop (2012)**: Universidad Peruana Cayetano Heredia, Lima, Peru

Regular Lectures in
Geography and Health, Public Health, University of Pennsylvania
Infectious Disease Epidemiology, University of Pennsylvania
Parasitology, University of Pennsylvania

Independent Study Instructor
2013 "R Statistical Software for Prediction and Bayesian Data Analysis" Student: Brian Finkelman MD/PhD.
2014 "Disease Ecology and Basic Epidemiological Theory and Research Methods" Student: Sherrie Xie.
2014 "Statistical Methods for Infectious Diseases" Student: Erica Billig.
2015 "Dynamics of Urban Insect Infestation" Student: Erica Billig.

EDUCATIONAL SERVICE

- **Vice-chair, Graduate Group in Epidemiology and Biostatistics (2016-2019)** : Biomedical Graduate School, University of Pennsylvania
- **Chair of Curriculum Committee, Graduate Group in Epidemiology and Biostatistics (2016-2019)** : Biomedical Graduate School, University of Pennsylvania
- **Co-director, Public Health Certificate Program (2012-2017)** : Biomedical Graduate School, University of Pennsylvania
- **Co-director, Universidad Peruana Cayetano Heredia / University of Pennsylvania Partnership (2010-present)** : Peru and USA

MENTORING

Faculty Advisor

2018- Ricardo Castillo, DvM PhD Instructor, University of Pennsylvania School of Medicine

Postdoctoral Advisor

2018- Katherine Hacker, PhD University of Pennsylvania, Philadelphia, PA
2017-8 Jennifer Peterson, PhD Universidad Peruana Cayetano Heredia/University of Pennsylvania Zoonotic Disease Field Station, Arequipa, Peru
2014-2017 Ricardo Castillo, DvM PhD Universidad Peruana Cayetano Heredia/University of Pennsylvania Zoonotic Disease Field Station, Arequipa, Peru
2012-2013 Alexis Barbarin, PhD University of Pennsylvania, Philadelphia, Pa
2010-2014 Corentin Barbu, PhD University of Pennsylvania, Philadelphia, PA

PhD Advisor

2010-2013 Erica Foley (with Dustin Brisson), Biology, University of Pennsylvania, Philadelphia, PA
2011-2013 Andrew Hong (with Dylan Small), Statistics, Wharton School of the University of Pennsylvania, Philadelphia, PA
2011-2013 Oliver Entine (with Dylan Small), Statistics, Wharton School of the University of Pennsylvania, Philadelphia, PA
2014-2017 Erica Billig Rose, (with Jason Roy) PhD in Statistics, Department of Biostatistics and Epidemiology
2014-2018 Alexander Berry, (with Dustin Brisson), Biology,University of Pennsylvania,

PhD Committee Member

2010-2012 Jen Manne MD/PhD, Epidemiology, Harvard University School of Public Health.
2010-2014 Ricardo Castill-Neyra. DVM,PhD and Fulbright fellow. Johns Hopkins University UPenn/UPCH Zoonitic Disease Field Station, Arequipa, Peru
2011-2014 Laurel Redding, Epidemiology, University of Pennsylvania, Philadelphia, PA
2012-2014 Brian Finkelman, Epidemiology, University of Pennsylvania, Philadelphia, PA
2011-2015 Nikkita Patel, Epidemiology (Chair of committee), University of Pennsylvania, Philadelphia, PA

MS/MPH Advisor

2008-2010 Megan Christensen, MPH student, Univ. Wisconsin co-advisor with Dr. Jonathan Patz)
2015-2016- Holleh Husseinzadeh, Masters in Clinical Epidemiology, University of Pennsylvania
2017-2018- Lent Mantshonyane, Masters in Clinical Epidemiology, University of Pennsylvania
2018- Kevin O'Callahan, , Masters in Clinical Epidemiology, University of Pennsylvania
2018- Claudia Arevalo, Maestria en Salud Publica, Universidad San Agustin

Research Field Site Advisor

2011-2013 Aaron Tustin, MD student, UPenn/UPCH Zoonotic Disease Field Station, Arequipa, Peru
2009-2013 Stephen Delgado, UPenn/UPCH Zoonotic Disease Field Station, Arequipa, Peru
2009-2011 Kathleen Maloney PhD. UPenn/UPCH Zoonotic Disease Field Station, Arequipa, Peru
2013 Geoffrey Rodriguez, UPenn/UPCH Zoonotic Disease Field Station, Arequipa, Peru
2013 Amelia Breyre, UPenn/UPCH Zoonotic Disease Field Station, Arequipa, Peru
2015 Sarah Nutman, UPenn/UPCH Zoonotic Disease Field Station, Arequipa, Peru

