Supplementary Files

Table S1 – Crime and Physical Activity Parameters and Assumptions

Crime Parameters
The crime parameters we took into account when developing our agent-based model are based on both accepted knowledge of crime and conclusions presented in the following publications:

Supplemental Reference # 1
Supplemental Reference #2
Supplemental Reference #3
Manuscript Reference #8
Manuscript Reference #10

Parameter	Value(s)
Radius of effect of each crime	Baseline: 0.1 miles Tested: 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 miles
Duration of effect of each violent crime	Baseline: 14 days Tested: 2, 4, 10, 14, 28, 60, 120, 365 days
Duration of effect of each property crime	Baseline: 7 days Tested: 1, 2, 5, 7, 14, 30, 60, 182 days
Effect of each violent crime on walking through a location	Baseline: 20% Tested: 20%, 40%, 60%, 100%
Effect of each property crime on walking through a location	Baseline: 10% Tested: 10%, 20%, 30%, 100%
Effect of each violent crime on driving through a location	Baseline: 0% Tested: 0%, 10%, 20%, 30%, 100%
Effect of each property crime on driving through a location	Baseline: 0% Tested: 0%, 5%, 10%, 15%, 100%
Effect of each violent crime on exercising at a location	Baseline: 40% Tested: 40%, 80%, 100%
Effect of each property crime on exercising at a location	Baseline: 20% Tested: 20%, 40%, 60%, 100%

Physical Activity Parameters

Parameter	Value(s)	Source

Initial probability of exercising	Baseline: 25% Tested: 25%, 37.5%, 50%, 100%	Manuscript Reference #26
Exercise location preferences	In Home: 20.667% Gym/Rec Center: 27.667% Outdoor: 51.667%	Supplemental Reference #4
Maximum distance considered for exercise locations	Driving: 2.5 miles Walking: 0.5 miles	Manuscript Reference #19 Supplemental Reference #5
Percentage of population with access to a car	64.8%	Manuscript Reference #26
Probability of each exercise intensity for each exercise location	In Home Moderate: 60% Vigorous: 40% Gym/Rec Center Moderate: 60% Vigorous: 40% Outdoor Moderate: 74% Vigorous: 26%	Manuscript Reference #20
Minutes of physical activity for each exercise location and exercise intensity	In Home Moderate: 52.4 minutes Vigorous: 42.2 minutes Gym/Rec Center Moderate: 60 minutes Vigorous: 47.1 minutes Outdoor Moderate: 83.5 minutes Vigorous: 66 minutes	Manuscript Reference #20
Metabolic Equivalents (METs) for each exercise intensity	Moderate: 4.5 Vigorous: 7	Supplemental Reference #6

Model Assumptions

Assumptions	Data Source
"Each agent has a baseline probability to exercise. This captures the agent's current desire to exercise and includes factors like	Manuscript References #14 - 18

household financial and employment status, family/caregiving responsibilities, chronic health conditions, weather, social group influence, and broader social pressures including density of and relatability to exercisers in the community."	Supplemental Reference #7
"There are three location types where agents can engage in LTPA: 1)home, 2)outdoor locations (pools, parks, bike trails and lanes), or 3)municipal recreational centers."	Supplemental Reference #4,8

Manuscript Reference #19 |
| "We assume that crime affects LTPA decisions by reducing PA location accessibility when crime occurs at or near PA locations, or on the agent's travel path to the location." | Manuscript Reference #21

Supplemental Reference #7,9 |
"…objective measures of crime may not accurately reflect agents' perceptions of crime…"	Manuscript Reference #36-37
"We did not examine the specific factors that contribute to the baseline probability to exercise."	Supplemental Reference #7
"When calculating body weight changes for each woman over the course of the year, we assumed that compensatory eating did not occur (i.e., women consumed the same amount of calories despite doing more PA in response to increased PA location accessibility)."	Supplemental Reference #10

