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Evaluating Health and Disease in Sub-Saharan Africa: Minimally Invasive Collection of Plasma in the Malawi Longitudinal Study of Families and Health (MLSFH)

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Abstract

Background: The collection of biomarker-based indicators of adult health and fitness is an important addition to socioeconomic surveys since these indicators provide valuable insights into the biological functions, and the complex causal pathways between socioeconomic environments and health of adult individuals. Other than select Demographic and Health Surveys (DHS), there are almost no population-based sources of biomarker-based indicators of adult health in sub-Saharan Africa (SSA), where most population-based biologic data are focused on HIV, other STDs, malaria, or nutritional status. While infectious diseases---such as HIV and malaria---attract the majority of research and NGOs attention in sub-Saharan Africa, there is an important need to understand the general determinants of adult health in SSA since the region will rapidly age in the next decades in ways that are significantly different from the aging patterns in other developing regions due to the AIDS epidemic, and chronic diseases will increasingly become relevant for understanding the health of sub-Saharan populations. Methods and Design: We document our protocol for the collection of biomarker-based health indicators as a pilot project within the Malawi Longitudinal Study of Families and Health (MLSFH), and we provide basic descriptive information about the study population and the collected biomarker-based indicators of adult health obtained from respondents in rural Malawi. LabAnywhere kits were used to obtain blood plasma from 980 adult men and women living in Balaka, the

southern-most region in rural Malawi. The procedure allows for the non-invasive collection of blood plasma, but has not been been previously used in the context of a developing country. We collected biomarkers for inflammation and immunity, lipids, organ function, and metabolic processes. We specifically collected wide-range CRP, total cholesterol, LDL, HDL, total protein, urea, albumin, blood urea nitrogen, creatinine, random blood glucose and HbA1c assays. Overall, the mean values of the biomarkers are below the lower limits of clinical guidelines for adult populations in the U.S. and other developed countries, and only small proportions of the sample are above the upper limits of the normal clinical ranges as defined by U.S. standards. The correlationional patterns of the collected biomarkers are consistent with observations from developed countries, and the comparison with other low-income populations such as the Tsimane in Bolivia or the Yakuts in Siberia show remarkably similar age-specific patterns of the biomarkers despite differences in the mode of blood sampling. Discussion: The MLSFH biomarker sample makes a potentially important contribution to understanding the health of the adult populations in low income environments. The present study confirms that the collection of such biomarkers using the LabAnywhere system is feasible in rural sub-Saharan contexts: the refusal rate was very low in the MLSFH and following the procedures described above, only a small fraction of the biomarker samples could not be analyzed by LabAnywhere. The system therefore provides an attractive alternative to the collection of dried blood spots (DBS) and