Undergraudate Research Advisor

2011-2013 Tarub Mabud, University of Pennsylvania, Philadelphia, PA
2011-2012 Christine Skovira, undergraduate, University of Pennsylvania, Philadelphia, PA
2011 Stephanie Lamb, Summer Undergraduate Minority Research (SUMR) fellow, University of Pennsylvania, Philadelphia, PA
2012-2015 Karthik Setharuman, University of Pennsylvania, Philadelphia, PA
2013 Daniel Riveras-Lanas, Amherst Alumni Internship Program
2012-2013 Esther Kim, Ecology, Princeton University
2013-2015 Yage Wu, University of Pennsylvania, Philadelphia, PA
2013-2015 Dylan Tracy, University of Pennsylvania, Philadelphia, PA
2014 Michelle Ngo, Amherst Alumni Internship Program
2014 Daniel Sentana-Lledo, University of Pennsylvania
2014 Christine Tedijanto, Biology, University of Pennsylvania
2015-2017 Patrick Emedom-Nnamdi, University of Pennsylvania, Philadelphia, PA
2016-2017 Justin Sheen, Biology, University of Pennsylvania, Philadelphia, PA

LECTURES BY INVITATION (LAST FIVE YEARS)

Methods for Invasive Insects in Cities April 2014
United States Forest Service Philadelphia Field Station, Philadelphia, Pa

Spatial Uncertainty: Data, Modeling, and Communication July 2014
NIH, Webinar

The Epidemiology of Bed Bug Infestations in Philadelphia Dec. 2014
Testimony before the City Council of Philadelphia, City Hall, Philadelphia, Pa

Double-check your hotel room: Bed bugs as vectors of T. cruzi, the etiologic agent of Chagas disease May 2015
Ecology and Evolution of Infectious Diseases Annual Meeting, Athens, Ga

Modelo Adaptativo para Vigilancia Aug. 2015
Regional office of the Ministry of Health, Arequipa, Peru

Emergence, control and re-emergence of Trypanosoma cruzi in Southern Peru
Texas A & M, College Station, Texas Sep. 2015
Princeton University, Princeton, NJ. Oct. 2015

The City and the Bugs/La Ciudad y Los Chinches Feb. 2016
University of Puerto Rico, Rio Piedras, Puerto Rico

Socio-spatial studies of Chagas Disease in Peru
Williams College, Williamstown, MA Apr. 2016
SUNY Albany, Albany, NY May 2016

Chagas Disease: Interventions and Models in Urban Settings
Imperial College, London Feb. 2018
Panamerican Health Organization, Washington, DC Apr. 2018

21st Century Seminar: "Bugs in the City: Controlling Chagas Disease in Arequipa, Peru Oct. 2018
Rutgers School of Public Health, New Brunswick, NJ

Sickness & the City Oct. 2018
New York Academy of Medicine, New York, NY

Bugs & Cities: Controlling Chagas Disease Vectors in Arequipa, Peru Sept. 2019
Tulane School of Public Health and Tropical Medicine, New Orleans, La

Testimony on Bill No. 190106 the "Bed Bug Bill" Oct. 2019
Testimony before the City Council of Philadelphia, City Hall, Philadelphia, Pa

Chagas Disease in Southern Peru: Programs, Politics and Progress Sept. 2019
Latin American and Latino Studies, University of Pennsylvania, Phila. PA.

Triatomines and Bed Bugs: Parallel Plagues, Divergent Responses Nov. 2019
Entomological Society of America, St. Louis, MO.

Risk Maps, Apps and Incentives: Improving Active Surveillance for *Triatoma infestans* Nov. 2019
American Society of Tropical Medicine, Washington, DC.

