



OUR 24th YEAR!

It's been almost a year since we last updated you and it has been quite a busy year for us! In our 24th year, as we look back, we would like to thank all of the participants for their ongoing commitment to the Iowa Fluoride Study. We have been able to accomplish so much and we realize we owe our great achievements to you! With the New Year quickly approaching, we would like to share some study updates and new personnel with you. Thank you for enabling us to close the year with some great news!

The Numbers Say It All!

To date, we have accomplished:

- 698** Five-year dental exams
- 630** Eight-year dental exams
- 552** Thirteen-year dental exams
- 408** Seventeen-year dental exams
- 39,259** Completed and returned questionnaires
- 3,192** Activity monitor studies
- 975** Parent bone exams
- 471** Five-year bone exams
- 539** Eight-year bone exams
- 483** Eleven-year bone exams
- 489** Thirteen-year bone exams
- 419** Fifteen-year bone exams
- 366** Seventeen-year bone exams
- 322** Nineteen-year bone exams
- 571** Twenty-one-year questionnaires completed and returned
- 7** Twenty-three-year exams completed

RECENT PRESS RELEASE



Dr. Steven Levy and colleagues at the University of Iowa's Colleges of Dentistry, Public Health, Liberal Arts and Sciences, Engineering, and Medicine have received a two-year NIDCR award for the Iowa Fluoride Study.

Dr. Steven Levy, Department of Preventive and Community Dentistry, and colleagues at the University of Iowa's Colleges of Dentistry, Public Health, Liberal Arts and Sciences, Engineering, and Medicine have received a two-year award of \$2,318,154 from the National Institute of Dental and Craniofacial Research (NIDCR) for their study, "Fluoride, Dietary and Other Factors Related to Young Adult Bone Measures and Dental Caries."

Other research team members include Drs. John Warren (Preventive & Community Dentistry), Karin Weber-Gasparoni (Pediatric Dentistry), Teresa Marshall (Preventive & Community Dentistry), and Justine Kolker (Operative Dentistry), all from the College of Dentistry; Drs. Joseph Cavanaugh (Biostatistics), and James Torner, Linda Snetselaar and Trudy Burns, all Epidemiology from the College of Public Health; Dr. Kathy Janz (Health and Human Physiology) from the College of Liberal Arts and Sciences; and Dr. Punam Saha (Electrical-Computer Engineering) from the College of Engineering.

The NIDCR-funded Iowa Fluoride Study began in 1991. A cohort of nearly 1,900 women with newborns were recruited to study longitudinally the complex exposures and intakes of fluoride from water, many food, other beverages, and dental cavity prevention products, as well as relationships with dental caries (cavities) and other oral health conditions. Dietary and other factors were also assessed. Dental examinations were conducted at ages 5, 9, 13, and 17 to assess dental caries prevalence and incidence, as well as risk factors.

As an extension of the Iowa Fluoride Study, the Iowa Bone Development Study was funded by NIDCR in 1998 to better understand normal childhood bone development and relationships with fluoride and other dietary intakes and physical activity, anthropometric, and genetic factors. Bone assessments were conducted with NIH and other grant support at ages 5, 8-9, 11, 13, 15, 17 and 19.

The new NIH funding will support conducting a new wave of Dental exam and Bone exams at age 23 that include dual energy x-ray absorptiometry (DXA) of the hip, lumbar spine, and whole body, peripheral quantitative computed tomography (pQCT) of the radius and tibia, and multi-detector computed tomography (MDCT) of the tibia.

WEBSITE

Check out our website to find background information about the study, a list of publications and news articles related to this study. All of this would not be possible without your participation over the last 24 years!

Meet the Staff



Karie Mobley

The College of Dentistry and Department of Preventive and Community Dentistry welcome Karie Mobley. Karie is a Research Associate and is the Coordinator for the Iowa Fluoride Study/Iowa Bone Development Study.

