

**BIOGRAPHICAL SKETCH**

NAME: Emelia J. Benjamin, MD, ScM, FACC, FAHA

eRA COMMONS USER NAME: Emelia

POSITION TITLE: Professor of Medicine and Epidemiology,  
Assistant Provost for Faculty Development, Boston University Medical Campus**EDUCATION/TRAINING**

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Harvard College, Cambridge, MA	AB	06/1979	Psychology/Social Relations
Case Western Reserve University, Cleveland, OH	MD	06/1983	Medicine
Boston City Hospital, Boston, MA	Resident	06/1986	Internal Medicine
Boston University Medical Center, Boston, MA	Fellow	06/1988	Cardiology
Brigham and Women's Hospital, Boston, MA	Fellow	06/1990	Echocardiography
Framingham Heart Study, Framingham, MA	Fellow	06/1990	Epidemiology Research
Harvard School of Public Health, Boston, MA	ScM	06/1990	Epidemiology

**A. Personal Statement**

I am a cardiovascular genetic epidemiologist with research expertise in atrial fibrillation, inflammation, vascular function, and echocardiography. I have been an investigator at the Framingham Heart Study (FHS) since 1998. At FHS I serve as Co-I of the core contract, Joint-Director of the Medical Endpoints Committee, and Member of the Executive and Research Committees. My research focuses on the epidemiology, risk factors, prognosis, outcomes, and genomics of atrial fibrillation and cardiovascular disease. I am pursuing translational research by collaborating with basic scientists, geneticists, statisticians, health outcomes experts, electrophysiologists, and bioinformaticians. I am Chair of the American Heart Association's (AHA) Heart Disease & Stroke Statistics annual publication.

The current project aligns with my past experiences and professional interests in several ways:

- I am the inaugural Assistant Provost for Faculty Development at Boston University Medical Campus (BUMC: Schools of Medicine, Public Health & Dentistry), and inaugural Vice Chair for Faculty Development and Diversity in the Department of Medicine. I co-designed and co-lead the BUMC early career, mid-career, women's and underrepresented-minority longitudinal faculty development programs.
- I have a fundamental commitment to faculty development and mentoring women, men, underrepresented minority and majority early, mid, and established investigators in epidemiology and academic medicine.
- I am one of the lead facilitators on the BUMC CTSI 5 session annual mentor training program spring.
- I am PI on the NHLBI's American Heart Association (AHA) -Tobacco Regulation and Addiction Center Research (A-TRAC) Training and Education Core D for 1P50 HL120163. I serve on the Tobacco Regulatory Science Evaluation (member) and Lifecourse (co-chair) working groups.
- I was PI on the American Council on Education/Sloan Foundation Faculty Flexibility Grant. BUSM was one of three medical schools in the country to receive the grant and our project focused on mid-career faculty development.
- I have successfully mentored 36 trainees and early career faculty members on research projects and dozens of faculty from around the country on their career. I received the 2011 BU Department of Medicine's Excellence in Research Mentoring Award, the 2012 AHA Women in Cardiology Mentoring Award, and the 2013 AHA Functional Genomics and Translational Biology Council Mentoring Award.

**For Dr. Kwan's application**, he conceived of and drafted the research plan for the project. I have provided critical feedback on multiple drafts of the application and training plan. We have previously coauthored four publications together, including Co-Editing an 11 article *Circulation* series "Global Burden of Cardiovascular Disease." I am serving as Co-Primary mentor. I have met individually with members of the mentoring team to ensure that we effectively coordinate our mentoring efforts. I will contribute to research design, analytical plans, critical revisions to abstracts and manuscripts, with a particular focus on cardiovascular care and disease.

**B. Positions and Honors****Professional Training/Experience - selected**

1990- Director, Vascular Laboratory, Framingham Heart Study, Framingham, MA

1996- Joint Director, Medical Endpoints Committee, Executive Committee, Framingham Study, MA

1998- Director, Framingham Heart Study Vascular Testing  
 2004-2016 Associate Editor, *Circulation*  
 2013- Editorial/Advisory Boards: *European Heart Journal*; *Nature Reviews Cardiology*  
 2014-2016 Co-Principal Investigator, Framingham Heart Study, Framingham, MA

