

Creating a Foundation for Health

By Lisa Rhuman

Estella Weigand took time from her typical whirlwind morning to talk about how and why she changed her eating patterns and added exercise to her life. Her husband, Ben, was traveling and she had just dropped off her kids, five-year-old Andrew and three-year-old Gabriella, before driving to her school where she is a bilingual coach. She coaches new teachers in managing dual language classrooms and has a caseload of English language learners. Over 20 languages are spoken by the students in her care.



The Weigand Family

After three years of trying to become pregnant, Estella and Ben decided it was time to seek fertility help at the OHSU Fertility Clinic. However, Estella discovered she was pregnant three weeks before their appointment. Because of her weight, she was referred to Dr. Nicole Marshall, an OHSU obstetrician and scientist who cares for mothers with high risk pregnancies. Dr. Marshall was non-judgmental while she suggested that Estella improve her nutrition and increase her activity for the best pregnancy outcome. She explained the risks of obesity during pregnancy – low and high birthweight, diabetes, stillbirth and more.

Dr. Marshall referred Estella to Christie Naze, a dietician who recommended a complete overhaul of her food and exercise routine. Estella and Ben had both been athletes in high school and college but after graduation, they no longer had a coach pushing them to run laps and to stay in shape. Their move from sunny California to the northwest meant they did less outdoors than before. Christie told them that exercise was free medicine, a comment Estella took to heart as she began swimming and walking daily.

Estella learned about portion sizes, how to make better choices at restaurants and that you do not have

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Director's Message

When I ask colleagues across different medical specialties what causes chronic diseases like heart disease and diabetes, they give one of three answers. The first is that heart disease is caused by bad genes. The second is that good bodies go “south” due to bad behavior and wear and tear. The third is that chronic disease is a natural outcome of getting older. It is obvious that each of these theories contains a nugget of truth. However, none of the three satisfy me.

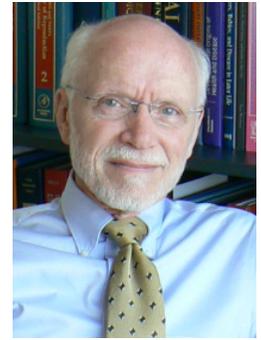
Why? New discoveries in medical science have revealed a new layer of understanding of disease origins. Disease history even in families may not be a sign of a defective gene but may be related to ongoing stresses that modify how genes are regulated. These modifications to DNA arise in early life. The way a person grows before birth is a marker of their risks for disease later in life.

This issue of *The Heart Beat* will discuss several aspects of the early life origins of disease.

I am thankful for the Weigand family and their willingness to tell their story. Estella's story contains several lessons. One is the importance of physicians, like Dr. Marshall, who talk to their patients and help them understand the importance of a healthy lifestyle. Another lesson is the courage of Estella who is determined to improve her health. The third lesson is the importance of family support in making lifestyle changes. Changes are almost impossible to make alone. The fourth lesson is the importance of a having a healthy pregnancy.

Dr. Leslie Myatt, an expert on pregnancy, reminds us that complications of pregnancy carry risk for the mother and baby alike. Don't be surprised if you see

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Kent Thornburg, Ph.D.



Director's Message *(continued from page 1)*

new specialty clinics designed to follow mothers and babies who had pregnancy complications.

Dr. Janne Boone-Heinonen is a public health expert and an expert on the early life origins of disease. She is a member of an elite club of people who are experts in both. She explains how these two once diverse subjects now fit hand in glove. The exciting part of her message is that disease prevention is the driving force for new public health strategies.

Liana Haywood tells how the Center for Developmental Health is partnering with the Moore Institute to combine biological research with new

opportunities to improve the health of people in Oregon and beyond.

One area of medical science that is blossoming is the study of sex differences in disease risk. I did not have room to explain it in detail. The gist is that understanding sex differences in causes and treatments for heart disease is improving the success rate of treatment for all people. Who would have guessed that men and women are so different even before birth?

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Creating a Foundation for Lifelong Health

to eat the entire portion or take leftovers home. She also learned she could indulge with a bite or two of chocolate cake, then walk away, and recommends that you enjoy quality food rather than quantity.

Ben was supportive; he exercised with her and changed his diet as well. While she changed her routine because she worried about Andy growing inside her, she laughed as she said that Ben had changed for his own safety – if he ate a food that she was avoiding, it was hard for her to resist.

They had never consumed full sugar sodas but had indulged in other high calorie, low nutrition foods and while her job had her walking throughout the day, she had not realized how much junk food comes into a school – cheap, quick, junk food.

She used a sugar meter daily to ensure she was not acquiring gestational diabetes and kept her blood glucose levels within an acceptable range. She

knows that being an American of Mexican descent puts her at higher risk for obesity and diabetes. Her parents are both diabetic although they are active.

While the goal was not to lose weight but rather to improve her nutrition and health, Estella lost over 25 pounds during her pregnancy and marvels that she was never hungry. Both Andy and Gabby

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were born at healthy weights between eight and nine pounds and are active, smart and healthy.

She and Ben credit Dr. Marshall for their children's good health and they encourage Andy and Gabby to be active and to make healthy food choices. Estella's advice to others who want to improve their health – be kind to yourself, but be serious. If you have insurance,

seek out a dietician. If you can afford it, go to a gym. Visit your doctor for regular physicals, too, so you will know what is going on with your body before a problem develops.

She notes that breastfeeding was the one thing that defeated her. She went back to work seven weeks after giving birth and was only able to breastfeed for about three months. She is a firm believer that women should take as much maternity leave as they are able to in order to firmly establish breastfeeding.

According to Estella, she was not on a diet but rather she was engaging a new lifestyle. She and Ben are still fighting the weight battle. Estella turns 40 this year and Ben is

42. They have lost friends who were in their forties to heart disease and don't want to leave their kids without parents because of a poor food choice.

Estella and Ben are still inspired by Christie's comment that they are not only improving their own health but they are laying the foundation for their children's lifelong nutrition and health as well. ❖

Dr. Marshall comments, "It was an absolute pleasure caring for Estella and Ben as they began their family. While I routinely talk to patients about the importance of nutrition and exercise, I have never had a patient who embraced the opportunity to change her lifestyle for the improvement of her health and that of her children in the way that Estella did. Through her commitment to regular exercise and healthy eating, she created the optimal environment for her children to develop and, in the process, lost a significant amount of weight, although that was never our goal. This was even more challenging during her second pregnancy when she had a toddler at home in addition to her work and home responsibilities, but she and Ben again made the commitment to make time for exercise and, once again, the entire family benefited from this dedication."

Development of Disease in the Mother after a Complicated Pregnancy

By Leslie Myatt, Ph.D.

Pregnancy is usually a joyous event with the outcome being a healthy, happy baby and mother. While most pregnancies are perfectly normal, some are complicated by medical conditions such as preeclampsia (high blood pressure), gestational diabetes, or preterm birth. Investigating these pregnancies has led to the realization that the women who suffer complications are at risk during their pregnancy and beyond. There can be lifelong consequences for her health. For example, we are now aware that women who suffer preeclampsia during their pregnancy are at two-fold increased risk of developing cardiovascular diseases in later life. Indeed, women with early onset or more severe preeclampsia are at even greater risk (eight to ten-fold) of developing cardiovascular disease. Similarly women who suffer gestational diabetes in pregnancy are at increased risk of developing type 2 (insulin resistant) diabetes in later life. This can appear in just a few years following pregnancy in some women.

How does the complicated pregnancy lead to risk for the mother? Pregnancy is a “stress test” for maternal cardiovascular and metabolic systems. There are tremendous adaptations of the maternal cardiovascular system to pregnancy of a similar magnitude to those seen in highly trained athletes. The difference is that the pregnant woman achieves this adaptation in nine months while it takes the athlete several years of intense training! Some women are detrimentally affected by the “stress test” and develop preeclampsia or gestational diabetes. Some may have a pre-existing cardiovascular or metabolic condition that is exposed by pregnancy.

It is also possible that the disease exhibited in pregnancy damages their cardiovascular or metabolic system so they go on to display the disease later. Either way, pregnancy is the “test” that identifies women at risk. Until now there has been little advice provided to these women who have pregnancy complications relative to future pregnancies or to their own health in later life. It is apparent that they should be provided with regular screening for development of cardiovascular or metabolic disease and perhaps even given preventive treatment over the years after their pregnancy.

Thankfully medical professional organizations are establishing guidelines for care and some institutions are establishing follow up clinics to provide screening. These conditions may affect up to 20 percent of the four-million pregnancies ending in birth in the USA each year and can lead to increased



maternal problems or even death. For example, worldwide preeclampsia is responsible for one maternal death every seven minutes (75,000 total per annum). In addition, these conditions of pregnancy are associated with problems in the newborn, including growth restriction or prematurity with all its attendant complications.