Karie graduated from the University of Iowa with a bachelor's degree in Psychology and was trained in Clinical Laboratory Sciences. She was previously a Coordinator for the BRIDGE Study at the Iowa City Veterans' Affairs Medical Center, and had been in emergency medicine as a Paramedic before becoming a Certified Clinical Research Coordinator (CCRC). Karie was born in Wheaton, IL, grew up in Iowa City, and now resides outside Cedar Rapids with her husband, Rod. In her free time, Karie enjoys good food, big band swing music, and fostering abandoned animals.



Daisy Patino

The College of Dentistry and Department of Preventive and Community Dentistry welcome Daisy Patino. Daisy is a part-time Research Assistant with the Iowa Fluoride and Iowa Bone Development Study. Daisy is a graduate student and a dental hygienist at the College of Dentistry. She graduated from Southern Illinois University with a bachelor of science degree in dental hygiene. Daisy was born in Chicago, IL, grew up in Cicero, IL, and now lives in Iowa City. In her free time, Daisy enjoys listening to music and spending time with close friends.



Alexandra Curtis

The College of Dentistry and Department of Preventive and Community Dentistry welcome Alexandra Curtis. Alexandra is the new Iowa Fluoride Study statistician.

Alexandra is a graduate student in the Department of Biostatistics at the University of Iowa. She graduated from the University at Buffalo with a BA in Biology and Mathematics. Alexandra was born and raised in Buffalo, NY, and moved to Iowa City this past fall to begin graduate school. In her free time, Alexandra enjoys bike rides and catching up with friends.



Shayna Hogue

The College of Dentistry and Department of Preventive and Community Dentistry welcome Shayna Hogue. Shayna is the Iowa Bone Development Study CT Technologist.

She is a graduate of the University of Iowa with a Bachelor's Degree in Radiation Science, as well as certified in Computed Tomography and Mammography. After graduation she started working full time at the University of Iowa Hospitals and Clinics in the General X-ray department where she stayed for two years before transferring to the CT department. She worked in the clinical/inpatient CT department for two and a half years prior to joining the APPIL lab. Shayna grew up on a farm near Stronghurst, IL, and now resides in Iowa City with her husband, Matt. In her free time, she enjoys cooking, crafts, the outdoors, and spending time with family & friends.

STUDY RESULTS VALUABLE IN NATIONAL EFFORTS

Optimization of lifestyle factors, such as physical activity and diet, can enhance peak bone mass and strength, which are key for reducing risk of osteoporosis and fragility fractures later in life. Better understanding these relationships, as well as how lifestyle interacts with genetics, has been an ongoing main goal of the Iowa Bone Development Study. This December, The National Osteoporosis Foundation (NOF) issued a scientific statement to provide evidence-based guidance and a national implementation strategy for the purpose of helping individuals achieve optimal peak bone mass early in life. Dr. Kathleen Janz, our physical activity investigator, served on the NOF scientific statement committee and wrote the major section on physical activity and bone development. She presented much of this evidence at a special National Institutes of Health: Peak Bone Mass Development Workshop held on November 17. Dr. Steven Levy also participated and contributed critical information and insights on the roles of fluoride in bone health and public health. These contributions to this important science and policy were possible only due to your continued contributions to our study. We are grateful. If you would like an electronic or paper copy of the NOF statement on lifestyle and peak bone mass, please contact us and we will be happy to send it to you.

ACTIVE VOICE: IT'S A POWER THING:

MUSCLE FUNCTION, MUSCLE SIZE AND BONE STRENGTH

By Kathleen F. Janz, Ed.D., FACSM, and Shelby L. Francis, MA

Kathleen F. Janz, Ed.D., FACSM, is a physical activity epidemiologist in the Department of Health and Human Physiology at the University of Iowa in Iowa City, Iowa. Her research addresses everyday physical activity and musculoskeletal and metabolic health outcomes during the developmental years.

Shelby L. Francis, MA, is completing her Ph.D. with Dr. Janz at the University of Iowa, with a focus on accelerometry-determined measures of mechanical loading for bone health. Ms. Francis is a member of ACSM.