PUBLICATIONS GOOGLE SCHOLAR PROFILE

1. Dubey JP, **Levy, M. Z.**, Sreekumar C, Kwok OC, Shen SK, Dahl E, Thulliez P, and Lehmann T. Tissue distribution and molecular characterization of chicken isolates of Toxoplasma gondii from Peru. J. Parasitol. 2004;90:1015–8.
2. Saito M, Bautista CT, Gilman RH, Bowering A, **Levy, M. Z.**, and Evans CA. The value of counting BCG scars for interpretation of tuberculin skin tests in a tuberculosis hyperendemic shantytown, Peru. Int. J. Tuberc. Lung Dis. 2004;8:842–7.
3. **Levy, M. Z.**, Medeiros EA, Shang N, Soares MC, Homenko AS, Almeida RM, Garrett DO, Roth VR, Jarvis WR, Wells CD, Binkin N, and Laserson KF. TST reversion in a BCG-revaccinated population of nursing and medical students, São Paulo, Brazil, 1997-2000. Int. J. Tuberc. Lung Dis. 2005;9:771–6.
4. **Levy, M. Z.**, Bowman NM, Kawai V, Waller LA, Cornejo del Carpio JG, Cordova Benzaquen E, Gilman RH, and Bern C. Periurban Trypanosoma cruzi-infected Triatoma infestans, Arequipa, Peru. Emerging Infect. Dis. 2006;12:1345–52.
5. **Levy, M. Z.**, Kawai V, Bowman NM, Waller LA, Cabrera L, Pinedo-Cancino VV, Seitz AE, Steurer FJ, Cornejo del Carpio JG, Cordova-Benzaquen E, Maguire JH, Gilman RH, and Bern C. Targeted screening strategies to detect Trypanosoma cruzi infection in children. PLoS Negl Trop Dis 2007;1:e103.
6. Bowman NM, Kawai V, **Levy, M. Z.**, Cornejo del Carpio JG, Cabrera L, Delgado F, Malaga F, Cordova Benzaquen E, Pinedo VV, Steurer F, Seitz AE, Gilman RH, and Bern C. Chagas disease transmission in periurban communities of Arequipa, Peru. Clin. Infect. Dis. 2008;46:1822–8.
7. **Levy, M. Z.**, Quispe-Machaca VR, Ylla-Velasquez JL, Waller LA, Richards JM, Rath B, Borrini-Mayori K, Carpio JG del, Cordova-Benzaquen E, McKenzie FE, Wirtz RA, Maguire JH, Gilman RH, and Bern C. Impregnated netting slows infestation by Triatoma infestans. Am. J. Trop. Med. Hyg. 2008;79:528–34.

8. Bayer AM, Hunter GC, Gilman RH, Cornejo Del Carpio JG, Naquira C, Bern C, and **Levy, M. Z.** Chagas disease, migration and community settlement patterns in Arequipa, Peru. PLoS Negl Trop Dis 2009;3:e567.
9. **Levy, M. Z.**, Bowman NM, Kawai V, Plotkin JB, Waller LA, Cabrera L, Steurer F, Seitz AE, Pinedo-Cancino VV, Cornejo del Carpio JG, Cordova Benzaquen E, McKenzie FE, Maguire JH, Gilman RH, and Bern C. Spatial patterns in discordant diagnostic test results for Chagas disease: links to transmission hotspots. Clin. Infect. Dis. 2009;48:1104–6.
10. Verani JR, Seitz A, Gilman RH, LaFuente C, Galdos-Cardenas G, Kawai V, LaFuente E de, Ferrufino L, Bowman NM, Pinedo-Cancino V, **Levy, M. Z.**, Steurer F, Todd CW, Kirchhoff LV, Cabrera L, Verastegui M, and Bern C. Geographic variation in the sensitivity of recombinant antigen-based rapid tests for chronic Trypanosoma cruzi infection. Am. J. Trop. Med. Hyg. 2009;80:410–5.
11. **Levy, M. Z.**, Malaga Chavez FS, Cornejo Del Carpio JG, Vilhena DA, McKenzie FE, and Plotkin JB. Rational spatio-temporal strategies for controlling a Chagas disease vector in urban environments. J R Soc Interface 2010;7:1061–70.
12. McCune S, Bayer AM, Hunter GC, Bowman NM, Cornejo del Carpio JG, Naquira C, Gilman RH, Bern C, and **Levy, M. Z.** A Multi-disciplinary Overview of Chagas in Periurban Peru. Journal of International & Global Studies 2010;1.
13. Bowman NM, Kawai V, Gilman RH, Bocangel C, Galdos-Cardenas G, Cabrera L, **Levy, M. Z.**, Cornejo del Carpio JG, Delgado F, Rosenthal L, Pinedo-Cancino VV, Steurer F, Seitz AE, Maguire JH, and Bern C. Autonomic dysfunction and risk factors associated with Trypanosoma cruzi infection among children in Arequipa, Peru. Am. J. Trop. Med. Hyg. 2011;84:85–90.
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"School reopening plans should focus on disease control | Expert Opinion" Alison Buttenheim and **Michael Z. Levy** Op-Ed, *The Philadelphia Inquirer,* March 17th, 2020

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LANGUAGES AND COMPUTING

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