The Multiethnic Study of Atherosclerosis

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The MESA (Multi-Ethnic Study of Atherosclerosis) was established in 1999 to investigate the importance of subclinical cardiovascular disease (CVD) in predicting clinical outcomes in multiethnic populations [1]. MESA expanded on the prior work of Framingham and other National Heart, Lung, and Blood Institute cohort studies by specifically focusing on evaluation of non-white race and ethnic groups and aggressively incorporating newer imaging technologies for evaluation of subclinical CV disease. This issue of *Global Heart* highlights some key areas of work from 16 years of research by the MESA team that resulted in >1,000 peer-reviewed manuscripts based on both the National Heart, Lung, and Blood Institute contract activities and 145 independent extramurally funded ancillary studies that expanded the scope and breadth of the research.

The MESA cohort was initially recruited in 2000 to 2002 and comprised 6,814 white, African American, Hispanic/Latino, and Chinese adults ages 45 to 84 years from 6 U.S. communities: Baltimore, MD (Johns Hopkins University); Chicago, IL (Northwestern University); Forsyth County, NC (Wake Forest University); Los Angeles County, CA (University of California at Los Angeles); Northern Manhattan and Southern Bronx, NY (Columbia University); and St Paul, MN (University of Minnesota). The MESA participants were free of clinical CVD at the baseline exam and required that each field center recruited participants from ≥2 race/ethnic groups. This design better facilitated the study of factors vital for future CVD prevention efforts by evaluating variables associated with transitioning from a CVD-free state to clinical CV events. In addition, multiple measures of some of the imaging tests (e.g., coronary computed tomography) allowed for examination of both determinants of and outcomes associated with progression of the key measures of atherosclerosis. The recruitment of a diverse sample (age, race/ethnicity, sex) allowed for a better understanding of subgroup differences in CV etiology. Follow-up for cardiovascular outcomes and mortality is being conducted on an ongoing basis, now with >12 years of adjudicated outcomes.

Right from its inception, the MESA team has encouraged the cutting edge investigator-initiated independent ancillary studies from investigators both within and outside of the original MESA group to supplement the parent study. This process has resulted in 145 extramurally funded ancillary studies (the vast majority were funded through National Institutes of Health research project grants, or R01s) that have greatly expanded the scientific depth and breadth of the study. The scope of these additional studies ranged from evaluating new endpoints (e.g., pulmonary disease, renal disease, eye disease, dementia) and/or new predictor variables (e.g., air pollution/environmental factors, behavioral factors, community resources, novel imaging/image analysis, lab assays, genetic markers). For example, MESA Exam 6 (beginning September 2016) will integrate a large number of peer-reviewed extramurally funded studies assessing significant questions (i.e., early heart failure, unrecognized atrial fibrillation, early lung disease, epigenetic factors, predictors/outcomes of cognition) that seek to enhance the existing database and future scientific productivity. To ensure success, this new complicated model will incorporate substantial planning, coordination, and teamwork among the MESA contractors, ancillary grant-funded investigators, and National Institutes of Health staff.

Fully evaluating the complex MESA dataset requires the work of a multidisciplinary community of colleagues creating a unique network of translational scientific work from clinical to population studies. It should be noted that >50% of MESA publications were led by colleagues at institutions that did not receive direct MESA contract funding and >50% of publications have been linked to ancillary studies versus the "parent" MESA study. A Web of Science [2] search for articles on the topic "Multi-Ethnic Study of Atherosclerosis" yielded 940 results, 21,309 citations (excluding self-citations), 26.4 citations per article, and an h-index of 74. This special issue of *Global Heart* highlights the enormous scientific diversity and productivity of the MESA project with manuscripts describing first the origin and development of the MESA, followed by many of the key MESA research findings involving CVD risk prediction, coronary artery calcification, carotid artery thickness, diabetes, novel markers/biomarkers, air pollution and lung disease, peripheral vascular and aortic disease, as well as the effect of the neighborhoods on CVD risk.

From its inception, MESA was designed to be a population laboratory available for use by MESA as well as non-MESA colleagues. In particular, from the beginning MESA prioritized the involvement of young investigators who were given the opportunity to lead some if not most of the analyses leading to publications of ancillary as well as core data collected through the central contract. All MESA data collected, including both contract-funded data and ancillary study data (primarily from grants), have been and will continue to be made available to the scientific community. These data can be accessed through direct collaboration with MESA investigators using the MESA database [3] (particularly encouraged), the National Heart, Lung, and Blood Institute's BioLINCC [4], and the

The authors report no relationships that could be construed as a conflict of interest.
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GLOBAL HEART

VOL. 11, NO. 3, 2016
ISSN 2211-8160/$36.00.
http://dx.doi.org/10.1016/j.gheart.2016.09.001

National Center for Biotechnology Information's dbGaP database [5].

Although this special issue of *Global Heart* provides an excellent summary of a sampling of key activities of MESA and research findings to date, this collection of articles, however, is by no means a comprehensive overview of MESA's activities, but is intended to give readers a high-level view of some of MESA's important contributions to CV epidemiology and prevention. MESA investigators remain poised to integrate new scientific areas and opportunities in future examinations. Scientific discovery is a team sport and the MESA team is no exception. MESA has been exceptionally productive in large part due to the participation of research colleagues from diverse disciplines that have used the cohort infrastructure to address new cutting-edge questions. Although much has been accomplished, we as a scientific community have more work ahead as we seek to find ways to reduce the burden from chronic diseases in and beyond the United States.

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