We in the Knight Cardiovascular Institute and the Center for Women's Health are aware that an adverse intrauterine environment results in fetal programming, where the offspring may develop disease in adult life. Despite many years of research effort and improvement in clinical care, the incidence of such complicated pregnancies has not decreased. We in the Center for Developmental Health are working around the clock to discover ways to alleviate the disease burden of people who were born to mothers who had complications during their pregnancies. ❖

David J.P. Barker Memorial Lecture

April 4, 2019, 5:30 p.m., OHSU 8B60 Auditorium

The Knight Cardiovascular Institute is pleased to announce that Janet Catov, Ph.D., M.S., will present the 2019 Barker Lectureship.

Dr. Catov is associate professor in the Department of Obstetrics, Gynecology & Reproductive Sciences and the Department of Epidemiology at the University of Pittsburgh. Her research focuses on how pregnancy predicts later heart disease.

Heart Creative Agency

Mollie Dickson and Jennifer Bryman had a strong desire to change the way Americans eat in order to shift toward a more positive health trajectory for future generations. They didn't want to do that through guilt, scare tactics, dieting restrictions, or other methods that have been tried and tried again. Instead, they wanted to take a different approach—one they believed could captivate public attention and inspire sustainable lifestyle change. Their solution was the creative marketing industry.

Together they have built a strong, purpose-driven agency that exclusively partners with natural food/beverage and wellness brands to elevate their digital marketing content and presence on social platforms. By equipping brands they believe in with the strategy and tools needed to rise to the top in today's competitive market, they are helping to crush corporate junk food market and inspire people to eat well, cook more and live better.

In five years, they have grown from just two founders to a talented team of fifteen and support over 75 natural brands—from local startups to B Corps to billion dollar companies.

Their work helps people around the country of all income levels and backgrounds discover the indulgence, pleasure, and community that comes with selecting, preparing, and eating whole foods. They believe that sustained change is far more likely to happen when people enjoy what they are doing so their goal is to draw people in with delicious appetite appeal, which is then followed by the great perk of the way it makes them feel based on immediate and long term health effects. ❖

Butternut Pear Soup with Cashew Cream

Recipe courtesy of Heart Creative Agency

4 to 6 servings

Ingredients:

- 3 tablespoons olive oil, divided
- 2 medium carrots, diced
- 1 large leek, halved lengthwise and thinly sliced
- 1 large pear (Bosc or d'Anjou), cored and diced
- 3 garlic cloves, chopped
- 1" piece fresh ginger, peeled and finely chopped
- 2 packages Woodstock All-Natural Frozen Butternut Squash
- 8 cups vegetable broth
- 1 cup raw cashews, soaked in water for at least 4 hours
- ½ cup sage leaves

Directions:

In a large pot, warm 2 tablespoons oil over medium heat.

Sauté carrots and leeks until soft, about 6-8 minutes. Stir in pear, garlic, and ginger, and cook 2 minutes more. Add squash and broth, bring to a simmer, and cook until all vegetables are completely soft, about 15 minutes.

While soup cooks, drain cashews and transfer to a blender. Add ¾ cup water and blend until creamy. Add salt to taste.

In a small skillet, warm remaining 1 tablespoon oil over medium heat. Add sage leaves and fry briefly until they turn a darker green color, about 30 seconds. Set aside.

When vegetables are tender, use an immersion blender or standard blender to puree. If using a standard blender, puree in small batches and remove the center cap to release steam - do not fill more than 1/3 full as hot liquids expand in the blender. Add salt to taste.

To serve, ladle soup into bowls and drizzle with cashew cream. Top with a few sage leaves and sprinkling of paprika, if desired. ❖



The Developmental Origins of Public Health

By **Janne Boone-Heinonen, Ph.D., M.P.H.**

Public health scientists care about preventing disease, especially among people who are in poverty. Preventing disease is more effective and is less costly than treating disease. Poor communities often lack the support systems needed to encourage healthy lifestyles. The field of public health is developing ties with the research field that is studying how disease arises from early life experiences. These experiences include poor nutrition and social stress; both are known to lead to disease in later life.

