PCAST
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>> John Holdren: This is already our second meeting since (inaudible) to meet with President Obama and discuss with him the challenges and opportunities in the domains of science, technology and innovation going forward. And to discuss with him the ways in which PCAST could be most helpful in advancing the nation's priorities in science technology innovation and STEM education in the second term.

A number of the issues that the President has already made clear will be on his second term agenda are issues on our agenda this morning, to be discussed here. We will be hearing from Todd Park, the chief technology officer of the United States and assistant to the President on open government, which is an issue of course that is -- revolves around participation, inclusion, effectiveness. And I know Todd will have a lot to say about the challenges and opportunities in that domain.

We'll be hearing about issues around health care, which obviously in the ongoing process of implementing the Affordable Care Act and finding ways even beyond that to find -- to get better health outcomes for more Americans at affordable cost. A lot of challenges there, and we will be hearing about some of those.

A third domain which I think is not on the published agenda but we'll find a few minutes for, is a preview of PCAST thinking around the challenges and opportunities at the intersection of energy and climate change. Which the President has also made clear will be a major focus of his in the second term.

Before I turn to my cochair Eric Lander for a few further words of welcome now I want to specifically recognize our member professor Jim Gates who will be receiving the National Medal of Science in a ceremony. (Applause.)

We're very proud of you, Jim. This is, for the benefit of those in the audience who are not so familiar with all of these things, this is the highest award in science given by the federal government, and it's an enormous, an enormous honor indeed.

Eric, additions?

>> Eric Lander: Well, I want to add my welcome to John's. There's a tremendous amount of work to do as we look ahead to this year and next four years and I want to thank the PCAST for its continued energy and the service. We've had a lot of activity in the first four years of this group, and I think there's a lot ahead.

So we're going to start today directly with Todd Park. Todd, as John has mentioned, is the chief technology officer of the United States and is before that a very innovative person in the world of IT, and he has brought a lot of that innovative energy to the federal government. From the beginning of this administration, the concept of open government has been a really central theme. The idea that the people with data are the people with data. And being able to make those data available to the American people so that they can use it individually and then so that entrepreneurs within the country can make it easier for the people to use it individually, and allow all sorts of just unimaginable ways to take advantage of government data and create ways to improve people's health, to promote commerce. For me it's been one of the most exciting things to see this open government initiative, and particularly the open data initiative within it.
Todd has been particularly energetic in this area and he's come to PCAST before to tell us a bit about it, and I confess because we have such a good time when Todd comes to tell us about it, and because it is so incredibly fast-moving, anybody who thought government things have to by definition move slowly, has not seen this open data initiative.

Todd is back again. And so Todd, tell us what's been going on in the last 24 hours over there. Actually feel free to take the last whole month or two. No seriously, we're grateful to have you and we're looking forward to this session with you.

>> Todd Park: Thank you so much, Eric and John, and PCAST for having me back I always love coming back to PCAST. It's one of my very favorite places to hang out and one of my favorite groups of people with whom to talk. So what I'd love to do is just over the next few minutes here I'm going to give some overview remarks about our open data initiatives program and then open it up for a lively Q&A. So I'm here today to talk about this key dimension of our open government program, the open data initiative program, and the objective of this program as I talked about previously is to open up access to government data resources, information resources, in, critically, machine readable form. As fuel for entrepreneurship, innovation and scientific discovery, while always -- critical note which we'll talk more about -- rigorously protecting privacy and confidentiality. The basic attitude of course is that it is the people's data. The American public paid for this data and we should give it back to them in forms that are usable to spur economic growth and social benefits.

As we'll talk about, we've made a huge amount of progress over the course of the President's first term, and we plan to continue to prioritize the scale as we head into the second term as an engine of economic growth and social benefit.

So as Eric mentioned, this effort was really kicked off by the President personally through his issuance of the open government directive, which has been a defining action for this whole movement at the beginning of the first term. And it draws among other things, upon the weather for inspiration. And more specifically, what the government actually did decades ago with weather data.

I think everyone here knows, but a lot of folks don't know, the vast majority of weather data in the U.S. is actually collected by the U.S. federal government. What the government did a few decades ago was incredibly interesting, it took this weather data and made it available in computable form, to anybody, for free, without (indiscernible) rights. What happened is people picked up this data and turned it into Weather Channel, Weather.com, global weather apps, weather insurance and much more, which added billions of dollars to the U.S. economy, a lot of jobs, and improved all of our lives in countless ways.

Another story along similar lines is the global positioning system. This was under President Reagan and President Clinton, as I think everyone in this room knows, GPS was originally built for the U.S. military, but then the American government made it available as an open utility for anyone to actually access for free. And that of course in the hands of entrepreneurs and innovators has been turned into everything from navigation systems to precision crop farming that's dramatically increased the productivity of American agriculture to location based apps on your phone and much, much more.

