Bennett Allen, PhD, MPA
Assistant Professor
Center for Opioid Epidemiology and Policy
Department of Population Health
NYU Grossman School of Medicine
180 Madison Avenue, 5th Floor, Office 5-54
New York, NY 10016
T: (+1) 646-501-3708
E: bennett.allen@nyulangone.org

July 31, 2024

Dear Drs. Cutler and Lleras-Muney:

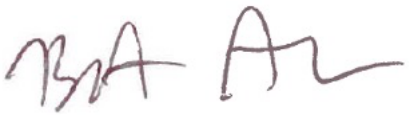
On behalf of my co-authors, I am pleased to submit an extended abstract titled "Establishing a Life Return on Investment (LROI) for Public Health Decision-Making: A Public-Academic Partnership to Inform Policies by Estimating and Comparing Life Expectancy Gains from Alternative New York City Health Investments" for your consideration for presentation at the National Bureau of Economic Research (NBER) conference on the Determinants of Mortality in January 2025.

This extended abstract represents a collaboration between the NYC Department of Health and Mental Hygiene and NYU Grossman School of Medicine to integrate health economic modeling into public health decision-making and resource allocation to increase life expectancy in New York City. Our extended abstract presents preliminary findings on the impact of strategic, model-driven public health investments to intervene on two leading causes of premature mortality, cardiometabolic disorders and drug overdose. We see our work as of strong interest to NBER's diverse and dynamic audience across academic and applied economics, public health, and social science through our rigorous integration of health economics modeling with practical and impactful public health intervention.

If accepted, we anticipate that this paper will be presented jointly by a representative from the NYU Grossman School of Medicine (Dr. Allen or Dr. Braithwaite, depending on availability) and the NYC Department of Health and Mental Hygiene (Dr. Vasan or Ms. Parrott, depending on availability). As part of this submission, we confirm that this extended abstract was not commissioned, has not been previously published, and has not been submitted to any journal or other conference venue. We assure that all authors contributed to the extended abstract and approved the text submitted. Lastly, we declare that this work is supported in part by a grant from the Commonwealth Fund to Dr. Allen (award no. 24-23973).

Thank you very much for your consideration. We look forward to hearing from you.

Sincerely,



Bennett Allen, PhD, MPA

Establishing a Life Return on Investment (LROI) for Public Health Decision-Making: A Public-Academic Partnership to Inform Policies by Estimating and Comparing Life Expectancy Gains from Alternative New York City Health Investments

R. Scott Braithwaite, MD, Professor and Director, Division of Comparative Effectiveness and Decision Sciences, Department of Population Health, NYU Grossman School of Medicine

Bennett Allen, PhD, MPA, Assistant Professor, Center for Opioid Epidemiology and Policy, Department of Population Health, NYU Grossman School of Medicine

Jannae Parrott, MPH, Monitoring and Evaluation Analyst, Center for Population Health Data Science, Bureau of Epidemiology Services, NYC Department of Health and Mental Hygiene

Ashwin Vasan, MD, PhD, Commissioner, NYC Department of Health and Mental Hygiene

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Extended Abstract

Life expectancy is an important measure of a population's health, and health scientists, economists, and social scientists tracking the well-being of populations are interested in quantifying impacts of social determinants of health on longevity to inform and coordinate public health interventions. This is especially important in current times, as American life expectancy has fallen and lags far behind peer nations, and where healthcare investments continue to grow without producing corresponding improvements in life expectancy. While the availability of new and richer data sets has made it possible to develop increasingly precise estimates of the relative contributions of determinants to life expectancy—and thus to inform health services allocation and delivery—these estimates are often biased, as they are based on associations rather than on causal relationships. As a result, they may yield misleading policy recommendations for public health and healthcare systems that wish to intervene. Similarly, comparative estimates between individual public health interventions or portfolios of interventions are rarely produced in ways that are easily used by public-sector decision-makers and resource-allocators.

After New York City (NYC) experienced the steepest ever-recorded drop in life expectancy in 2020, the NYC Department of Health and Mental Hygiene (DOHMH) launched the HealthyNYC multi-sector, citywide population health initiative in 2023, with a goal to increase life expectancy in NYC beyond 83 years by 2030, exceeding the highest ever on record for NYC. HealthyNYC is comprised of three pillars: (1) a broad public awareness and messaging campaign targeting individuals and key institutions; (2) multi-sector, public-private learning collaboratives organized around the leading causes of preventable death and driving key cross-sector programs and policies; and (3) fiscal efforts to shift the gradient of local health budgeting and spending towards prevention and higher return activities, as measured by impact on mortality and life expectancy. HealthyNYC aims to use strategic public health policy investments across six leading and preventable causes of mortality (cardiometabolic disorders, drug overdose, suicide, homicide, screenable cancer, and COVID-19) to maximally impact life expectancy in NYC. To inform HealthyNYC's investment portfolio, DOHMH partnered with the New York University Grossman School of Medicine's Department of Population Health (DPH) to pilot a proof-of-concept to estimate the improvement in life expectancy—heretofore referred to as Life Return on Investment or "LROI"—that could arise from a range of potential investment scenarios impacting two of the six causes of death, cardiometabolic conditions and drug overdose. This public-academic partnership sought to integrate rich data sources with mechanistic modeling and systematic evidence evaluation, thereby reducing the danger that biased results will produce misleading policy inferences.