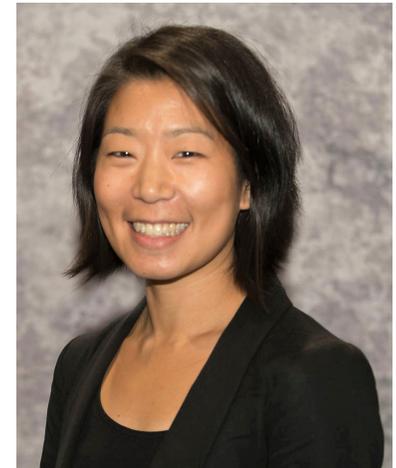
What is the role of early life stress in public health?

First, the public health community has long understood the importance of maternal and child health and a healthy childhood, but it has not understood that these stages in life are the primary drivers of chronic disease throughout life. That is changing. Current public health and medical science research have identified early development as the most important time in life when chronic diseases like diabetes, heart disease and obesity can be prevented.

Chronic disease prevention strategies based on early development require taking the long view. We now know that vulnerability to disease begins not only before birth, but also prior to conception. We have learned that diseases can result from conditions when the mother was a child, when the grandmother was a child and even when the great-grandmother was pregnant. Prevention, then, must take into account historical exposures to stressors that have implications for future generations.

Second, we have come to learn that social circumstances before birth and in early life impact the way our bodies respond to stressors later in life, including poor nutrition and social stress. That is, some individuals, due to processes that occurred before they were born, are less resilient to everyday stress than are others.

Third, the emerging science of developmental origins of disease provides critical insights about how health disparities are passed from one generation to the next. That is, our most socially vulnerable communities are at the highest risk of harm from poor nutrition and social stress, are most sensitive to their effects and are the most likely to pass them to future generations.



Janne Boone-Heinonen, Ph.D., M.P.H., Associate Professor of Epidemiology

What is the role of public health in preventing disease arising from development?

Correcting the biological processes that give rise to health disparities is a daunting task. It requires changes to the food system, to workplaces and schools, to the ways that mothers and fathers are supported and to the ways we deliver clinical and social services. Public health offers tools that are needed to achieve these changes. In order to affect change, public health must work with communities, scientists, health care systems, and clinical providers.

The Center for Developmental Health and the Moore Institute for Nutrition & Wellness are taking the first critical steps toward building these partnerships and improving population health. The Moore Institute is pleased to be working with the new OHSU-PSU School of Public Health. This partnership offers new hope that real changes in the health status of Oregonians are possible. ❖

Early development is the most important time in life when chronic diseases like diabetes, heart disease and obesity can be prevented.

The Heart Beat

Please contact us by email at heart@ohsu.edu or by phone at 503-494-2382 if you would prefer to receive this newsletter by email or if you would like to receive information about lectures and events at the CDH. ❖

Working with the Moore Institute to Prevent Chronic Disease **by Liana Haywood, M.P.H.**

Throughout the 1990s, David Barker, M.D., Ph.D., FRS (1938-2013) put forth evidence showing the impact of nutrition before birth on later heart disease risk. His studies in England revealed that low birthweight babies had an increased risk of acquiring heart disease as adults, suggesting that chronic disease risk was programmed before birth. This became known as the Barker Hypothesis.

In the late 1980s, Barker met Kent Thornburg, Ph.D., then studying how the heart develops before birth. Thornburg entered into a collaboration with Barker, still skeptical of his hypothesis, but understanding that if there was a biological mechanism for programming heart disease risk in the womb, their research could demonstrate how it worked. The two formed a close partnership, with Barker splitting his work between the University of Southampton in England and OHSU. Their work together contributed to the new field of Developmental Origins of Health and Disease, or DOHaD.

The research at OHSU attracted scientists who wanted to be part of this emerging paradigm shift in understanding how chronic disease risk is formed. Much of the work took place through the OHSU Heart Research Center, which Thornburg had started many years ago. After a transformative gift in 2012 from Phil and Penny Knight establishing the Knight Cardiovascular Institute (KCVI), the Heart Research Center was absorbed into KCVI and expanded to become the Center for Developmental Health (CDH).

Comprised of more than 60 scientists, the CDH conducts research into how risk for chronic diseases like obesity, diabetes and heart disease are established, and how they can be prevented. CDH research teams are studying everything from how the placenta affects fetal development to the effects

of under- and over-nutrition on critical development processes.