In fact, actually civilian commercial access to GPS alone is estimated last year to have added about $90 billion in value to the American economy. And it actually has been done without regulation, without legislation, without massive new expenditure of taxpayer capital, taxpayers had already bought the military a fabulous GPS system. All the government did was jiu jitsu it, if you will, into the public domain. It put it in the hands of ingenious American entrepreneurs who then turned it into all kinds of incredible improvements to our lives, jobs, and economic value.

So the object of the open data initiatives program of the President is to basically run this play again. Run the weather and GPS plays again, but this time across a vast array of additional data resources that are in the possession of our government. And are, again I must emphasize, the people's data. The public has paid for it and we should give it back to them, while rigorously protecting privacy and confidentiality, of course.

To kind of illustrate the potential I like to think of the end of one of my favorite movies, which is Raiders of the Lost Ark. Remember at the end, if you've seen this movie -- if you haven't, I highly recommend it. Indie walks into a giant government warehouse, where they're leaving the lost Ark of the Covenant in this box. And it's a warehouse as far as the eye can see filled with boxes after boxes all of which contain countless treasures like the Ark of the Covenant, right? Well, that's a really good metaphor for the data treasures of the American government. That people have paid for, and that we need to give back to the public. And we're actually doing this across six targeted sectors: Health, energy, education, public safety, finance, and global development.

And our additional prototype of this new raft of open data initiatives was to help the initiative, which is the Institute of Medicine, and HHS started, and when I was back in HHS in 2010, under the sponsorship of Secretary Sebelius and Harvey Feinberg, and the objective of the health data initiative was to help unlock, is to help unlock, the power of data and information, help improve health and healthcare by catalyzing the development of an ecosystem of data supply innovation that continuously improves health and health care through the power of data.

So one of the underlying principles that's important to talk about here is that the objective isn't just to publish data, right? Because data by itself is not incredibly helpful. You can't pour data on a wound and heal it. You can't feed a baby data. I love data, I love my baby daughter Diana, I can't feed her data as much as I'd like to, because it's not consumable as a human-sustaining thing. You can't pour data on a road and fix it. Data is only useful if it's applied to actually create useful public benefit. Like better health care, like more efficient public services, like actually better transportation, like improved education outcomes, like improved energy outcomes, et cetera.

So in order to actually be applied, it needs appliers. So it's critical not just to free up data, but also to catalyze and develop an ecosystem of use of that data, right? And one of the best practices for the private sector, which is done quite a lot in terms of developing ecosystems of entrepreneurs and developers around given resources, is when you're beginning this whole process, don't just liberate data blindly. Don't just make utility data available blindly. Engage developers and entrepreneurs who envision to be the customers of it, of the uses of it from the beginning. So we actually did, in this building, was to kick off the health data initiative in a room -- in a room close by, and we invited 45, actually I should say very skeptical at that time entrepreneurs and innovators into a room, brought our data experts, and put meekly in front of the 45 entrepreneurs and innovators a pile of our data. Saying okay, look, here's some of the data we have. We have data available, we could make it available, we could make it machine readable, easy to use. What do you think?

And the entrepreneurs actually dived into this data, they got very interested. It was data around directories of where the all health care providers were, all the health care providers, regional statistics around health, and health care. They got very, very interested, and we then challenged them in 90 days to come back to this building, in the main auditorium, and to demonstrate what they had done with the data in that 90 day span.

We weren't sure exactly what would happen as a result, but sure enough, 90 days later they came back with the first ever health datapalooza and showcased 20 plus brand new apps and services that uses data to help you actually find the right hospital for your family, help public health officials to get a better sense what's actually going on in terms of the health care communities, help actually doctors and hospitals deliver better care, et cetera, et cetera.

That was extremely exciting and just to show you what can transpire and how fast it can transpire, what happened is first of all more entrepreneurs and innovators got excited about plugging into our data and using it to do all kinds of good things; and secondly, a whole bunch of folks inside government, who really didn't understand the potential of the data, right? It was very abstract to them, right? They could only imagine

downside, no upside. They saw at the datapalooza living proof of what would happen if you actually made this data available. Folks who actually also cared about improving health and health care, who didn't actually need to use your money, could take the data and turn it into all kinds of new utilities that could help a lot of people and advance your mission without you having to spend a dime. So folks inside government with data got a very concrete illustration of consequences of liberating the data.

So more people started liberating data, which then sparked more use, which then sparked more data liberation. It was a virtual spiral, a double helix of data liberation and use that moved incredibly rapidly. Just to show you how rapidly, we just executed this past June the 2012 datapalooza cosponsored by not just HHS, but Robert Wood Health Foundation, California Health Care Foundation, et cetera, and this time 1600 entrepreneurs and innovators crowded into the Washington Events Center for two days, and there were hundreds of people who were very angry because they couldn't get tickets to get into the datapalooza to witness the best of 230 plus companies that had competed in a competitive American Idol style process for the right to present to the 1600 folks. An incredible array of companies ranging from small to very large that had utilized all kinds of our data to produce products and services that improve health and health care.

Just actually to give you a sense of the kinds of data people are using and examples of how they're using it, the kinds of data being made available, again in machine readable form, easily findable on healthdata.gov, directories of health care providers of all kinds, kind of think of it as GPS for where health care is delivered. Quality of care delivered by health care providers, patient satisfaction with health care providers, the latest medical and scientific knowledge, again in machine readable form. Information about drugs filed with the FDA, now made available through a very elegant API. Insurance policy and pricing by zip code across the country, et cetera. Being made available on healthdata.gov in downloadable files through APIs.

And examples of what have been done with it, one example we talked about actually a lot is called iTriage, this is actually story sounds that like an episode of ER, but it's a true story. This ER doc Wayne Guerra and Pete Hudson, two ER docs in Denver, who got tired of continuously seeing patients who had not gotten the right healthcare at the right time and hit the ER, so they built a company and a mobile app called iTriage that uses open data from U.S. government about where are all the doctors, where are all the hospitals, where are all the health cares, et cetera, where are all the medical health centers, so on, so forth. They imported that into this mobile app and also used GPS to create an app that allows you to punch in your symptoms and have the app then recommend based on what's happening with you, and where you are, the best local health care providers for your situation. That you can then actually go and book an appointment with. And you can actually use the app to book appointments with many of them.

It started like 8 seconds ago, but it's been downloaded over 8 million times. It has a four and a half star rating on the apps store, it's literally saved people's lives. There was a fantastic story on the CBS Evening News about a month and a half ago that talked about how it actually saved the life of Bob Ketterer by helping him get care when a doctor realized he was having a stroke, and did things to save his life. And Bob said if he hadn't had that kind of access where to go and a doc that he wouldn't have even realized he was having a stroke, he wouldn't have gone, and would have actually likely ended up in a very, very bad place.

The company has hired 90 people in Denver. It's hiring folks. So if you actually have nieces, nephews, cousins, mothers, fathers, sisters who are interested in health care IT, iTriage is hiring. It got bought by Aetna for actually a good price, and it's being funded by end of the scale across the country. It's a very exciting story.

Another example and a fantastic user of data of all kinds is Archimedes, which is a company that's developed a whole set of apps called Indigo, they help doctors and patients at the point of care, to get the latest evidence about actually what to do, what not to do in a given situation, which is a fantastic utility. Search engines like

Helpline and Google have actually used this information to significantly improve health search. So Helpline, which talks to about 100 million folks a month, ingested a huge amount of data from FDA, NIH, CMF, et cetera. So you see to try to filter and improve search research for health topics on the internet, so less of a random walk, it's actually more targeted and more generally helpful. Google has integrated information, for example, from FDA about drugs into search for drugs on Google.

Aetna, as another very interesting example, has done a lot of great work in this area. They're one of the biggest hits at 2011 datapalooza, because actually after a spectacular demonstration of some spectacular apps, Aetna walked on stage and said I've got an interesting data target innovation to show you, it's called a nurse. And what they said was look, apps are cool, but there are a lot of folks who frankly aren't going to use iPad apps to engage in health care improvement.

So Aetna actually instead built an IT cockpit for several thousand nurses it employs across the country, who are now actually being assigned to local primary care docs to help them manage their sickest patients. And they built an app that can access all kinds of information resources, to help that nurse to become even more omniscient than he or she already was to help the patient.

And the example that they gave was, okay, I'm an Aetna nurse, I'm sitting in New Albany, Ohio at a call center, I've just been assigned by Dr. Jones in Georgia to a patient who is 68, diabetic, depressed, about to go to renal therapy, about be discharged from the hospital. Classic example of a patient who typically gets lost in the shuffle of the healthcare system to the massive detriment in terms of her health condition. And so then the nurse proceeds to say, okay, here is the best local dialysis center, best mental health center, I'll make appointments for you, here's transportation resources to actually get you here, here's latest and greatest advice I can give you about how to manage your condition, here's the latest greatest nutritional advice I can actually give you, et cetera.

Each of these transactions is actually powered by an open information resource from the federal government. But the best part of the story to me is that the 68-year-old who is diabetic, depressed, about to go to renal care, about to be released from the hospital, doesn't have to be flipping around icons on an iPad to get the power of information to help her. She's actually getting power of information to help her through one of the oldest and most effective user interfaces ever designed, which is called talking to another human being.

So this illustrates one very profound point I think about open data, which is it's not just about the apps. When people start talking about applying data, right, they instantly think of the apps store. And that's cool, there are a lot of great apps that are genuinely helpful. But I think they're the minority of the value to be added through open data, and through data in general, right? The apps are one thing, but information enriched services, like docs and nurses, for example, who have the power to actually do a better job when they have patients. Apps equally, if not even more powerful, it is a third wave, apps and information rich services. There's actually the notion of promulgating more effective, transparent, efficient and competitive marketplaces, right?