### **Academic Appointments**

1990-97 Assistant Professor of Medicine, Boston University School of Medicine, Boston, MA  
 1998-04 Associate Professor of Medicine, Boston University School of Medicine, Boston, MA  
 2004- Professor of Medicine, Boston University School of Medicine, Boston, MA  
 2006- Professor of Epidemiology, Boston University School of Public Health, Boston, MA  
 2008- Vice Chair, Faculty Development & Diversity, Medicine Department, BUSM, Boston, MA  
 2015- Assistant Provost, Faculty Development, Boston University Medical Campus, Boston, MA

### **Certification & Honors**

1979 Phi Beta Kappa, Harvard College, Cambridge, MA  
 1988 Certificate, American Board of Internal Medicine  
 1989 Diplomate, Cardiovascular Disease  
 1992 Fellow, American College of Cardiology  
 1995 Gender Equity Award, American Medical Women's Association, B.U. School/Medicine  
 2000 Fellow American Heart Association, Epidemiology & Prevention & Clinical Card. Councils  
 2001 Wendy Kline Memorial Award for Outstanding Volunteer Leadership, Boston Division AHA  
 2002 American Heart Association (**AHA**), New England Affiliate, Great Communicator Award  
 2007-08 ELAM Fellow - Executive Leadership in Academic Medicine, Drexel University, Philadelphia, PA  
 One of 48 women from around the country selected to receive leadership training  
 2008 Association of University Cardiologists, Elected Member  
 2011 Boston University Department of Medicine Excellence in Research Mentoring Award  
 2012 AHA - National, 2012 Women in Cardiology Mentoring Award  
 2012 Association of Black Cardiologists, Inc. (ABC) 2012 Dr. Daniel D. Savage Memorial Science Award. The award is the ABC's highest honor, to recognize scientific achievement  
 2013 AHA - National, 2013 Functional Genomics and Translational Biology Mentoring Award  
 2014 Thomson Reuters List of Highly Cited Researchers; 1 of 402 researchers (top 1%) in medicine.  
 2014-15 Boston University Leadership Program, Boston, MA. One of 20 institutional leaders selected based on performance, contributions to BU, and overall leadership potential.  
 2015 Paul Dudley White Award, American Heart Association  
 2015 BUSM, Department of Medicine's Joel G. Caslowitz, MD Award for Excellence in Teaching – Hospital based.  
 2016 American Heart Association, Gold Heart Award; the highest national AHA award  
 2016 American Heart Association, Population Scientist of the Year; the highest national AHA award for population science  
 2015 Thomson Reuters List of Highly Cited Researchers; top 1% in medicine

### **Activities and Committees, Recent Selected**

2003-04 AHA National Conference, Co-Chair, Addressing Ethnic Disparities  
 2006-09 ACC/AHA, Primary Prevention of CVD Performance Measures committee  
 2007-11 NIH Study Section: Cardiovascular and Sleep Epidemiology, Chartered Member.  
 2008-09 NIH/NHLBI, Co-Chair, Workshop on the Prevention of Atrial Fibrillation  
 2008-12 AHA Interdisciplinary Council on Functional Genomics & Translational Biology, Vice- & Chair  
 2009 FDA Review AstraZeneca drug application, prevention CVD, JUPITER, Temporary member  
 2009-12 AHA Science Advisory & Coordinating Committee, Member-at-Large (2009-10); FGTB (-2012)  
 2010-12 AHA Study Section, Genomics & Translational Biology & Epidemiology Research, Chair  
 2010-15 AHA Manuscript Oversight Committee  
 2010-11 AHA Summit on Atrial Fibrillation, Chair  
 2011- NHLBI's Coronary Artery Risk Development in Young Adults (CARDIA) Study, OSMB, Member  
 2011-2012 NIH Search Committee to help identify the next Associate Director for Disease Prevention (reporting directly to the NIH Director) at the National Institutes of Health, Member  
 2012-16 AHA Research Committee, Member  
 2014-16 AHA Council Operations Committee, Member  
 2012-14 Medicare Evidence Development and Coverage Advisory Committee (MEDCAC), Member

2011- AHA Committee on Statistics, Council on Epidemiology, Arrhythmia Chapter, Founder  
 2013-15 AHA Cardiovascular Epidemiology Council, Statistics Committee, Vice Chair  
 2015-17 AHA Cardiovascular Epidemiology Council, Statistics Committee, Chair  
 2015-16 AHA Research Leaders Academy, Co-Chair