In 2012, Bob and Charlee Moore, founders of Bob's Red Mill, met with OHSU leaders to talk about nutrition research. One of those discussions was with Susan Bagby, M.D., a founding member of the OHSU Heart Research Center and longtime collaborator of Thornburg and Barker. The conversation resulted in a pledge from the Moores to create the Bob and Charlee Moore Institute for Nutrition & Wellness. The Moores, having a lifelong passion about the effects of nutrition on long-term health, had never heard about the research showing the important role of nutrition before birth in establishing chronic disease risk.

The mission of the Moore Institute is to translate the science of DOHaD into means of improving population health. Much of that is accomplished through health education, curriculum development, community engagement, and program and policy development. For the past six years, the Moore Institute has worked in step with the CDH, with Thornburg serving as director of both groups.

Thornburg felt strongly that once scientists understood the true impact of nutrition before birth and in early life in establishing risk for many chronic diseases, they had a moral obligation to share that information to improve public health. The goal of scientific progress should be to share it with the public.

Going forward, the Moore Institute will continue to find ways of translating and sharing the science developed through the CDH and elsewhere, illuminating the critical development period during pregnancy and early life and the role nutrition plays during this development in establishing chronic disease risk. ❖



Charlee and Bob Moore, Founding donors of the OHSU Bob and Charlee Moore Institute

We are saddened to announce that Charlee Moore, Bob's Red Mill co-founder and benefactor of the Moore Institute, died in October at age 90. Charlee lived a full life raising a family and, with her husband Bob, building a business dedicated to their belief in the power of whole grains to improve health. Charlee's passion for healthy eating inspired not only her family, but also people across the globe through Bob's Red Mill products and later through her and Bob's philanthropic generosity aimed at making future generations healthier. ❖

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Online donations can be made at www.ohsu.edu/heart.

The Effect of Gender on the Development of Heart Disease *continued from page 8*

Another surprise that was discovered from the Finnish data is the difference between men and women who have high blood pressure. For both men and women, being born small and putting on weight as an adult is a double risk for high blood pressure. However, the size of the placenta also predicts high blood pressure in women but only if their mother was below average in height.

Sex related differences begin in the womb. Boys grow faster than girls before birth. To do so they use a dangerous strategy; they grow rapidly with as little development of placental tissue as possible. The placenta is the organ that transports all of the required nutrients from the mother to the fetus over the entire period of gestation. Without the placenta, no baby can survive. However, the placenta is costly to maintain, requiring sugars, fats and amino acids from the mother's blood for its own fuel, taking even more than is passed to the baby. Boys invest less in making a placenta than do girls. They also stimulate their mothers to eat more calories. Thus, boys must



accomplish their growth faster than girls with less placenta to support their appetites. They do this by revving up the transport of nutrients. This puts them in a dangerous position when nutrient levels in the mother are depleted. This is one reason why boys die more easily before birth if the mother has complications.

For example, during the '60s famine in China, the birth ratio of boys to girls was decreased because fewer baby boys survived as fetuses.

This story connects with heart disease. Boys who grow poorly in the womb are more likely to have high blood pressure and to suffer sub-optimal kidney development.

As scientists and physicians work together to discover the reasons that some people are vulnerable for acquiring heart disease, their sleuthing has brought home the point that men and women travel different roads on the pathway toward disease. Our task now is to design therapeutic strategies that are sex specific so that we can prevent both girls and boys from being saddled with the pain of diseases of the heart and blood vessels later in their lives. ❖



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The Effect of Gender on the Development of Heart Disease

by Kent Thornburg, Ph.D.

Our understanding of heart disease has changed dramatically over the past few decades. It was once common for people to believe that men were more often stricken with heart disease than were women. People knew that men had a typical form of chest and arm pain suffered during a heart attack which became the mantra for public awareness for when to seek immediate help. However, further research found that women often have different symptoms that can be confused with stomach pain or extreme discomfort. In addition, women more often have disease in the tiny coronary arteries in the heart, rather than the large ones which is more common in men.

Our late colleague, Professor David Barker, along with scientists at OHSU and in Finland, found many ways in which early life growth and development set the stage for heart disease differently for men than for women. While both men and women are more likely to die of heart disease if they were born at the low end of the birthweight scale, men are more likely to be afflicted with diseases that affect the large blood vessels in the heart (coronary arteries), especially if they were born to mothers who were shorter than average and if they had a small placenta. On the other hand, women's risk for disease is more related to her size and body proportions at the time she was born, regardless of mother's height.



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