So one of the things that's happening is we're making all kinds of data available about the insurance pricing, about health care provider quality, so on so forth. And everyone from U.S. News & World Report with new health plan ranking is using a whole bunch of our data, to companies like vitals.com or Healthgrades are actually picking this data and using it to radically improve the transparency marketplace around health insurance, health care providers, et cetera. For use by consumers, by primary care doctors, for referrals, so on, so forth. One of the really powerful aspects of that is it makes the entire marketplace more competitive. It makes the entire marketplace more functional.

There was a great study that CMS recently published where it looked at a set of quality metrics, they had

started publishing enhanced quality metrics, it started publishing in 2006 around hospital quality. And it then actually tracked over the course of five years what had happened to just power of transparency on the types of care where really no other change had happened in terms of reimbursement or anything else, where just transparency happened.

And it was amazing from the metrics, just through transparency alone, performance improved. For example, if you actually show up at the hospital with a heart attack and you have a pretty good profile, there's always a particular kind of therapy you should get 100 percent of the time. It turned out in 2006 that Americans were only getting it 55 percent of the time.

Hospitals were actually shocked by this. They mobilized, and by 2011 the number was 91 percent. 91 percent. So another example is getting antibiotics an hour before surgery, which should really always happen. It was only happening 78 percent of the time in 2006, and now it's happening 97 percent. Right? So -- and you know, the vast majority of patients who benefited from those kinds of improvements, right, they didn't have to use iPad app, iPhone app, Android app, to get the improvements, they just benefited from a more transparent competitive marketplace that improved care through the power of open data.

One of the things I encourage you all to think about is not to think about the apps, and the benefit and manifestation of open data. It's apps enriched services, like the Aetna nurse who is now super-powered by data, and more functional, competitive, transparent marketplace.

So this is actually very, very exciting to see in these datapaloozas, to see hundreds of companies born or improving through the power of data, creating all kinds of new products and services to improve health care, creating all kinds of new jobs, and doing it again without regulation, legislation or large-scale expenditure of new types of capital, but simply enabled by the jiu jitsu of giving the people their data back.

There's actually one spinoff over the initiatives I want to talk about. All of this is actually not just a case study of the health data initiative but it's the template we're using across all the other data issues. So it's meant to be a template for your thinking about this as well.

One spinoff that's very important of health data initiative is something called Blue Button. Have we talked about Blue Button before? I think we have. This is something that is I think inspired by open data initiatives, but I think it's important to keep conceptually distinct from the rest of the open data initiatives movement. Because this isn't about making data available to everybody, for everyone to access, this is actually about making your data available to you, and you alone.

So really calling it the MyData initiative, to kind of keep it conceptually distinct from the open data initiatives overall, and Blue Button is an appropriate example for this. As I think we talked about before, Blue Button was an effort that was started by the VA with leadership from the great Peter Levin and the Department of Defense about two years ago, and it was sparked by the desire to give veterans, members of the military, and Medicare beneficiaries a secure private copy of their own information. Of their own information. And so essentially what happened is VA, DOD and Medicare installed a Blue Button on a patient portal, this is what they actually have like My Healthevet, so a veteran could go to My Healthevet, could log in, authenticate themselves, and then not only see but be able to push a Blue Button and download a private copy of their own data securely.

Peter Levin was asked how many veterans will ultimately use this thing. Peter didn't know, he said I think it's a blow-out hit, crazy blow out hit, maybe 25,000 veterans, if you can imagine. Thousands of veterans choose to download their own information.

What's actually happened over the last two years is over 1.4 million veterans, members of the military and Medicare patients have securely download their own health care information via Blue Button, and a very interesting thing happening as this was happening, which was folks in the private sector started calling us and asking, are you allowed to do what you just did?

And we said can you please clarify the question. They said, well, are you allowed under HIPAA to let patients download electronically a copy of their own information. And they were being serious, right? We said absolutely. In fact, under HIPAA, patients have a right to their own information. But there was a huge amount of confusion among very smart people, if you think about this. And one of the most valuable benefits of the Blue Button has been a definitive communication by the government that in fact patients have a right to their own data electronically and securely. That is actually legal to do.

So what's happened is it's now spread, it's being adopted by more and more folks and insurance companies, health providers, et cetera. Over 400 companies and organizations have committed to either deploy Blue Button, or develop tools, power button data, that can help patients to use or take control of their own health care. So personal health records, upload your own Blue Button data and use it to help manage your medications, so forth. Over 88 million Americans now have access to Blue Button data from at least one source, VA, Medicare, health insurers, hospitals, et cetera, and we're doing all kinds of things to improve it.