Supplemental References

1. Mason P, Kearns A, Livingston M. "Safe Going": the influence of crime rates and perceived crime and safety on walking in deprived neighbourhoods. *Social science & medicine.* 2013;91:15-24.
2. Rossen LM, Pollack KM, Curriero FC, et al. Neighborhood incivilities, perceived neighborhood safety, and walking to school among urban-dwelling children. *Journal of physical activity and health.* 2011;8(2):262-271.
3. Janke KM, Propper C, Shields MA. Does violent crime deter physical activity? 2013.
4. Fan JX, Kowaleski-Jones L, Wen M. Walking or dancing: patterns of physical activity by cross-sectional age among US women. *Journal of aging and health.* 2013;25(7):1182-1203.
5. Yang Y, Diez-Roux AV. Walking distance by trip purpose and population subgroups. *American journal of preventive medicine.* 2012;43(1):11-19.
6. Centers for Disease Control and Prevention. General Physical Activities Defined by Level of Intensity. https://www.cdc.gov/nccdphp/dnpa/physical/pdf/pa_intensity_table_2_1.pdf.
7. Joseph RP, Ainsworth BE, Keller C, Dodgson JE. Barriers to physical activity among African American women: an integrative review of the literature. *Women & health.* 2015;55(6):679-699.

8. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *American journal of public health.* 2001;91(12):1995-2003.
9. Adlakha D, Hipp AJ, Marx C, et al. Home and workplace built environment supports for physical activity. *American journal of preventive medicine.* 2015;48(1):104-107.
10. Donnelly JE, Herrmann SD, Lambourne K, Szabo AN, Honas JJ, Washburn RA. Does increased exercise or physical activity alter ad-libitum daily energy intake or macronutrient composition in healthy adults? A systematic review. *PloS one.* 2014;9(1):e83498.

Extended Validation Section

The two primary outcomes of our model, proportion of women exercising daily and women with obesity were validated for the baseline scenario. Additionally, we validated expected model outcomes in extreme crime and physical activity scenarios.

The proportion of women exercising daily is equal to the average of the proportion of women who exercised each day over all of days of the one year simulation. In the baseline scenario, this 21.28% (95% range: 21.27, 21.29) of women exercised per day. To validate this outcome, we used data from the DC-CHNA survey which asked 79 adult women in Washington DC questions on multiple topics including their physical activity behaviors[27]. In the survey, participants are asked the number of days per week that they performed moderate or vigorous sports, fitness, and/or recreational activities during their leisure time. Of the 79 women participating in the DC-CHNA survey, 78 (99%) responded and we calculated a probability of exercising on any given day of 25.34%, a 4.06% difference from the simulated value.

To validate the starting overweight and obesity prevalence, we compared the prevalence computed by our model to that in the Behavioral Risk Factor Surveillance System (BRFSS) data (Centers for Disease Control and Prevention-conducted survey on U.S. residents' health-related

risk behaviors and chronic health conditions)[28]. Recall the population in our model is all adult (18+) African American females in wards 5, 7, and 8 in Washington DC. BRFSS data is not available on the ward level, so we used the overweight and obesity prevalence for adult African American females in all of Washington DC. Our model computed an overweight and obesity prevalence of 80.44% (95% range: 80.23, 80.63), and BRFSS data states a 76% (95% confidence interval: 71, 82%) overweight and obesity prevalence, which places our computed value within the confidence interval for the BRFSS data.

Model behavior under extreme scenarios must be validated as these can be considered boundary conditions for the model. As our model is primarily an interaction between a baseline probability to exercise and an influence of crime on that probability, we examined scenarios with extremely low and extremely high parameterizations for both mechanisms. With a baseline probability of exercise of 0%, the proportion of women exercising daily was 0%, regardless of the effect of crime, as expected. Similarly, when exposure to a single crime reduces the probability of exercise by 100% and the radius of crime impact is 1 mile, the proportion of women exercising daily was 0%, regardless of the baseline probability of exercise, as expected. Simulations run with a 100% baseline probability of exercise and the removal of crime occurrences resulted in 97.9% of women exercising daily. The reduction of 2.1% corresponds to the percentage of time women in the model do not have access to a viable exercise location nearby. This occurs when an agent decides to exercise at a gym/rec center or outdoors but there is no location of that type within their walking or driving cutoff distance. Repeating the same simulation with no cutoff distances for walking or driving results in 100% of women exercising daily.

Manuscript References

27. Thomas S, Yingling L, Adu-Brimpong J, et al. Mobile Health Technology Can Objectively Capture Physical Activity (PA) Targets Among African-American Women Within Resource-Limited Communities-the Washington, D.C. Cardiovascular Health and Needs Assessment. *J Racial Ethn Health Disparities.* 2016.
28. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System (BRFSS).