**C. Contribution to Science Briefly describe up to 5 of your most significant contributions to science.**

**Peer-reviewed Publications:** 466 Original; 1 MedEd Portal; 78 Review/Science; 10 Editorials; 8 Chapters

- **Citation indices Google Scholar, Accessed January 11, 2017**

<u>Citation indices</u>	<b>All</b>
Citations	143287
h-index	149
i10-index	456

A full list of Dr. Benjamin's publications can be found at **ORCID – [0000-0003-4076-2336](https://orcid.org/0000-0003-4076-2336)**;

Website: <http://profiles.bu.edu/Emelia.Benjamin>

<http://www.ncbi.nlm.nih.gov/sites/myncbi/emelia.benjamin.1/bibliography/45166649/public/?sort=date&direction=ascending>

**1. Atrial Fibrillation (AF) – Epidemiology and Genomics:**

I am considered one of the world's leading authorities on the epidemiology of AF. I have published over 125 peer-reviewed publications on AF's demographics, secular trends, lifetime risk, international burden, early life antecedents, risk factors, treatment patterns, risk prediction models, administrative data base outcomes, patterns/clinical course, and prognosis.

- Benjamin EJ**, Levy D, Vaziri SM, D'Agostino RB, Belanger AJ, Wolf PA. Independent risk factors for atrial fibrillation in a population-based cohort. The Framingham Heart Study. *JAMA* 1994;271:840-844. PMID 8114238  
First publication establishing the risk factors for atrial fibrillation in the community.  
[Cited by 2054](#) according to Google Scholar, accessed May 26, 2015
- Benjamin EJ**, Wolf PA, D'Agostino RB, Silbershatz H, Kannel WB, Levy D. Impact of atrial fibrillation on the risk of death: the Framingham Heart Study. *Circulation* 1998;98:946-952. PMID 9737513  
First publication establishing that atrial fibrillation in the community predicted an increased risk for all-cause mortality, adjusting for coexistent risk factors. Also the first article to note that there was a statistical interaction, such that atrial fibrillation eliminated the typical female survival advantage. Twelfth most cited article published in *Circulation*. <http://circ.ahajournals.org/reports/most-cited>  
[Cited by 3106](#) according to Google Scholar, accessed May 26, 2015
- Wang TJ, Larson MG, Levy D, Vasan RS, Leip EP, Wolf PA, D'Agostino RB, Murabito JM, Kannel WB, **Benjamin EJ**. Temporal relations of atrial fibrillation and **congestive heart failure** and their joint influence on mortality: the Framingham Heart Study. *Circulation* 2003;107:2920-2925. PMID 12771006  
One of the first articles to highlight that atrial fibrillation and heart failure frequently complicate each other's course, and regardless of the order they emerge, developing the other condition worsens prognosis. [Cited by 929](#) according to Google Scholar, accessed May 26, 2015
- Benjamin EJ**, Rice KM, ...Ellinor PT, Witteman JC. Variants in *ZFHX3* are associated with atrial fibrillation in individuals of European ancestry. *Nat Genet*. 2009;41:879-881. PMID 19597492 PMCID 2761746 [Cited by 195](#)

**2. Global Health:**

I have collaborated with scientists in middle-income countries to enhance research capacity and participated in efforts to highlight the global burden of noncommunicable diseases. I was one of 7 appointed members of the World Heart Federation's Research Working Group, I have participated in program development and workshops every two years for the World Cardiology Congress since 2011. I have collaborated with researchers on studies in China and Brazil (ongoing). I participate in the Global Burden of Disease consortium for atrial fibrillation research, and have markedly expanded the Global Burden of Disease section in the annual American Heart Association's *Heart and Stroke Statistics* publication that I currently chair. With Dr. Kwan I proposed and Guest Co-Edited the series of 11 articles on the global burden of cardiovascular disease published in *Circulation*.

- a. Lozano R, ..... **Benjamin EJ**, ..... Memish ZA. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the global burden of disease study 2010. *Lancet*. 2012;380:2095-2128. PMID 23245604.
- b. Kwan GF, **Benjamin EJ**. Global health and cardiovascular disease. *Circulation*. 2015;132:1217. PMID 26416629. Introduction to Global Health Series for *Circulation*
- c. Kwan GF, Jean-Baptiste W, Cleophas P, Leandre F, Louine M, Luma M, **Benjamin EJ**, Mukherjee JS, Bukhman G, Hirschhorn LR. Descriptive epidemiology and short-term outcomes of heart failure hospitalisation in rural Haiti. *Heart*. 2016; 102(2):140-6. PMID: 26729609; PMC4854668
- d. Wu Y, **Benjamin EJ**, MacMahon S. Prevention and Control of Cardiovascular Disease in the Rapidly Changing Economy of China. *Circulation*. 2016;133:2545-60. PMID: 27297347. PMC4910645.