I might dig out for a second, here, but I think this is very obvious to dig out with. Blue Button initially was a downloadable text file. Because we wanted to keep it simple, we wanted to follow Occam's razor. And that was a great first step, but it turns out it's a file kind of human readable and kind of machine readable but not particularly good at either. So one of the things we've been doing with the health initiative programs is actually to create or adopt a much more machine readable file, using the Consolidated Clinical Document Architecture standard that's actually promulgated through the whole health IT push being choreographed by HHS, so basically the same format for every type in America of is now being programmed or already is capable of producing having that be the machine readable standard for Blue Button.

And then we've also actually, the fellows have choreographed an open national design competition for a truly human readable version of the Blue Button information, and it's gotten over 240 entrants from professional designers, who are amazing, and one will be announced soon. And then that design for a human readable open format for the Blue Button file will be made open source so anyone can actually download it. So that's very exciting.

Another piece of feedback that we've gotten, and again, this is part of the whole theme of you've got to engage the innovation to understand how to really make data available in a way that would be useful. We've heard from a lot of patients and a lot of doctors and a lot of innovators, is that the ability to go to a website, log in, hit a button and download your data is great. But if you're one of the 5 percent of Medicare beneficiaries that account for 40 percent of the cost, have chronic or other conditions and see 14 different doctors a year, you're not going to go to a website and keep hitting download, download. What people have asked for is something we're working on to an open public private progression called Blue Button Plus. This is the whole idea of set it and forget it, the whole idea of patients being able to say to a doctor, or health system or insurer that I want you to send my information on a secured continuous feed to my personal health locker until I tell you to stop.

And so it's a whole initiative of a patient to be able to direct information to go where the patient wants it to go, and having that actually being given a next Blue Button. That's very exciting.

This MyData spinoff initiative is also very powerful, this whole idea of letting patients, letting consumers, get their own data. No one else, just the patients and consumers getting a copy of their own data, is a very

important emerging part of this work as well. So I actually do want to take this moment to talk a bit about privacy, again this is part of the template for the updated initiatives more broadly.

It's incredibly important, and it's essential as we advance the cause of open data and MyData, right, to always, always, rigorously protect privacy and confidentiality. So the open data effort, MyData effort and privacy and protection go hand in hand. Go hand in hand. So for example, all the data we've published that's truly open on healthdata.gov, data.gov, stuff anyone can download, is by definition non-personal data. It's data like the weather, or hospital quality, or drugs filed with the FDA. It's actually subject to mosaic testing. Because as you know better than anyone, you don't want to be in a situation where you're releasing data openly that could be combined with other data to actually reidentify individuals. That's a huge mistake.

So all data posted on data.gov is subject to mosaic testing. And obviously information like Blue Button data is not available on data.gov. It's not available for everyone to download. It's available for you, and you alone to download your own data. And so that's a very important principle I think to just triple emphasize.

So a final point on health data, Mackenzie actually came out with a study this summer on open health data and MyData and estimated that it actually reaches a potential in terms of application, it could be worth $300 to $450 billion annually to the American economy. Not to mention -- I mean on top of that, obviously improve lives, save lives, quality of life, productivity, et cetera. Which they didn't attempt to quantify. So, massive benefit.

These may sound like big numbers to you, but if you consider that we spend $2.7 trillion dollars plus on health care, in fact health care is famously not incredibly awesome at applying data, there are a lot of people who actually think that $450 billion dollar number is pretty conservative. So that's very, very exciting.

So we are continuing to scale healthy initiative and have now cloned it in 5 additional sectors, energy, education, public safety, finance, global development, and we're running the same play that I just talked about in these new sectors. So we have posted thousands of major government data resources across these sectors for free, easily findable public accessible on the data.gov website, and subsidiary sites. We have dedicated community sites for each of these sectors, so in addition to healthdata.gov is safetydata.gov, educationdata.gov, et cetera. They're easily findable, very importantly they're computer readable as much as humanly possible, and available for free. And include information around, you know, U.S. college characteristics, performance and pricing; the energy efficiency of 30,000 consumer appliances, IT products, natural hazards and preparedness data, product recalls, consumer credit card complaints, information of all kinds, and much, much more.

So we are very, very excited about that. We also actually have opened up cities, counties and states via data.gov. So new portals on data.gov where cities, counties and states are now posting their open data. So data.gov becomes a truly one stop shop for anyone who is interested in free public data. We're also unlocking the power of other private sector data sources, by open innovation, by creating standard computer readable formats for such data to make them easily usable, and stimulating voluntary commitments from private sector organizations to release these data. For example, five colleges recently committed to release financial aid shopping information in standard XML format. We're also mobilizing colleges to release their course catalog information online in a common format.