Using a validated mechanistic computer simulation, the public-academic partnership evaluated the impact on life expectancy of alternative investments in policies impacting health. We leveraged several administrative health data sources, including emergency department and hospital visits, health services utilization data, and mortality records. For cardiometabolic disorders and drug overdose, DOHMH compiled a list of feasible public health investment scenarios, encompassing social, behavioral, and medical programs, and drawing both from national and international evidence, guidelines, and best practices, as well as local experience and practical application in NYC. Nine cardiometabolic interventions were modeled (e.g., home blood pressure monitoring, cardiac rehabilitation, and smoking cessation programs). Five overdose prevention interventions were modeled (e.g., naloxone distribution, overdose prevention centers, and nurse-prescribed medications for opioid use disorder).

Harnessing expertise in evidence evaluation and synthesis, the public-academic partnership identified a subset of those investments with high likelihood of causally impacting health outcomes. Synthesizing the subset of investments with DOHMH surveillance and programmatic data and with the mechanistic computer simulation, the public-academic partnership then estimated benefit (number of life-years added to NYC life expectancy) and LROI value (net monetary benefit from life expectancy improvement divided by incremental programmatic cost) from alternative investment scenarios. Analyses were performed for NYC as a whole, as well as stratified by the 55 Public Use Microdata Areas (PUMAs) comprising NYC. The impacts of possible investments on life expectancy were estimated for cardiometabolic conditions and drug overdose separately and jointly. Investment scenarios also considered differences in life expectancy by socioeconomic inequality to assess the role of public health interventions in reducing health inequity.

For cardiometabolic interventions, we found that alternative investment scenarios would add between 0.03 (home blood pressure monitor, produce prescription) and 0.38 (improving primary care access) years to NYC life expectancy, and that all cardiometabolic investments combined would add 1.15 life-years. We found that alternative investment scenarios would confer their benefit with LROI values of between 0.65 (supervised aerobic exercise) and 17.17 (smoking cessation), and that all investments combined would confer aggregate benefit at a value of 2.51. Life expectancy gain and value varied greatly by PUMA, with more benefit and/or greater value generally accruing to PUMAs with lower income and/or lower baseline life-expectancies. For example, the lowest income PUMA would gain 0.17 life-years from community health workers, at a LROI value of 1.64 life-years, whereas the highest income PUMA would gain 0.04 life-years, at a value of 1.16.

For overdose prevention interventions, we found that alternative investment scenarios would add between 0.01 (overdose prevention centers) and 0.05 (increased naloxone distribution) years to NYC life expectancy, and that all overdose prevention investments combined would add 0.10 life-years. We found that alternative investment scenarios would confer their benefit with LROI values of between 7.03 (overdose prevention centers) and 71.39 (naloxone distribution), and that all investments combined would confer aggregate benefit at a value of 38.42. Life expectancy gain and value varied greatly by PUMA, with more benefit and/or greater value generally accruing to PUMAs with lower income and/or lower baseline life-expectancies. For example, the lowest income PUMA would gain 0.17 life-years from naloxone distribution, at a value of 267.37, whereas the highest income PUMA would gain 0.02 life-years, at a value of 19.22.

Considering a holistic public health investment approach to life expectancy, when combining all cardiometabolic and opioid interventions, we estimated an added 1.25 life-years to NYC life expectancy at a LROI of 2.71. The lowest income PUMA would gain 1.78 life-years at a value of 3.23, while the highest income PUMA would gain 0.82 life-years at a value of 3.20. Findings suggest that

strategic public health investment across causes of premature mortality can serve as a tool to build health equity.

This study has several limitations. First, estimates were derived using available administrative data and, as such, any biases associated with our data would translate to our modeling and estimation. However, our leveraging a range of administrative health and health services data sources in concert with systematic evidence review and domain expertise, imbues confidence in our approach. Second, our model development required us to make assumptions about the impact of interventions and costs associated with the implementation of such interventions, including that selected interventions are fully implemented without unexpected costs. However, our public-academic partnership leveraged both a systematic review of available, high-quality evidence to assess the potential for intervention impact and DOHMH practitioner expertise to identify realistic assumptions about the implementation of interventions at the community-level in NYC. Third, our use of PUMA boundaries, while approximating NYC neighborhoods, may not fully capture nuances of neighborhood dynamics and health services implementation boundaries. Future research can generate estimates to identify implementation across other geographic boundaries (e.g., zip codes, community districts) to assess optimally efficient intervention strategies.

In sum, findings suggest that strategic public health investment across causes of mortality can serve as a tool to build population health and health equity, and that LROI may be a useful summary measure to judge the relative impact and value of individual interventions, as well as comparative portfolio analysis of groups of interventions. The public-academic partnership and model-driven approach to public health prevention also demonstrates the proof of concept for the use of health economics methods to inform public health policy and intervention. Such public-academic partnerships are scalable at the state and local level to inform coordinated public health interventions to increase life expectancy.