### 3. Vascular Function:

We have measured vascular function with brachial flow-mediated dilation, peripheral arterial tonometry (fingertip), and carotid, femoral, radial and brachial tonometry in 2 generations of Framingham participants making it one of the largest studies of vascular function in the community.

- a. **Benjamin EJ**, Larson MG, Keyes MJ, Mitchell GF, Vasani RS, Keaney JF, Jr., Lehman BT, Fan S, Osypiuk E, Vita JA. Clinical correlates and heritability of flow-mediated dilation in the community: The Framingham Heart Study. *Circulation*. 2004;109:613-619. PMID 14769683
- b. Mitchell GF, Vita JA, Larson MG, Parise H, Keyes MJ, Warner E, Vasani RS, Levy D, **Benjamin EJ**. Cross-sectional relations of peripheral microvascular function, cardiovascular disease risk factors, and aortic stiffness: the Framingham Heart Study. *Circulation* 2005;112:3722-3728 PMID 16330686
- c. Hamburg NM, Keyes MJ, Larson MG, Vasani RS, Schnabel R, Pryde MM, Mitchell GF, Sheffy J, Vita JA, **Benjamin EJ**. Cross-Sectional Relations of Digital Vascular Function to Cardiovascular Risk Factors in the Framingham Heart Study. *Circulation* 2008;117:2467-74. PMCID: PMC2734141.
- d. Hamburg NM, Palmisano J, Larson MG, Sullivan LM, Lehman BT, Vasani RS, Levy D, Mitchell GF, Vita JA, **Benjamin EJ**. Relation of Brachial and Digital Measures of Vascular Function in the Community: The Framingham Heart Study. *Hypertension* 2011;57:390-6. PMID:21263120; PMCID: PMC3049726.

### 4. Inflammation:

We have measured about 11 systemic inflammatory biomarkers in 2 generations at the Framingham Heart Study, and serially in the Offspring, making the data set one of the most comprehensive examinations of inflammation in the community.

- a. Fontes JD, Yamamoto JF, Larson MG, Wang N, Dallmeier D, Rienstra M, Schnabel RB, Vasani RS, Keaney JF, Jr., **Benjamin EJ**. Clinical correlates of change in inflammatory biomarkers: The Framingham Heart Study. *Atherosclerosis*. 2013;228:217-223. PMID 23489346 PMCID 3650714.
- b. Vita JA, Keaney JF, Jr., Larson MG, Keyes MJ, Massaro JM, Lipinska I, Lehman BT, Fan S, Osypiuk E, Wilson PW, Vasani RS, Mitchell GF, **Benjamin EJ**. Brachial artery vasodilator function and systemic inflammation in the Framingham Offspring Study. *Circulation*. 2004;110:3604-3609. PMID 15569842 [Cited by 183](#)
- c. Pou KM, Massaro JM, Hoffmann U, Vasani RS, Maurovich-Horvat P, Larson MG, Keaney JF, Jr., Meigs JB, Lipinska I, Kathiresan S, Murabito JM, O'Donnell CJ, **Benjamin EJ**,\* Fox CS.\* Visceral and subcutaneous adipose tissue volumes are cross-sectionally related to markers of inflammation and oxidative stress: The Framingham Heart Study. *Circulation*. 2007;116:1234-1241. PMID 17709633 [Cited by 489](#) accessed 7/31/2015 Google Scholar
- d. Schnabel RB, Yin X, Larson MG, Yamamoto JF, Fontes JD, Kathiresan S, Rong J, Levy D, Keaney JF, Jr., Wang TJ, Murabito JM, Vasani RS, **Benjamin EJ**. Multiple inflammatory biomarkers in relation to cardiovascular events and mortality in the community. *Arterioscler Thromb Vasc Biol*. 2013;33:1728-1733. PMID 23640499 PMCID 3753537.

### D. Research Support

#### ONGOING:

R01 HL128914

MPIs: **Benjamin, EJ** / Ellinor, PT

Period: 08/01/15-05/31/19

#### **AFGen Consortium: Atrial Fibrillation Genomics to Functional Analyses**

Specific Aims: The purpose of this study is to elucidate the genomics (molecular biology concerned with the structure, function, evolution, and mapping of genomes) of atrial fibrillation to functional analyses.