There's an effort called the Learning Registry, which you may have heard about, which is an effort to basically take all kinds of online digital learning resources spread across the web and have folks tag them with metadata tags that essentially say this is good for this particular common core standard for people between this age and this age, and I like or don't like it. That's essentially tagging the whole universe of digital online learning resources, and training it into a searchable dataset, if you will, that can then feed all kinds of online tutorial platforms, et cetera. That's actually super, super exciting.

And we're also advancing, again a distinct initiative, the MyData effort. Basically cloning Blue Button. So have we talked about Green Button? Okay. So Green Button is a clone of Blue Button, but it's in the energy space. So it's basically the ability for businesses and consumers to download securely a copy of their own electricity usage. So it got started actually about a year and a half ago, it's already available now to 16 million American houses and businesses through a bunch of innovative utilities, we have another 20 million customers getting capability soon. They actually have already employed auto Green Button, Green Button Connect, so the ability to actually get ongoing feed of your own data. And there are hundreds of apps and services that have already been built on top of this data.

And we're also working on a similar MyData effort in education, people get their own transcript data, their own student loan data, and that will be securely rolling out soon.

In addition to getting liberating data, just as per the health initiative template, we're actually working aggressively to get the word out about these data resources to everyone possible so that they engage in the data, use the data, build in the data products, services, companies, using the data through a program of data jams, meet-ups, hack-a-thons, datapaloozas. Kind of neat, things are different when memos are flying around the White House talking about the latest datapalooza and how actually it's going to work.

We've now held just over the course of this summer, fall and winter our first datapaloozas in the realms of energy, education, public safety, finance, and global development. We're highlighting resources that are available, highlighting emerging architectural examples of innovators that leverage the open data to build apps, services and companies that are already collectively helping millions of people create jobs. And let me just talk about the few of the latest examples across these initial sectors that I think can be very instructive in conceptualizing how this data actually adds value.

There's a company called BillGuard which was founded in 2010 which basically helps find deceptive, erroneous and fraudulent charges on your debit card or credit card bills, it's a free software that alerts you whenever a charge on your bill has been reported by others as fraudulent, then assists you in getting your money back. It's not just finding fraudulent charge, it's subtle cases like people who say they will stop billing you after your free trial, but keeps billing you systematically. So it catches that stuff. Amongst other data sources that utilize this freely available billing complaint data from the Consumer Financial Protection Bureau, which actually is made available. The company has hired 21 people, has raised 13 million venture capital, is growing quite rapidly.

Bright Scope is a company founded by Mike Alfred that uses freely available data from the Department of Labor on retirement plans, to create independent ratings for those plans. That's been a famously opaque space in the past. Bright Scope offers a free tool to help the public understand and maximize benefits associated with those retirement plans, and numerous employers have changed their plan offerings as a result, offering better plans and lower fees, based on this information. The company has hired 55 employees to date and is growing rapidly.

Something called On Deck Capital, this is a very interesting kind of financing company. So they're a huge swath of small businesses across the country that can't access high power D.C. funding, and access traditional bank loans for their funding. The problem is banks have a very expensive rate infrastructure, they can't use to figure out whether to give Kareem's Crawfish or the barber shop on Main Street money. So they end up using the business owner's credit score, which is actually frequently a very bad predictor on whether the business itself is a good credit risk. So On Deck Capital has actually built software that sucks in a bunch of data, including data from the census, statistical data and other sources, and by running algorithms on the data it can

verify and approve applications for business loans of up to $150,000 for local retail outfits. It's delivered over 250 million in loans already to small U.S. businesses that wouldn't have gotten financing otherwise, and currently employs 150 people.

Or take OPower, in the energy space here in Arlington, Virginia, that works with over 75 energy utilities, providing millions of people across the country with a better understanding of how they use energy, basically giving you a report that shows you how your energy is compared with a benchmark and targeted tips for how to save money. They rely heavily on freely available U.S. government data, to enable services including national and regional trends in energy consumption, weather data, information about the energy efficiency consumer appliances, et cetera. It's hired 200 people, it's growing rapidly, and to date it saved Americans, helped Americans save more than 1.4 terawatt hours of energy, which is enough to power all the homes in a small city for a year, and over 165 million on energy bills. Wattzon is a company that does something similar. We Make It Safer is an interesting company founded by Jennifer Tooney in Oakland, California. It basically enables you, if you're a consumer or small business, to monitor your possessions or monitor your inventory for recalled products, by checking basically the products inventory against a complete database of all products that have been recalled.

It's got over 400,000 users now, it's checked 4.5 million products recalls, it's already prevented an estimated 2,000 injuries, and relies heavily on data obviously from our consumer products safety commission, our national highway traffic safety administration, and it would have been impossible to start that without U.S. government data.

Noodle is a company that built a tool that leverages government data and students own data to help students find the right college for students like them, based on school information and affordability. I could go on and on and on. But it's incredibly exciting.