Their research article appears in the October 2015 issue of *Medicine & Science in Sports & Exercise*® (MSSE).



Kathleen F. Janz,
Ed.D., FACSM



Shelby L. Francis,
MA

Physical activity is an effective strategy for promoting a healthy, strong skeleton in children and adolescents. During physical activity, mechanical forces are exerted on the bones through impact (ground reaction) forces and by the contractile activity of muscles. These physical forces result in a preservation or gain of bone mass and alter bone structure. Though both impact and muscle forces are important to bone strength, the greatest physiologic loads placed on bones are from muscle forces due to muscle's disadvantageous attachment on bony levers. Measures of muscle size, e.g., lean mass and muscle cross-sectional area (MCSA), are thought to be the best predictors of bone strength and may serve as proxies for muscle forces, since the force generated by muscle is proportional to size. However, size is not a perfect surrogate for function since it does not fully reflect contractile and neuromuscular integrity properties. On the other hand, jumping activities elegantly integrate these properties with function and size. This observation suggested to us that measures of muscle power during jumping might be effective non-invasive predictors of lower body bone strength.

Consistent with our public health training, we were particularly keen on exploring the use of the peak vertical jump to measure muscle function. The measure is easy to standardize and inexpensive to administer. We were certainly not the first to link vertical jump to bone strength. Other investigators have used jump height rather than using jump height adjusted for body weight to calculate peak power as the exposure variable. This is a key distinction since power is a specific type of muscle function that includes the main mechanical loading features needed for bone adaptation, i.e., high magnitude, quick application and (when done during sport) variable-loading. In our recently published MSSE article, we reported strong and consistent associations among muscle power, MCSA and bone strength of the tibia in 303 adolescents ages 16 to 18 years. As suggested, muscle power was measured using a vertical jump while MCSA and bone strength were measured using peripheral quantitative computed tomography (pQCT) that provided high-resolution, three-dimensional imaging of the lower leg tissues. The magnitude of the association between muscle power and bone strength was nearly identical to the magnitude of the association between MCSA and bone strength. This was surprising since MCSA is a precise and accurate clinical measure while vertical jump is a field test. We also found that the MCSA mediated, but did not fully explain, the association between muscle power and bone strength. That is, indirect pathways (MCSA mediated) and direct pathways (independent of MCSA) existed. These results indicated that muscle function was not synonymous with muscle size. Standardized β values indicated that the direct effect of muscle power was greater in males than females for most bone strength outcomes; whereas mediation models accounted for a higher percentage of the variance in strength outcomes in females than in males. This observation suggests that, as a group, adolescent males use their lower limb muscles more than adolescent females.

Since it is possible to train for muscle size without increasing muscle power, or to increase muscle size without even exercising (e.g., steroid use), knowing that function and size are not synonymous is significant. We think that muscle power should be viewed as an important health-related physical fitness trait (in addition to a sport performance attribute) and would like to see more health-related research on jumping. Perhaps someday the vertical jump test will take its place alongside the PACER and other health-related assessments in school-based fitness testing. In short, a simple test (vertical jump) can be used to measure muscle power. Furthermore, jump performance is just as strongly associated with bone strength as muscle size when quantified by clinical pQCT scans.

ELECTRONIC QUESTIONNAIRES

The new electronic questionnaires you have received and completed by email are an exciting new way of staying in touch with the IFS. Email is fast, convenient, and we can be reached in seconds. Thanks for all of your participation!

Update: We continue to be successful with all aspects of the studies because of your great participation! Our participants now range in age from 20 $\frac{3}{4}$ – 23 $\frac{3}{4}$ years old. We are collecting our age 21 questionnaire data, while simultaneously starting our 23-year bone and dental exams.



Address Service Requested

happy holidays

and all the best for the New Year!

Thank you for your continued participation in our studies.

We are excited to have received grant funding to
continue working with you over the next few years!

As always, we will keep you informed.