**Role:** Multi-PI, contact PI

### **Identification of Common Genetic Variants for Atrial Fibrillation and PR interval**

2 R01 HL092577-05      MPIs: Ellinor PT/**Benjamin EJ**/Lunetta KM      Period: 04/15/09–03/31/18

**Specific Aims:** Our renewal grant will sequence the 9 **previously reported** genome-wide significant loci for AF in 1000 cases and controls. We will use a combination of cellular electrophysiology, mouse and zebrafish to identify functional variants for AF.

**Role:** Multi-PI with Drs. Patrick T. Ellinor of MGH and Kathryn M. Lunetta of FHS/BU

### **NIH AHA-Tobacco Regulation and Addiction Center Research: Training and Education Core (Core D)**

P50 HL120163      MPIs: Rose Marie Robertson RM, Aruni Bhatnagar      Period: 9/19/13-9/18/18

**Specific Aims:** 1. Coordinate all educational activities; 2. Select mentors for early career scientists; 3. Follow the progress of mentoring activities; 4. Assist in developing educational material for all center initiatives.

**Role:** Sub-Project ID: 8150, Subcontract PI, Core D, Education and Training Core, PI

### **Mechanistic Relationships between Ethanol and Human Atrial Fibrillation**

R01 AA022222      PI: Gregory Marcus      Period: 04/15/14-03/31/19

**Specific Aims:** The study's purpose is to elucidate the mechanistic relationship between ethanol and AF.

**Role:** Subcontract-PI

### **Jackson Heart Study Renewal - Field Center**

HHSN26820130047C      PI: Adolfo Correa      Period: 08/16/13-04/30/17

**Specific Aims:** Co-mentor early career scientists in analysis, writing, & critical revision of abstracts & papers.

**Role:** Subcontract- PI

### **Genomics of Cardiac Electrical Activity and Arrhythmias**

R01 HL116747      MPI: Nona Sotoodehnia, Dan Arking      Period: 07/01/13-06/30/18

**Specific Aims:** Analyze FHS participants exome data in relation to ECG traits

**Role:** Subcontract-PI

### **Adiposity, Inflammation and Neurocognitive Decline in African Americans**

R01 AG045255      PI: Beverly Gwen Windham      Period: 06/15/14-03/31/17

**Specific Aims:** Examine adiposity, cognitive function, and inflammation and develop a clinical risk score.

**Role:** Subcontract-PI

### **The Framingham Heart Study Physical Examination, Testing and Surveillance**

HHSN268201500001I      PI: Vasana S. Ramachandran      Period: 10/01/01-03/31/20

**Specific Aims:** Provide resources for examination of Original, Offspring, and Third Generation cohorts.

**Role:** Co-PI

### **COMPLETED GRANT SUPPORT WITH EJ Benjamin as PI:**

#### **Faculty Development**

**Multilevel Mentoring: Boston University SOM Accelerator Plan**      Period: 11/1/12-10/31/15

Agency: American Council on Education, Alfred P. Sloan Faculty Career Flexibility Award

#### **Atrial Fibrillation Grants with EJ Benjamin as MPI:**

**R01 HL102214**      Patterns of Health Care Use, Treatment & Outcomes in Atrial Fibrillation: PATH-AF  
MPI: Lesley H Curtis; **Benjamin EJ**, Susan R Heckbert;      Period: 05/01/10–04/30/13

**RC1 HL101056**      Risk prediction of AF: clinical, biological and genetic markers;  
MPI **Benjamin EJ**, Alvaro Alonso, MD, PhD;      Period: 09/30/09–07/31/12

#### **Inflammation Grants with EJ Benjamin PI:**

**R01 HL64753, R01 HL076784, R01 AG028321 ended prior to 07/31/2012**

#### **Vascular Grants with EJ Benjamin, PI:**

**R01 HL60040 and R01 HL70100 ended prior to 07/31/2012**

### **The Framingham Heart Study Physical Examination, Testing and Surveillance**

Type: N01-HC 25195; HHSN268201500001I PI: Ramachandran S. Vasana, MD      Period: 10/01/01-03/31/18

**Specific Aims:** Provide resources for examination of Original, Offspring, and Third Generation cohorts.

**Role:** Co-PI through 2016, Co-I 2017-