Because, you know, one of our favorite laws of the universe for open government and open data is I think a lot talked about previously, called Joy's law. It's named after Bill Joy, who once famously said, look, no matter who you are, you have to remember that most of the smartest people in the world work for somebody else. An enormously large number of smart people work for the U.S. government. But even the U.S. government is vastly outnumbered by the rest of the planet earth, right? You could actually take the people's data, the data people already paid for, data taxpayers have paid for, and you give it back to them in machine readable, easily findable, usable form, while rigorously protecting privacy, then Hudson will create iTriage, and countless other new applications, services, companies, nonprofits, actually help deliver vast benefits to American people, grow the economy, create jobs, make the marketplace more efficient, and result in general rejoicing.

So one note actually for PCAST is that McKinsey is now sufficiently interested in this they're doing a follow up study, not the same level of depth as the health data initiative study, but a follow-up study using the same basic technology at the other 5 new data initiatives as well. And trying to basically say, okay, what's the most important data being made available, what are the archetypical examples of what's happening with the data, what are the key emerging value axes, what's the aggregate total benefit for America, what does the public sector, private sector, need to do, keep doing, in order to unlock this potential. And that should actually be coming out in the spring, which we're very, very excited about.

I also should note that this was largely enabled, this work, especially over the last several months, in particular, of course, by the work of the Presidential Innovation Fellows, who have done enormously awesome work to help make data more findable, accessible, usable, machine readable, have actually helped get the word out about it and get it integrated and to develop entrepreneurial communities and tripping the use of it, et cetera, et cetera. So hats off to them for everything they're doing to help us with this effort.

In terms of next steps, one, we are going to continue to enlist additional federal agencies in the open data initiatives program as fast track liberators of key existing datasets that create large scale economic benefit while protecting privacy. We also, as per the recently announced digital government strategy this past summer, are going to be with OMB issuing policy soon that makes open and computer readable the default status of new data created by the federal government going forward, that's part of the digital government strategy that was released last summer.

We're upgrading the data.gov site and its communities to make it even easier to use for entrepreneurs and developers, to put new content there about what are the most important new datasets that actually have been surfaced, based on feedback from the observations in the world. What are archetypal examples of how they have been used and how to get people started using them? I think that's the key content we now have we can put on data.gov, and just continue to expand our productivity to entrepreneurs across the country. We got a lot of interest from everyone, from major capital networks to entrepreneur networks to lean start-up type organizations, universities, et cetera.

And we're really, really interested in again kind of creating online documentation of all of our content, all of our learning in terms of the most important datasets, examples of how they're being used and how to use it, and putting that in kind of a self-serve form on data.gov so everyone from universities to entrepreneurs to venture capitalists to start-up can take that and then promulgate to their audiences and their stakeholders and their networks, information about the data that's available and how it's being used and to spur more use of that data. So we're very, very excited about this.

As we increasingly live in and move into a data-driven economy, data-driven world, we believe that open data initiatives can play a major role in having that world produce maximum benefit for the American people in terms of improvements in lives in very tangible ways, economic growth, and jobs. And we're just very excited by continuing to jiu-jitsu as we head into the second term.

>> Thank you, Todd. Wow. Are you excited about this?

>> Yes. I wasn't going to tell you this, but I'll tell you this because we're among friends. Also being webcast globally. In the spirit of -- whenever I hear, which happens increasingly often, about a new incredible use of our open data to help people, to create jobs, I have this little happy dance I do, and actually --

>> Would you like to do it for us now?

>> Yeah. Yeah. Actually, it could go viral. So I was actually going to tell Eric Schmidt about this because the latest example happened recently when Bryan Sivak, my successor at HHS, who is leaving to help the initiative, just called me and said go to Google and type aspirin into search box. I said why. He said just do it. So I went to Google and typed aspirin in the search box, and poof, next to the standard search results there was this whole box that had a whole bunch of fantastic information about aspirin from FDA, and U.S. government, sourced from FDA and U.S. government, and the best part about this is we didn't know it was happening. It didn't happen because of evangelism by us, didn't happen because we met them at a meet-up. They just somehow learned about the API we have for Daily Med, and boom, they materialized. And now that information is helping everyone on Google who searches for aspirin and every other drug. So I basically then got up in my office and uncontrollably -- and that's what I do now, actually, every time I hear about this. And it's happening a lot. I'm dancing like continuously. It's like a nonstop dance-a-thon in my office. So to answer your question, I'm incredibly excited.

>> Good to know. Yeah. So we saw our practice of raising flags and I see a trillion. Jackson has her flag up.

>> Shirley Jackson: A few comments. I'm looking for gangnam style. In terms of your happy dance. Not that I could do it.

Question, here. I assume that when you keep talking about things being in machine readable form, that underlying this is some of these semantic type technologies that allow intelligent software agents to do inferential search. One, is that true?

