Testimony of

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"Innovation in Food is Health"

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Introduction

Chairman Markey, Ranking Member Marshall, and distinguished members of the Committee, it is my pleasure to appear before you today to discuss the innovations that are transforming healthcare and addressing the costs of poor nutrition. Across the country, 1000s of entrepreneurs are working on the agriculture, food and health innovations that will reduce the health-related costs of poor nutrition, improving longevity, and increasing the United States' competitive advantage. Their work is central to the country's effort to improve nutrition for every aspect of our society. Achieving this promise will require innovation, policy, and regulatory coordination to accelerate the opportunity.

My name is Carter Williams. I am managing director and CEO of the iSelect Fund. I have spent my entire career developing and implementing technology. An engineer by training, I did my graduate work at MIT concentrating on innovation, R&D and system dynamics. My first job was on the shop floor working on F/A-18s at McDonnell Douglas in St. Louis. I spent 15 years at Boeing in aerospace and defense in Phantom Works, where we worked on very complex engineering efforts designed to protect the nation 10-20 years into the future. While at Boeing, I managed the technology strategy for more than $2.5B in annual R&D investment. In 2004, I entered the realm of startups, successfully developing one of the first internet of things (IoT) frameworks for building energy management, reducing energy usage by 20% with software. That company was ultimately bought by Johnson Controls. With deep practical experience driving innovation in companies large and small, I decided to dedicate my efforts to accelerating innovation across the economy. Since 2014, I have led a venture fund that has met with more than 5,000 entrepreneurs and backed more than 70 AgTech and HealthTech startups. Meeting that many entrepreneurs of all different forms has taught me a lot about what is possible.

My practical expertise is to look out 20+ years and marshal the forces of innovation to solve tough problems. Problems too hard to solve with one answer, but solvable when you leverage the innovation of 100s of startups focused against a common objective.

Innovation

Innovation is the creation of new businesses and systems to satisfy customer needs. Innovation does not invent; it adapts technology to build better and less expensive products. Great innovation makes our lives simpler and better in ways we did not know possible the moment before.

In a sense we have seen this happen already in computers. In 1980, I tried to persuade my father to buy an IBM PC, arguing it could help balance his checkbook. He demurred. He ultimately became an active power user of computers, for work. He died of a sudden heart attack in 1998. Now, I can buy a $99 device linked to my mobile phone to take my own EKG. I can order my own labs at Quest, for cholesterol, but also for inflammation markers. My watch reports my resting heart rate and hours of sleep. I have a record of my time series heart rate for every bike ride since 2009. I have a low-cost automatic defibrillator in my home. Each product is better and cheaper than the alternative.

We need to do many things to eliminate the healthcare cost of poor nutrition. Some policy, some regulatory, and some innovation. Near term we need to intervene with medically tailored meals[1]. Long term we need to improve nutrition.

[1] Medically Tailored Meals Could Save U.S. Nearly $13.6B Per Year
https://nutrition.tufts.edu/news/medically-tailored-meals-could-save-us-nearly-136b-year

I am told you cannot eliminate the healthcare cost of poor nutrition because you can't change people's behavior. As if behavior does not change. We changed our behavior with mobile phones. We went from healthy diets to poor diets. We stopped smoking. We drink less alcohol.

The simplest way to change people's behavior is to build a better product. 60% of people today make their decisions based on price. If entrepreneurs develop food that is tasty, nutritious, and affordable, behavior will change. Easy to say, hard to do. We live in a large, complex commodity system.

Food and Health are a system[2], driven by market forces. It needs to serve everyone. Many things will change, but frankly many things have changed before. The world has driven large changes. Looking at the efforts of 1000s of startups we see a new food system emerging that we call "System C". Built on the foundation of the existing food systems:

> **System A – Tasty and Nutritious:** Our original food system. The garden of Eden so to speak. Tasty and nutritious. It works when there are two humans, but it does not scale to 8.5B. Built on 4.5B years of evolution. System A is still available to the wealthiest in society, and selectively in some cultures.
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> **System B – Scalable and Cheap:** 19M people died of famine in World War 2[3]. We sought to scale calories globally. We started the green revolution, monoculture, UNICEFs, the World Food Program, and launched global scale. It delivered calories, removed famine as a tool of war, and extended life, but increased diabetes. 3B people remain under nourished.
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> **System C – Tasty, Nutritious, and Affordable**: The system we now seek takes the best of A and B to create a new system built on modern nutrition science, that is tasty and nutritious, but affordable and scalable. In one part fresh, but also low-cost forms that deliver quality nutrition without causing additional health problems.

It took 4.5B years to build system A, then 60 years to scale System B. We are now 10 years into building System C.

Background

In the US we spend about $1.7T on food, and $1.9T on the healthcare cost of poor nutrition. The number is $14T globally. Type 2 diabetes kills 283 Americans every day[4]. A recent Goldman Sachs study[5] found that US GDP would be 1% higher per year if we cured obesity.

Despite 350K years of human evolution, and all our innovations in healthcare, the healthcare cost of poor nutrition continues to weaken our economy, burden our communities, and shorten lives.

At the end of World War II, the US decided to end global starvation, leading to the green revolution[6]. Farms went from producing 20 bushels of corn per acre to more than 173 bushels today. We saw similar gains in livestock and fresh vegetables, fruits, and nuts. In 2010, global

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[2] History of modern nutrition science—implications for current research, dietary guidelines, and food policy https://www.bmj.com/content/361/bmj.k2392
[3] Famines, Our World in Data https://ourworldindata.org/famines
[4] Statistics About Diabetes: https://diabetes.org/about-diabetes/statistics/about-diabetes
[5] Obesity drugs are among health breakthroughs forecast to boost GDP, https://www.goldmansachs.com/intelligence/pages/obesity-drugs-are-among-breakthroughs-forecast-GDP.html
[6] The Green Revolution: Norman Borlaug and the Race to Fight Global Hunger https://www.pbs.org/wgbh/americanexperience/features/green-revolution-norman-borlaug-race-to-fight-global-hunger/

agriculture with American technology ended the calorie famine. A combination of US innovation, science, policy and farmers, led by the US but implemented globally, changed global production.

Our collective focus on yield and calories is now not enough. 3B people remain under-nourished today. People who would have died of starvation now live long enough to die of diabetes, cardiovascular disease, and cancer.

In 2000, the US sequenced the human genome. That launched 1000s of new companies and created solutions for immunotherapy, vaccines, heart disease, blindness, and more. The world followed US leadership to create a global shift in healthcare.

We have the same opportunity today in nutrition. The same sort of foundation that led to discoveries in the human genome can lead to a world where food is understood to be synonymous with health. With all our efforts in nutrition, we still do not really understand whether a ketogenic diet is good or bad. With all our efforts in agriculture, we still are unsure of the ideal balance of microbes, genetics, and fertilizers. We have come a long way, but we can do better.

A Future Vision of Health

Sometime in the future, you will walk into a grocery store. You may be pre-diabetic, obese, have cancer, or seek to run a marathon. But the experience will be different than it is today.

By then we will live in the realm of System C. You will have seamless access to a nutritionist nudging you as you shift your behavior. Maybe a clinical intervention like medically tailored meals[7] or a nutraceutical form of Ozempic. You still eat what you enjoy, but what you enjoy is now better for you. Your calorie intake is 25% less than your parents', and 45% less of those calories come from ultra-processed foods. Less fat, and more lean muscle mass without going to the gym every day. Co-morbidities are a rare medical burden.

The vegetables, frozen or fresh, are nutrient dense, boosting vitamins and micronutrients. A product of regenerative agriculture. The grass-fed beef, net carbon positive, managed on grass lands with virtual fences[8], deliver better taste and balanced omega 3/6, reducing vascular inflammation. The processed foods are sweet and tasty, but zero glycemic impact[9]. Full of prebiotics, fueling your gut microbiome. The center of the store offers packaged bioactives[10] for those genetically at risk of diabetes, leaky gut, high blood pressure, or cholesterol. Your microbiome[11] is back in balance. You sleep better, are less depressed, and enjoy life without medical fears.

It all seems fanciful. It was slow at first, then things happened all at once, because innovation, policy and regulations found the way to reduce the healthcare cost of poor nutrition.

Medical care moved from sick care to functional medicine[12,] forestalling disease. Medical software applications became part of the grocery store mobile apps. It is your data, not theirs. The app knows your health history, it tracks your purchases, it recommends products. It is integrated into your health

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[7] Eatwell Meal Kits - https://www.eatwellmealkits.com/
[8] Vence https://www.merck-animal-health-usa.com/species/cattle/vence
[9] Bonumose, Inc. – healthy sugar for the mass market: https://bonumose.com/
[10] Bright Seed https://www.brightseedbio.com/
[11] Meet the Psychobiome: https://www.science.org/content/article/meet-psychobiome-gut-bacteria-may-alter-how-you-think-feel-and-act
[12] https://www.functionhealth.com/

insurance[13]. It nudges you with recipes, reminds you of a higher quality pasta, or offers a protein dense gluten free bread.

The software runs on deep analytics and AI. Your DNA is sequenced, covered by the grocery store because you are a loyal customer. Your health data is protected by the blockchain, allowing integration into a synthetic control arm model comparing your genetics and health to peer groups based on race, age and social determinants.

Inspired by the original human genome project, we now have data from The Human Microbiome Project, The Human Nutrition Project, and The Soil Microbiome Project. Each built by government, academia, and industry as a foundational, science-backed model guiding health. This foundational data is integrated into Health Shift[14], a comprehensive human synthetic control arm built from the health data of 1M people who have donated their data to science.

Other commercial software data systems gather blood tests, radiology, and new assays. The database continues[15] to grow, to train the AI systems that lead to new medical discoveries, new health treatments, new understanding of nutrition, and rapidly adapting regulatory frameworks. Monitored over decades, these longitudinal data sets capture, as one example, the correlation between childhood viruses and late-stage health conditions like MS and Alzheimer's.

We understand the nutritional value of the food in the grocery store because we now use a real-time, low-cost spectroscopy assay that determines the macro and micro-nutrients in meat, fish, vegetables, and grains[16]. Over time this reveals the wide variability in nutrition, from sweet potatoes to beef. Farmers, ranchers, CPGs, processors, and others realize the variability and implications, improving quality in production. Consumer labels accurately represent nutritional quality.

Bioactive innovators have built computational models of human nutrition[17]. The models determine the metabolic effect of a nutrient on human health. They use AI to scan every journal, story, and historical artifact to find natural solutions that improve health. They take 1000's of natural ingredients and test their benefit, in billions of configurations, to find the key ingredients that improve health. They convert these discoveries into products, integrated into processed foods or standalone supplements to improve individual health.

Precision fermentation is used to develop new ingredients from food waste. These new products replace animal collagen in food[18], or protein in animal feed[19]. We have new sugars that offer sweetness with low glycemic impact, a direct replacement for sugar without the danger of diabetes[20].

Livestock feeding operations are more efficient with software[21] that assure animal husbandry, improves nutrition efficiency, and manage operations to minimize and reverse carbon footprint. Protein dense soy and improved feed conversion ratios reduce the cost of protein in human diets and eliminate the need for antibiotics.

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[13] Uber and Instacart expand their health plan partnerships https://endpts.com/uber-and-instacart-expand-their-health-plan-partnerships/
[14] https://www.linkedin.com/pulse/healthshift-empowering-people-transforming-healthcare-carter-williams
[15] https://flywheel.io/
[16] https://www.edacious.com/
[17] https://agfundernews.com/meet-the-founder-brightseeds-dr-jim-flatt-illuminates-the-dark-matter-of-nutrition
[18] https://geltor.com/
[19] https://www.bondpets.com/ https://bensonhill.com/
[20] https://bonumose.com/
[21] Livestock Management Software https://www.agriwebb.com/

Crop genetics companies apply deep learning and computational intensity to reveal every genetic trait[22]. For decades, improvements in yield reduced taste and nutrition. Now we have the engineering tools to breed crops that improve yield, taste, and nutrition. Corn, soy, wheat and 100s of other crops, all with better quality at a lower cost.

After deep research into the soil microbiome, farmers have transitioned to biologics that create a consortium of microbes in the soil[23]. These microbes improve crop nutrient intake. They naturally fixate nitrogen from the air to feed the crops[24]. Our command of the soil microbiome improves crop nutritional density, making crops robust against disease, drought, weeds, and heat.

Autonomous systems using precision spraying, lasers[25] and mechanical means care for the crops through the season, augmented with biologic-based herbicides[26]. Limiting the application of chemicals to precise applications. The advances in biologics reduce production costs dramatically. These new tools for soil health are validated with ground penetrating radar[27], imagery, and other sensor systems to train AI models and validate climate and nutritional gains. Financial services, in the form of insets[28], allow Consumer Package Goods companies to offer price premiums for better nutrition.

Protein engineering, built on breakthroughs like protein folding, develops peptides that protect food and crops from pests. These biologic solutions decay naturally. The rapid design tools allow for seasonal solutions. The approach is integrated with EPAs safety systems, to assure fast engineering of nature-based solutions to protect crops and reduce the cost of crop loss.

Recommendations

The technology listed above is all real. These are all emerging companies we and other investors are supporting today. With increased interest rates, venture investing is today at an all-time low, but the ecosystem will adapt, building even stronger companies. The work happening now around medically tailored meals is vitally important in the immediate term, while the innovations outlined above will become commercially successful over the coming years, reducing the need for such meals in time. We do need to think about two key pillars to match these entrepreneurial efforts:

1. We spent $1B in R&D to unlock the human genome. Industry and government need to set a plan, in the context of today's AI, to do the same in Soil Health, Human Microbiome, and Nutrition Science.
2. The FDA, USDA and EPA need room to rethink how they regulate safety. Using big data and synthetic control arms to speed solutions and stop harms.

We need to do 1,000 different things well. Which will happen. Our economy is perfectly suited to advance society and technology to improve nutrition better and faster than expected. But we do need to decide to take the steps necessary to eliminate the healthcare cost of poor nutrition, as a national mission, like we did to end famine.

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[22] CropOS Technology Platform https://player.vimeo.com/video/534843655
[23] https://www.holganix.com/ https://www.plutonbio.com/
[24] https://kulabio.com/ https://www.pivotbio.com/
[25] https://carbonrobotics.com/
[26] https://harpebio.com/
[27] https://earthoptics.com/
[28] https://arvaintelligence.com/

> “If you want to build a ship, don’t drum up the men to gather wood, divide the work, and give orders. Instead, teach them to yearn for the vast and endless sea.”
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> — Antoine de Saint-Exupéry

Conclusion

Looking back to this day, to this room, we will come to see our shift in focus to eliminate the healthcare cost of poor nutrition as a joint mission aligning policy, innovation, research and NGOs. When we are done, the healthcare cost of poor nutrition will be $0. This will happen as we build System C. We will increase the scientific understanding of the human microbiome, human nutrition, soil microbiome, and crop science. Our regulations will adapt to advanced food, bio-actives, and nutraceuticals. The speed of entrepreneurs and innovation will step in, delivering more than expected, better quality products, at a lower cost to society and individually.

Looking ahead, this seems hard but the reality is the net effect of science, regulation and innovation will eliminate the healthcare cost of poor nutrition, increase longevity, improve productivity, and make life better.

Addendum

There are 1000s of companies developing innovations to reduce the healthcare cost of poor nutrition. These are a few of those companies that inspire the content of this testimony. Many come from our portfolio. Not all of these will succeed. They do represent examples of the innovation in progress.

7. **EatWell Meal Kits** - Food as medicine meal kits, education, and analytics to address food insecurity and reduce costs for insurers (https://www.eatwellmealkits.com/)
8. **Vence** – virtual fence for livestock management that enables the scaling of the sustainable production of grass fed and pasture raised livestock (https://www.merck-animal-health-usa.com/species/cattle/vence)
9. **Bonumose** - commercializing low-glycemic index, natural sugars through a proprietary, cost-effective enzymatic process (https://bonumose.com/)
10. **Brightseed** - AI powered nutrition discovery company that identifies unique micronutrients in the plant kingdom and maps them to specific human health conditions where they can have the highest impact (https://www.brightseedbio.com/)
11. **Holobiome** - platform for microbiome-based therapeutics to treat diseases of the central and enteric nervous systems (https://holobiome.org/)
12. **Function Health** – Developed by Mark Hyman, a blood testing platform that pairs you with a doctor for review of key blood analytes twice a year. (https://www.functionhealth.com/)
13. **Noom** – Easy nutrition tracking with recommendations (https://www.noom.com/)
15. **Flywheel** - research workflow solution that provides cloud-scale data management and computational analysis (https://flywheel.io/)
16. **Edacious** - accessible low cost nutritional measurement using a suite of spectroscopy tools for the agrifood supply chain (https://www.edacious.com/)
17. **Brightseed** - AI powered nutrition discovery company that identifies unique micronutrients in the plant kingdom and maps them to specific human health conditions where they can have the highest impact (https://www.brightseedbio.com/)
18. **Geltor** - platform technology that enables it to cost effectively produce sustainable and beneficial proteins for the cosmetic, food, beverage, nutritional supplement, and healthcare industries (https://geltor.com/)
19. **Bond Pet Foods** – Using precision fermentation to manufacture animal cells without the animal (https://www.bondpets.com/)
20. Bonumose - commercializing low-glycemic index, natural sugars through a proprietary, cost-effective enzymatic process (https://bonumose.com/)
21. **Agriwebb** - building the digital backbone of the livestock industry, connecting animal and land management to the supply chain and the consumer (https://www.agriwebb.com/)
22. **Benson Hill** - combines machine learning and big data with genome editing and plant biology to accelerate the product development process (https://bensonhill.com/)
23. **Vestaron** - biological crop protection products that address resistance and safety/ environmental externalities (https://www.vestaron.com/)
24. **Kula Bio** - nitrogen fixing microbe that replaces 50-80% of applied nitrogen at or below the cost of synthetic nitrogen (https://kulabio.com/)
25. **Autonomous Pivot** - noninvasive soil/crop sensor network that feeds AI decision support engine for autonomous irrigation, fertigation, and crop protection (https://www.autonomouspivot.com/)
26. **Harpe Bio** - natural, sustainable, biological weed control solutions (https://harpebio.com/)
27. **EarthOptics** - measurement and modeling of key soil attributes (https://earthoptics.com/)
28. **Arva Intelligence** - provides carbon insetting and offsetting solutions by connecting growers to buyers in the carbon markets (https://arvaintelligence.com/)