The Benefits of Knowledge: Mortality Risks, Mental Health and Life-Cycle Behaviors

A. Benefit of Knowledge — Analytic Approaches::: The analyses conducted as part of this project will utilize unprecedented 13-year MLFSFH panel data from 2006–18 for 1,400+ mature adults on SDPs, health and life-cycle behaviors, including multiple waves of pre- and post-intervention data. The key analyses of these data to be conducted as part of this project include (Aim 3): (a) evaluate the causal impact of health information on (i) SDPs, (ii) mental health and health behaviors, and (iii) labor supplies, savings, intergenerational transfers and other life-cycle behaviors, and (b) investigate the pathways through which SDPs affect these behaviors and outcomes.

A.0.a. Evaluation the impact of health-information on SDPs and life-cycle behavior: The randomized health-information intervention in 2016 provides exogenous variation among respondents in their knowledge about current mortality and health conditions, with the aim of improving the accuracy of individuals’ SDPs. Whether this is the case, and whether updated SDPs affect subsequent health, health behaviors and other life-cycle behaviors, is evaluated using established econometric methods for program evaluation. In essence, we will estimate the difference-in-difference equation \( Y_{it} = \alpha + \beta \text{Intervention}_{it} + \gamma X_{it} + \delta \text{Time} + \mu_i + \epsilon_{it} \), where, depending on the model and outcome of interest, \( Y_{it} \) is a measure of either SDPs, mental health, health- or other life-cycle-behaviors. Individual fixed-effects \( \mu_i \) account for all time-invariant differences between individuals (including potential pre-treatment differences across villages), \( \text{Time} \) reflects secular time trends, and \( X_{it} \) includes time-varying individual or village characteristics. The intervention variable—\( \text{Intervention}_{it} = \text{Post}_i \times \text{Treatment}_t \)—is defined as the interaction between the treatment dummy (\( \text{Post}_i = 1 \) for all treatment villages) and an indicator \( \text{Post}_i \) that equals 1 for all post-intervention time periods. In this diff-in-diff estimation, \( \beta \) captures the causal impact of the health-information intervention on the outcome of interest \( Y_{it} \), after controlling intra-individual heterogeneity through the fixed-effects \( \mu_i \). We will also examine the impact of the health-information intervention not only on health and behaviors, but also on SDPs and the determinants of SDPs such as household shocks or health inputs. Interactions with gender, schooling and HIV status will be considered, as well as analyses whether the effect of the intervention is modified by cognitive function (which may be a more relevant for heterogeneous treatment effects than schooling given the fairly low schooling levels among mature adults). Our identification of the causal effects of the health intervention in this estimation strategy relies on three specific assumptions: (a) non-random attrition across treatments, (b) random assignment into treatment, and (c) parallel time trends across treatment groups. There are several standard ways to check for assumptions (a) and (b), though not necessarily (c), as it requires having multiple pre-intervention data points. One important advantage of our data is exactly this availability of multiple pre-intervention data points, which will allow us to explicitly test the last assumption (c) of common time trends across treatment groups (e.g., see prior MLFSFH studies\(^7\)).

A.0.b. Identifying pathways between SDPs and behaviors: While the above analyses identify the effect of health-information on SDPs, health, and behaviors, they do not provide detailed insights into the pathways of how updated SDPs affect outcomes. To answer questions such as “Did individuals benefit by updating their SDPs by receiving new health-information, and how did this information affect their subsequent behaviors?” we will build on the analytic framework in Delavande & Kohler\(^8\) (forthcoming, Rev. of Econ. Studies) that is derived from an economic intertemporal choice model with uncertainty. For example, the probability of individual \( i \) choosing a certain health behavior \( a_i \) = 0 or 1, such as engaging in risky sex, is given as \(\text{Prob}(a_i = 1) = \text{Prob}\{V_i(1) + f_i S_i^+ U_i^+ + (1 - f_i) [p_i(1) S_i^+ U_i^+ - (1 - p_i(1)) S_i^- U_i^-] + \epsilon_{i1} \geq V_i(0) + f_i S_i^+ U_i^+ + (1 - f_i) [p_i(0) S_i^+ U_i^+ - (1 - p_i(0)) S_i^- U_i^-] + \epsilon_{i0}\} \), where \( V_i(a) \) is the immediate utility from behavior \( a_i \), \( U_i^+ \) and \( U_i^- \) are the status-dependent period 2 utility if \( i \) is HIV+ or HIV− respectively, \( p_i \) is the subjective probability of being HIV+ at the beginning of period 1, \( S_i^+ \) and \( S_i^- \) are the HIV-status dependent probabilities of surviving from period 1 to period 2, and \( \epsilon_{i1} \) represents unobserved heterogeneity in preferences, etc. \( p_i(a) \) is the subjective probability of becoming HIV+ as a function of behavior \( a \). Modification of this model for other health or life-cycle behaviors (smoking, work efforts, savings) is straightforward. Using our extensive data on SDPs and related expectations, the parameters of this model can be obtained using Roodman’s\(^9\) MLE-estimator for a recursive set of equations, where equations reflect (i) the disease/mortality perceptions prior to \( i \)’s access to the health-information provided as part of our intervention, (ii) probabilities of attrition, (iii) updates of the perceptions \( f_i, S_i^+ \) and \( S_i^- \) based on health-information, behavioral changes and contextual events such as local mortality, and (iv) individuals’ choices about their health behavior \( a_i \) as a function of SDPs \((f_i, S_i^+ \) and \( S_i^- \)) and other characteristics. Identification is obtained from exogenous variation in access to health-information resulting from our randomized intervention. Additional exclusion restrictions using exogenous variation in the MLFSFH identify other equations of the recursive system, as has been illustrated in our prior work.\(^8,10\) The results from this structural model then reveal the determinants of the initial expectations prior to the intervention, how individual behaviors and access to new information cause individuals to update their perceptions \( f_i, S_i^+ \) and \( S_i^- \), and how these updated perceptions affect health behaviors \( a_i \) and later life behaviors/outcomes (e.g., health, marriage, work efforts, intergenerational transfers). Importantly, estimated parameters can be used for health-policy simulations, as we have illustrated previously.\(^8\)
A.0.c. **Sample size, attrition and power considerations:** One indicator for the adequate power of the proposed analyses is our extensive mature-adult research that has informed the proposed research design.\textsuperscript{11–16} This conclusion is supported by more detailed power calculations. In 2012, the MLSFH mature adult survey completed 1,266 surveys, 90% of the 1,402 eligible respondents selected based on 2010 enrollment criteria; the 2013 MLSFH mature adult survey reinterviewed 1,203 (95%) of the 2012 respondents (plus additional who were absent in 2012). A N ≈ 1,500 is expected for the 2016 MLSFH survey, ≈90% (≈1,350) of whom can be expected to be retained until 2018. Power calculations using Optimal Design Software\textsuperscript{17} for (village-level) clustered randomized experiment with individual outcomes (N\textsubscript{2016–18} = 1,350, power = 80%, \(\alpha = .05\), \(R_{12}^2 = .2\)) suggest that our study design is able to identify minimum detectable effect sizes (MDES\textsuperscript{18,19}) of 19–22% for expected levels of within-village intra-class correlation in health-related outcomes in the range of .07–.15. Changes in SDPs, health and life-cycle behaviors as a result of the health-information intervention of ≈20% or higher will be detectable within our study design. Based on the existing literature, we expect that the health-information intervention will result in substantially larger changes in our measures of SDPs. Power of the study design will be substantially stronger for analyses that utilize the multiple longitudinal measures collected as part of this study.\textsuperscript{17}
B. Literature Cited:


