



THE FRAMINGHAM HEARTBEAT

The Framingham Heart Study is a project of the National Heart, Lung, & Blood Institute & Boston University.

Spring 2018

FHS Salutes the 5209 Participants in the Original Cohort on the 70th Anniversary of the Study

The dedication of the FHS participants to the study is famous.

The success of the Study and the important scientific results depend on three basic things: the vision and scientific rigor of the Research Investigators, the meticulous work of the Research Staff, and most of all, on the extraordinary generosity of the Research Participants.

What is the secret of the high rates of FHS participation for so many years? We need to look back at the standard set by the members of the Original Cohort. Two thirds of all the households in Framingham with residents between the ages of 29-59 were randomly selected to be included in the new study in 1948. And most of the eligible individuals who were invited to join the study said YES. Many attended examinations for over 60 years!

(continued on page 5)

WE NEED YOU!

Gen 3, Omni 2, and NOS, the research starts with you and ends with you!

Have you been to FHS for your third Exam? If not, please call for an appointment as soon as possible. Your participation is crucial to the study. You, and only you, can provide your unique data. FHS follows each participant over time; the data from each individual show us how personal differences and similarities affect lives. Significant improvements in healthcare worldwide are based on FHS research. We are in the last months of Exam 3. Please do not let it come to an end without you.

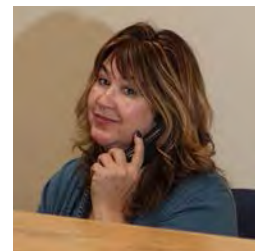
Let's continue what began 70 years ago!

Call Maureen Valentino: (800) 536-4143 or maureenv@bu.edu

Or Paulina Drummond: (888) 689-1682 or pautras@bu.edu

FHS Omni Participants, we need you.

Only you can provide your crucial information to continue the study. Nobody else can replace you!



Donna Chandler

Omni 2, if you haven't come to Exam 3, please call to make your appointment. This is the last year. Let's not lose this opportunity. Omni 1, we have the green light to see you again starting in 2019. We'd also like to update your medical information. If you haven't heard from us, please call Paulina at (508) 935-3485

Te necesitamos! Solo tu puedes proveer información crucial para que podamos continuar con el estudio.

Happy News About the Organization and Future of The Framingham Heart Study!

As you may know, the FHS was started by the US Public Health Service in 1948, and was soon turned over to the brand new National Heart, Lung, and Blood Institute. Since 1973, Boston University School of Medicine (BUSM) has been contracted to update design and to conduct the Framingham Heart Study. The FHS leaders are Vasam Ramachandran, MD, the BUSM Principal Investigator, and

Daniel Levy, MD, the NHLBI Director, and their co-investigators. They are both cardiologists and both started at FHS as research fellows years ago. FHS does not stand alone; it is part of both BUSM, led by Dean Karen Antman, and by the FHS Epidemiology section of NHLBI, led by the project officer, Brian Kit, MD. Recently, Dr. Kit sent an announcement that NHLBI plans to fund a new FHS exam-

ination. This step is the beginning of a formal NHLBI process that will lead to a new examination of FHS Offspring and Omni Group 1 and opportunities for important new research.

It is also important for FHS to acknowledge the tremendous contribution of Dr. Paul Sorlie, long time NHLBI FHS project officer, who retired in October 2017. His astute guidance to the FHS leadership over decades helped keep FHS on the most solid scientific foundation of epidemiology for which it is respected throughout the world. Along with the dedicated FHS participants, staff, and scientists, we hope to honor Paul's achievements and to wish him success and happiness in retirement.



Left to Right: Vasam Ramachandran, Daniel Levy, Dean Karen Antman, Brian Kit, Paul Sorlie

EXAM 3 UPDATE

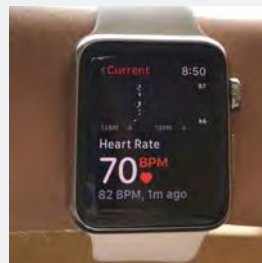


Joanne Murabito, MD,
Director of the FHS
Research Center
Examination.



Calling All iPhone and Android Users!

In June 2016 we began our electronic study (eFHS) to measure participants' heart rate, blood pressure, and activity level as they go about their daily lives. The eFHS app includes short surveys to update us on your recent medical history from wherever you can connect to Wi-Fi. We have enrolled over 1,100 Third Generation and Omni 2 participants. In a period of 14 days alone we have received 450,221 heart rate readings! We want to thank all of you who have participated and invite even more of you to join us. For iPhone users, the eFHS app pairs with a wireless blood pressure cuff and an Apple Watch. We now have a new version of the eFHS app that is compatible with Android phones.



All Third Generation and Omni 2 participants with an Android phone or an iPhone 5 or later (not including iPhone 5c) are eligible. For all iPhone users who were unable to get their Apple Watch or Blood Pressure Cuff at the time of their visit, we will be contacting you very soon to get those out! Please contact **Kelsey Fusco** at (508) 935-3415 or kmfusco@bu.edu with any questions about eFHS, with any technical difficulties, or if you would like to join the study.

Have You Been Spending More Time Sitting?

Changes in your physical activity patterns (including the amount of time you spend sitting) can happen so slowly that you may not even notice a difference. These changes might increase your risk for disease, or could be an indicator of an underlying issue with mobility, pain, lung and cardiovascular function, or even brain health. Third Generation, New Offspring Spouse, and Omni 2 participants can **help us tackle these important research questions by wearing the "Actical" monitor after their next FHS Exam**. The monitor is as small as a wristwatch and is worn on a belt. As you move, it records your activity. After 8 days, you mail it back to the FHS in a pre-paid envelope. We will also use this device to understand whether the smartphone apps and Apple watch do a good job of tracking physical activity in a study like eFHS. (If the week following your clinic exam is not the best time for you to wear the monitor, simply ask for it to be sent to you at a date that is more convenient.)

Fibroscan

Liver fat is now the most common cause of chronic liver disease, surpassing viruses such as hepatitis B or C and alcohol related liver disease. Liver fat also increases your risk for developing diabetes and heart disease. At the FHS, we are utilizing a new technology called Fibroscan to measure both liver fat and the stiffness of the liver. Increased liver fat can cause liver scarring in some individuals which will increase the liver stiffness and could lead to health problems. So far, we have completed over 2000 assessments as part of the FHS Exam 3. Thank you to all who have participated! We will continue to offer the Fibroscan to all FHS participants at the Exam 3 visit. Our future research plans will be to understand why some people develop liver fat and high liver stiffness and what this means for future cardiovascular health.



How Does Body Fat Affect Your Bone Health?

Pictured in front of the state of the art bone microarchitecture scanner is your Osteoporosis Study Team. Please see the Bone Density article on page 8.

(L): **Danette (Dani) Carroll, CBDT**, Field study Coordinator and Backup Technologist

(R): **Abby Foley, CBDT**, Primary Bone Density Technologist



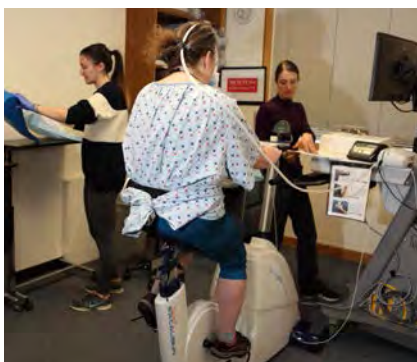
The Mighty Microbiome: It's Never Too Late! If You Still Have a Kit, Send It In Today

In October 2016, the Framingham Heart Study began research to learn more about the microbiome--that powerful community of bacteria that live on us and in us (e.g., on our skin and in our mouth or gut). Our lifestyles affect the microbiome, including where we live, what we eat, and what medicines we take. In turn, these bacteria can affect our metabolism, our immune system, and even our behavior.

Scientists have found that people with certain diseases have different kinds of bacteria in their gut compared to healthy people. Microbiome changes measured in stool samples have been related to cardiovascular disease, diabetes, obesity, and cancer. This FHS project is a unique opportunity to understand the complex relationships between our microbiome, our diet, environmental factors, and the development of cardiovascular disease.

We hope you will agree to contribute to the power of this microbiome study. You will be adding valuable new information to all that you have generously contributed to the Framingham Heart Study over the years. Please contact **Jared Zucker** at (508) 663-4052 or jmz@bu.edu with any questions about the Microbiome Study. If you need another kit, call Jared. He will be happy to send you a new one!

FHS Cardiopulmonary Fitness Update



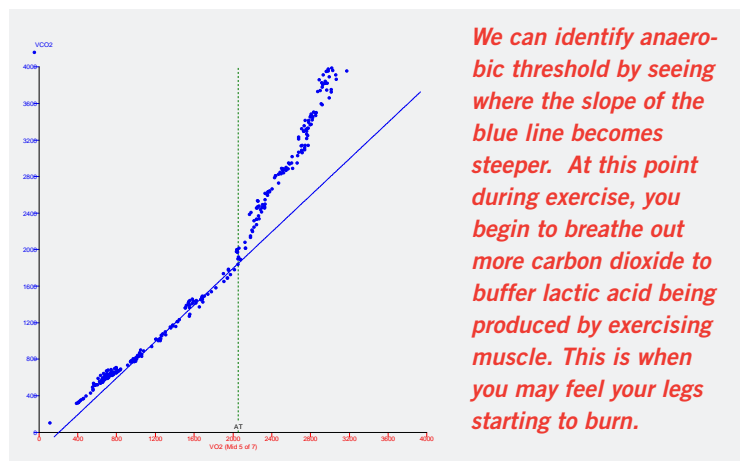
Thus far, the Cardiopulmonary Fitness Evaluation (CPFE) station has conducted over 2,000 exercise evaluations. Thanks to the commitment of the Framingham Heart Study participants, we have maintained a high level of enrollment in our station. Our specialized equipment allows us to look at how your body responds to exercise and allows us to collect over 200 variables per participant to use for data analysis.

The breath-by-breath data we can collect on each participant allows us to determine different fitness markers, including anaerobic threshold. The anaerobic threshold is the point where the cells in your muscles switch from aerobic metabolism (using oxygen to release energy) to anaerobic metabolism (using carbohydrates without oxygen); this is when the exercise starts to feel much harder. Anaerobic metabolism can't be maintained for long periods of time, so a higher anaerobic threshold permits an



Research Center Exam Team

individual to exercise more rigorously. Increasing the amount of exercise you do each week can potentially help you increase your anaerobic threshold. In the graph below you can see where the vertical dotted line marks this individual's anaerobic threshold.



Aortic Stiffness Emerges as Powerful New Risk Factor for Heart Disease

Stiffness of the main artery (aorta) that comes out of your heart and supplies blood to your body has emerged as a powerful new predictor of risk for high blood pressure. In the past, stiffening of the aorta was thought to be a consequence of longstanding high blood pressure. Blood pressure elevation was thought to accelerate wear and tear on the aorta, leading to breakdown of elastic fibers and stiffening of the wall of the aorta. However, data from the Framingham Heart Study has shown that stiffening of the aorta actually precedes and contributes to the development of high blood pressure, which is the leading risk factor for premature death worldwide. We also have shown that greater aortic stiffness is associated with markedly higher risk for conditions like heart attack, poor pumping of the heart, brain attack (stroke), and dementia. We assess aortic stiffness noninvasively in the vascular station by recording pulse tracings in the neck and groin area by using a fingertip pulse transducer or tonometer. Thanks to the dedication of FHS participants, our studies of aortic stiffness have provided major new insights into factors that contribute to high blood pressure, heart disease, and dementia.

GEN 3/OMNI 2 EXAM 3 CONTENT

The research staff work as a team to ensure the participants move through the exam efficiently. The time in the Research Center is 4.5 hours. Staff offer snacks and the option to complete the exam in two visits. You may ask any questions about the exam and may decline any part. For special accommodations to meet your needs, phone Maureen Valentino at (508) 935-3417, or speak to any staff member during your visit.

Pre-examination

- Telephone contact to set the day/time of your exam
- Appointment confirmation letter is sent to you along with instructions and a food frequency questionnaire

Examination Components

- Informed consent and contact information update
- Urine sample
- Phlebotomy (a blood draw for present and future measurements)
- Height, weight, waist, hip, ECG and hand grip strength
- Medical history update and blood pressure measurement (by MD or NP)
- Arterial tonometry – measures blood vessel (artery) stiffness
- Cardiopulmonary fitness test
- Bone density testing - high resolution imaging
- Fibroscan – a quick ultrasound of the liver
- Cognitive tests
- Self-administered questionnaires

Take Home Components

- eFHS (data collection by smart phone, wireless blood pressure monitor, Apple Watch)
- Physical activity monitor (Actical)
- Microbiome (stool sample collection)

After Examination Components

- Traumatic brain injury questionnaire
- Functional MRI and PET scan of the brain
- Brain bank registration

The Ongoing FHS Brain Donation Program

Although we have learned much about diseases affecting the brain, we still have many remaining questions. The best way to learn about these diseases is to study the brain itself. Our brain donation program is enabling research aimed at earlier and more accurate diagnosis of neurological illnesses, providing hope to future generations. It can provide families with a definitive diagnosis if their loved one had suffered from a neurological illness. **To register to be part of this research, please contact Linda Farese at (508) 935-3488.**

Remember:

Framingham Heart Study evaluations are designed for research. They do not replace your regular check-ups with your own doctor(s)!

FHS Salutes the Original Cohort on the 70th Anniversary of the Study

(continued from page 1)

The members of the Original Cohort stayed with FHS even if they moved out of town. They encouraged their children, grandchildren and neighbors to join as new generational and Omni cohorts were added to FHS. In addition, they responded to surveys and went to imaging sites. Some participants served on FHS committees, such as the ethics advisory board. They told their FHS stories in documentary films and newspaper articles. Their pride in being a member of the Original Cohort of the Framingham Heart Study shone through when they traveled and were complimented along the way on their contributions to medical research. The surviving members of this amazing Original Cohort are at least 99 years old. Our debt to them and to all of the FHS participants is boundless.

The most important lesson we have learned at FHS is that every FHS participant is unique and makes a contribution that no one else in the world can make. Each FHS participant is IRREPLACEABLE.

The information from your examinations is different from that of anyone else. When we analyze the data of over 15,000 FHS participants, we can get a good picture of how health and disease occur in populations. We hope all FHS participants will honor the gift of 70 years of the Original Cohort members by continuing your own FHS participation.

Here's what Original Cohort members say about the FHS:

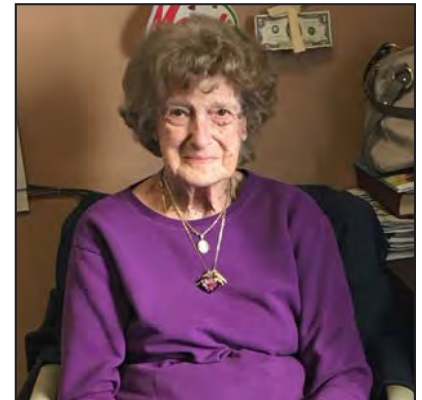
"I participated because it was a popular thing to do at the time. It was in the news and everyone heard positive things about it."

"It's been a very good experience over the years and I am glad to be a part of it."

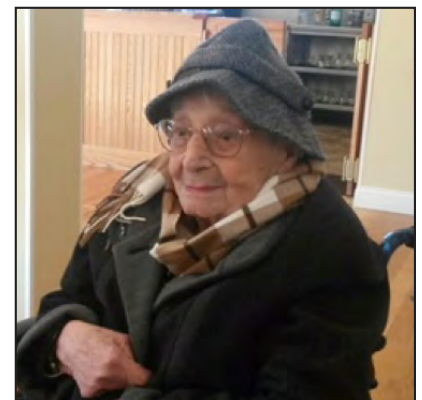
"My father always talked about how proud he was to be part of the Heart Study. He said he looked forward to the exams and it was a good organization to be part of. 'They always took good care of you,' he said."

"My mother said it was a great thing to do; she, her husband, and her parents were always happy to go in for the exams. She likes how the study has branched out into other areas, like the brain, and also in its understanding of what is hereditary and what is not. She and all of her relatives were very proud to be a part of the Heart Study. Any time it was mentioned in the news, they would talk about their role in it."

"My mother said that after WWII they learned of the study from doctors, friends, and the newspaper. They thought it would be good for my father, as he had a family history of heart disease. She was amazed how many people knew about the Heart Study, even in Europe. She said it has been an honor to be part of the world-renowned Framingham Heart Study."



Mary Alves – 99 years old
Original Cohort



Gina Galvani – 110 years old
Original Cohort



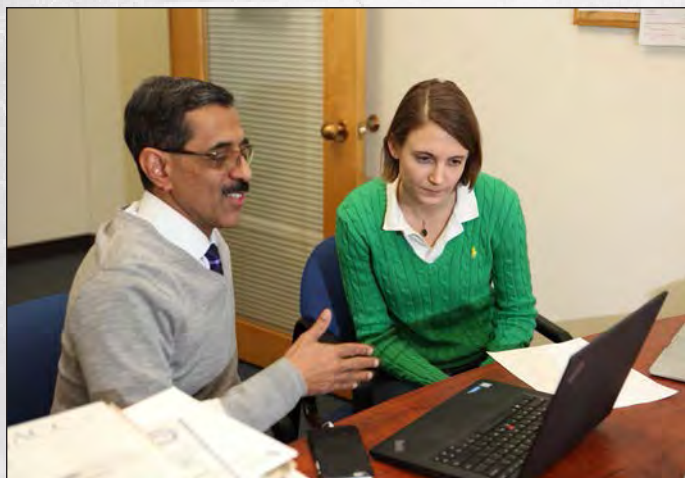
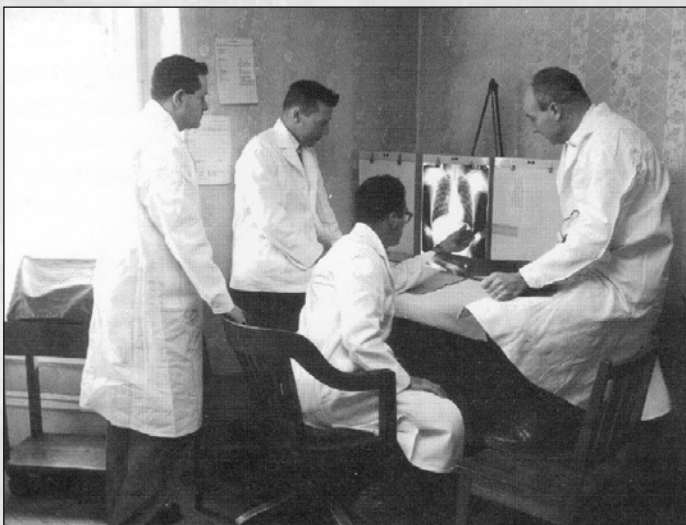
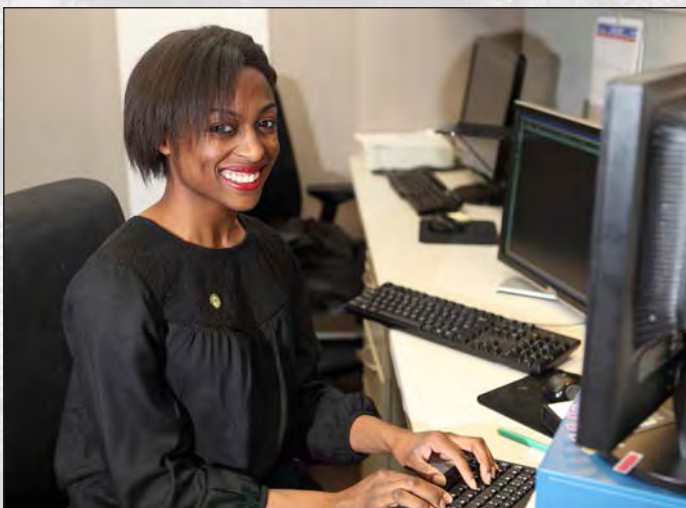
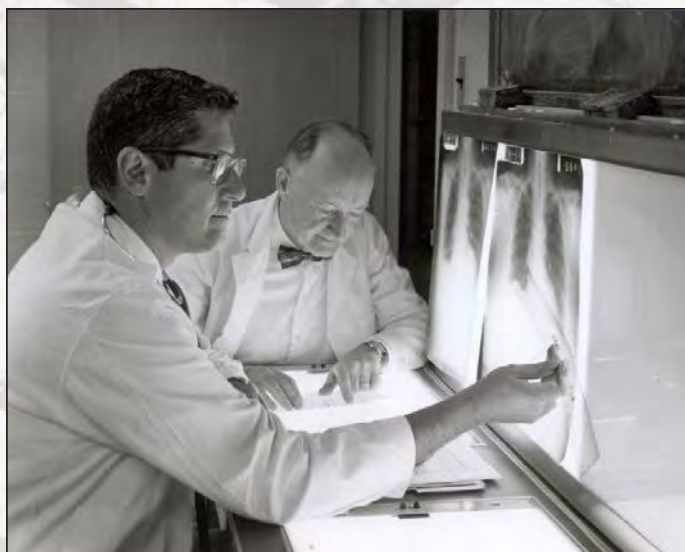
**A message from
Mayor Yvonne M. Spicer**

"I appreciate how the Framingham Heart Study has transformed lives through its tireless effort to benefit public health since 1948. This organization has been pivotal in maintaining healthy communities. Congratulations on your 70th anniversary!"

**A message from
Congresswoman Katherine Clark**

"I'd like to congratulate the Framingham Heart Study on 70 years of being a fantastic example of the value of investing in scientific research and cures for diseases. And to its 15,447 participants over the decades: Thank you for your unmatched generosity. It's because of all of you that we've seen a decrease in heart disease-related deaths since the study began. You're true lifesavers, and I look forward to the contributions you'll make for years to come."





FROM THE PAST TO THE PRESENT

Pages From The FHS Photo Album

Bone Study

Through the use of our high-resolution bone scanning device, the Bone Study has made many new discoveries about how health conditions affect bone health and how the better imaging tests help to assess risk. We have made the following new observations:

- Diabetes causes more holes to develop in the outer compartment of bone called the “cortical bone.”
- Visceral adipose tissue, or the fat in the abdomen, has an effect on the same part of the skeleton as diabetes, causing more holes to develop in the cortical bone.
- By combining our Framingham data with other cohorts from the U.S. and other countries such as Canada, Sweden, Switzerland, and France, we have determined that the new higher resolution bone scanner measurements predict fracture independently of the more traditional ways that clinicians assess fracture risk. Perhaps someday this technology will be used in general medical practice and not just in research.
- We have discovered genetic markers for osteoporosis using our HR-pQCT (high-resolution peripheral quantitative computed tomography) scanner that we would not otherwise have found with less advanced equipment.
- Losing weight over a period of six years and over 30 years results in worse measures of bone microarchitecture with slightly more impact on leg bones than wrist bones.

Have You Had a Recent Stroke? Please Let Us Know

Stroke is an emergency, and symptoms can include facial weakness, sudden difficulty speaking, weakness on one side of the body, or sudden vision loss.

Anyone with symptoms of stroke should call 911 and get immediate help.

If you had a stroke or received medical care for stroke symptoms, FHS would like to know as soon as you or a family member can contact us.

Reach us at the FHS Stroke Hotline at (617) 630-3627.

If you live out of state or are unable to be seen in person, we may also schedule an evaluation over the internet by video teleconference. **This is a research evaluation only and is not meant to provide any medical care or advice.** We greatly appreciate your efforts to help us monitor and research this disabling disease.

Platelet Study Breaks New Ground

In the current FHS exam one of the largest and deepest studies of platelets in human populations is taking place. A small amount of blood drawn during the exam is used the same day in the FHS lab by our platelet lab assistant (see photo below). Platelets are a critical cell type in both hemostasis (translation “wound healing and bleeding”) and thrombosis (translation “heart attack and stroke”).

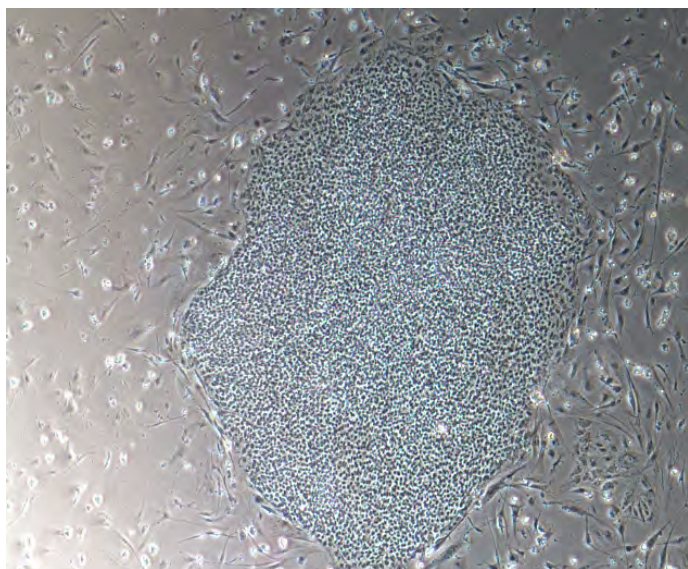
NHLBI and Framingham researcher Dr. Andrew Johnson and his lab are collecting many data points on platelets with different technologies in hopes of understanding their genetic components and whether epidemiological factors like family history of bleeding, diet and supplements, drug prescriptions, activity, and cardiovascular risk factors influence platelet reactivity. Early results from the study were presented at the International Platelets 2016 conference and the major International Society for Thrombosis & Hemostasis Meeting in 2017 in Berlin, Germany. These results include the strong association that women have higher platelet reactivity than men after accounting for other factors. This may have implications for treatment and future clinical trials design. Platelet researchers worldwide are excited to see what comes from such a large and detailed population study in their field and we are excited to have you be a part of it.



Amber Lachapelle, Lab Assistant

Patient-Derived Stem Cells That Are Made From Blood Samples of FHS Participants

In the past 10 years, the discovery that stem cells can be created in a dish from patients has revolutionized biology. These special cells, called “induced pluripotent stem cells”, or “iPSCs”, can be made from patient blood samples and have all the capabilities of embryonic stem cells without the need to destroy a human embryo. These special cells allow scientists to study diseases “in a dish”, to test for new potential disease treatments, and may one day result in a source of transplantable cells, addressing the shortage of organs available for patients in need. At their most recent examinations, blood samples from Gen 2, Gen 3, Omni 1, and Omni 2 cohorts have been collected and saved to create a bank of cells that can be made into iPSCs. Scientists at the Center for Regenerative Medicine (CRoM) of Boston University and Boston Medical Center have created iPSCs from some of these samples and are using them to understand the genes that make some people more sensitive than others to lung damage from cigarette smoke exposure. Thanks to the generosity of FHS participants, these cells are now available to researchers around the world, representing an incredible resource that will advance understanding of many diseases in coming years.



Induced pluripotent stem cells growing

Sugar and Artificially Sweetened Beverages and the Risks of Incident Stroke and Dementia

(This article is presented in the formal way that scientific results are shared in the community of researchers. You may find the details and conclusions of interest.)

Background and Purpose—Sugar and artificially-sweetened beverage intake have been linked to cardiometabolic risk factors, which increase the risk of cerebrovascular disease and dementia. We examined whether sugar or artificially sweetened beverage consumption was associated with the prospective risks of incident stroke or dementia in the community-based Framingham Heart Study Offspring cohort.

Methods—We studied 2888 participants aged >45 years for incident stroke (mean age 62 [SD, 9] years; 45% men) and 1484 participants aged >60 years for incident dementia (mean age 69 [SD, 6] years; 46% men). Beverage intake was quantified using a food-frequency questionnaire at cohort examinations 5 (1991–1995), 6 (1995–1998), and 7 (1998–2001). We quantified recent consumption at examination 7 and cumulative consumption by averaging across examinations. Surveillance for incident events commenced at examination 7 and continued for 10 years. We observed 97 cases of incident stroke (82 ischemic) and 81 cases of incident dementia (63 consistent with Alzheimer’s disease).

Results—After adjustments for age, sex, education (for analysis of dementia), caloric intake, diet quality, physical activity, and smoking, higher recent and higher cumulative intake of artificially sweetened soft drinks were associated with an increased risk of ischemic stroke, all-cause dementia, and Alzheimer’s disease dementia. When comparing daily cumulative intake to 0 per week (reference), the hazard ratios were 2.96 (95% confidence interval, 1.26–6.97) for ischemic stroke and 2.89 (95% confidence interval, 1.18–7.07) for Alzheimer’s disease. Sugar-sweetened beverages were not associated with stroke or dementia.

Conclusions—Artificially sweetened soft drink consumption was associated with a higher risk of stroke and dementia.

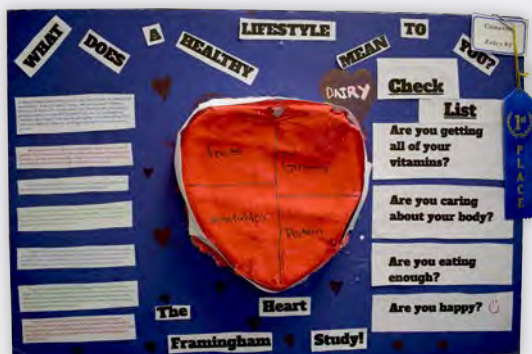
FHS Study of Traumatic Brain Injury (TBI)

We are extending research at FHS to better understand how history of traumatic brain injury (TBI) may impact cognitive function, brain structure and risk for dementia. Participants are being asked questions of past activities and incidents that are linked to higher risk of TBI (e.g., military service, sports participation, motor vehicle accidents, and concussions). Please help us by responding to the TBI survey when contacted.

McAuliffe 1st place



Cameron 1st place



Fuller 1st place



POSTER CONTEST

The Framingham Heart Study started the celebration of its 70th year with a poster contest for middle school students in Framingham. The theme of this contest was "What Does a Healthy Lifestyle Mean to You?" Prizes were awarded to the first and second place winners at each of the four middle schools. Schools that have students participating in this contest also received a donation. This contest was sponsored by the Friends of the Framingham Heart Study. Posters will be displayed at the Framingham Heart Study.

Fuller 2nd place



Walsh 1st place



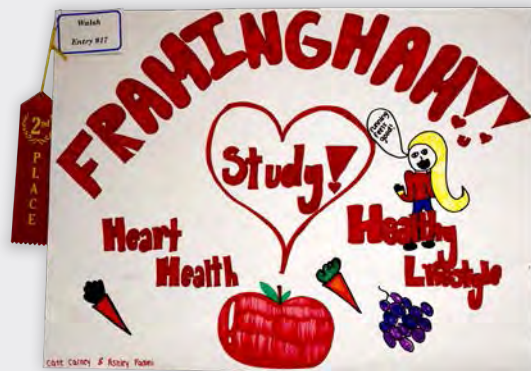
Cameron 2nd place



McAuliffe 2nd place



Walsh 2nd place



Instructions for Applying to the 2018 Scholarship Essay Contest

Last year, the Friends of the Framingham Heart Study awarded scholarships to two high school seniors planning to attend college. Friends President John Galvani and the board members announced two scholarships for 2018 based on an essay contest: a \$1,000 scholarship and a \$500 scholarship.

Eligibility: Open to children, stepchildren, and grandchildren of FHS participants. Applicants must be graduating from high school this year and planning to attend college in the fall 2018.



Left to right: Erica Pellegrino (Runner-up), Emily Fordham (Runner-up), Peter Allen, Treasurer Friends of the Framingham Heart Study, Emily Magoon (Winner), Dr. Daniel Levy, Director, Framingham Heart Study

To apply, only two items are needed: **an email** with the applicant's name, address, telephone number, and college and career plans (roughly a two-sentence description); and a **1,000-word essay** titled *How has the Framingham Heart Study research scope expanded over its 70 years?* This topic is to commemorate the Framingham Heart Study's 70th Anniversary. Applicants are welcome to tell a story, conduct an interview, or pursue any angle of interest. Please fact-check and proofread before submitting. Email the essay as an attachment to Emily Manders (emanders@bu.edu) by **Wednesday, April 18, 2018**. We will confirm receipt of all essays within one business day. If you don't receive a confirmation, please call (508) 935-3443.

The Friends will review the essays and notify recipients by May 15, 2018. Recipients will be invited to accept their awards at the FHS research center.



A Message From the Friends of the Framingham Heart Study

Greetings, fellow participants. We are participant volunteers from the Offspring, Third Generation, and Omni cohorts who meet periodically throughout the year as the Board of Trustees for the Friends of the Framingham Heart Study. With funds donated to the Friends, we provide support for items and activities at FHS, such as occasional travel grants to FHS investigators attending scientific conferences, audio-visual equipment for long-distance conferencing with collaborators, annual scholarships to high school graduates going to college, and the ECG cards sent to participants after exam visits. With your help, we'll be able to do more to support FHS in its ground-breaking research for improving public health related to heart disease, diabetes, cancer, sleep disorders, aging, and Alzheimer's disease.

To make a donation:

please mail a check made out to:
"Friends of the FHS." Address it to:

Lynda Norton
ATTN: Friends of the FHS
73 Mt. Wayte Ave., Suite 2
Framingham, MA 01702

The Friends of the FHS is a 501(c) (3) nonprofit organization supported solely by donations. We invite you to contribute a personal donation or one in the memory of, or in honor of, a family member or friend. No donation is too small or too large and all are tax deductible.

Trustees of Boston University
National Heart, Lung, and Blood Institute
Framingham Heart Study

73 Mt. Wayte Avenue
Framingham, MA 01702

RETURN SERVICE REQUESTED

www.framinghamheartstudy.org

**Gen 3, Omni 2 & NOS –
Please Come in for
Exam 3 Before It Ends!**

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Annual Medical History Updates

One of the most important ways you can contribute to the Study is by providing us with your recent medical history information. Why is that important? Because in medical research, knowing whether and when a disease developed brings us closer to learning, for example, the link between high blood pressure and stroke. Without your examinations and medical history updates, our estimate of this relationship and countless others is unclear. Your regular visits and medical history updates help make our understanding of disease accurate and focused. Even if you feel well or your health has not changed in several years, these updates help us document your health status.

Our goal is to update your medical information once a year. We will be sending you an email with instructions to complete the Medical History Update form online. You will also have the option of completing a paper form. Please call Caroline Flessa at (508) 935-3437 if you would like to complete the form on the phone, or if you have any questions. We greatly appreciate your efforts to keep your records current.

CONTACT US

Receptionist

(508) 872-6562 or (800) 854-7582

Brain Donation, Brain MRI, Cognitive Testing, Stroke Coordinator Linda Farese

(508) 935-3488, (800) 248-0409
or lfarese@bu.edu

Original, Second Generation (Offspring), Third Generation, New Offspring Spouse Coordinator Maureen Valentino

(508) 935-3417, (800) 536-4143
or maureenv@bu.edu

Omni Coordinator Paulina Drummond

(508) 935-3485, (888) 689-1682
or pautras@bu.edu