>> Todd Park: It is not yet true. We're at a much more basic level of machine readability, we're talking like downloadable XML files, or restful APIs that just surf the information and consume away. Our general mantra has been -- just make data available in whatever form you possibly can. Not perfectly, just get it out there. Because the feedback we have gotten from developers is if we don't get it at all, we can't do anything with it. But if you give us something, we can actually work with that. That being said, folks have actually been advancing semantic capabilities integrated with our open data, and with data.gov, that I think are very exciting. So we published, for example, our hospital compare, hospital directory, and quality dataset, in a semantic form.

>> Shirley Jackson: I think Jim Hendler has been doing some work.

>> Todd Park: Exactly. So I think that's an exciting frontier. I think that will be at the vanguard of what we do. But there are a lot of folks who are just entering this game, from a governing standpoint, so we just want them to do whatever they can and then eventually migrate toward the ultimate.

>> Shirley Jackson: Because you answered the first, and so I don't have the second question.

>> Always good to see Todd. You know, it was interesting watching you dance. The two Erics on PCAST can be found online dancing. Actually doing it gangnam style, but we won't go there. So we'll add your -- other members of PCAST are still very much wanted to complete the collection.

>> Maybe I'll come back we'll all dance together.

>> My question is something we wrestle with especially in thinking about advance manufacturing, one of the most impactful reports that's created and it's about capturing the benefit of all this activity. What do we know about the relative ability of Americans and the American economy to capture the benefit? In principle this data, as you said, it's open, it's free, it's global. But what about what we as Americans derive from all this? Other than the obvious benefits, but sort of secondary ones.

>> Todd Park: So are you talking about what -- when we open up our data, how are we assured that America -- benefit proportionately from the openness of our data. So that's a great question, and as an analogy I will tell you a story. Which I think is directly analogous. There was recently held a meeting at the White House with about 14 pioneering open data entrepreneurs who had built their companies on open data from the government. Like BillGuard, like On Deck Capital, like O Power. And we actually asked them if they would be willing to be open data ambassadors. We actually came up with the idea, we asked if they would be willing to do it, to spread the word about this data and its availability. And they all said to a person, absolutely.

We actually said just to test that for a second, to pressure test it, why would you be interested, as an entrepreneur that's using the data, spreading to other entrepreneurs that the data is also available to them for free. They said you know what, we actually want to expand the constituency for this data, that needs the

data, that ensures that it's accessible, that demands improvements in it, right? And we are confident that we will always be the best at using it.

So I think the analogy for us in the country is by definition, it is available on data.gov, it is available to entrepreneurs everywhere globally. I think actually we will always be the best at using it, and we actually do our outreach, when we do all our datapalooza activity it's obviously built on America, right, but I think to make it only available to Americans, would, A, be technically not possible; and B, kind of goes against the spirit of the data. But I think because of our proximity to it as a nation, and because of the nation's proximity to the U.S. government's efforts to educate folks about it, I think we'll always be our ecosystem of entrepreneurs and individuals will always be the best at using our own data.

>> -- if you're kind of giving any thought to a next stage where you try to shape the databases in ways that encourage kind of collaborative programs with the agencies that then can reach out to companies or to cities, big data in the urban environment, et cetera, et cetera.

>> Todd Park: Yeah, so this is really at the root of the intragovernment strategy and it's future artifacts like the open data policy that's going to come out, is that what you really need to do to maximize the potential open data is to evolve how the government itself and its agencies just fundamentally manage data, right?

And so if you do things like think of the data as a resource you want to make interoperable from the beginning, and bait that into your systems, that's by definition going to make it a lot easier to make it available to others, and to others could be the public. But there are other data systems we have that we will not make available to the public for all kinds of good reasons with respect to privacy and confidentiality, or national security. But it will actually enable that data, or any data, to be better used internally at that agency. And, you know, will encourage interagency collaboration by making different datasets interoperable. Mostly usable by others in the government. And so I think that the notion of actually making data more naturally machine readable and available via APIs will both aid and abet the open government, open data movement overall, but also improve the flow and management of data internally within and across agencies. Again, with all of my primarization I talked about previously with respect to protecting privacy and confidentiality.

>> Ernest Moniz: But program structuring would always stay with the agency.

>> What's that?

>> Ernest Moniz: Program structuring, using the data, would stay with the agencies and not come into your office.

>> Todd Park: Oh, yes. Just to be super clear, so my office is acting as leadership and catalyst for this effort, but health data initiative is being executed by HHS and a lot of agencies, energy data initiatives being led by DOE, safety data initiatives is being lead by Department of Transportation, and a set of other agencies.

The Finance data initiatives being led by Treasury. So the teams that are powering these initiatives are actually at the agency level. Who have actually, you know, many of them hired Presidential Innovation Fellows to actually help, they have their own teams working with the Innovation Fellows to advance the ball, going forward and keep doing it on an ongoing basis.

>> Rosina Bierbaum: Todd, very exciting, and it's clear you don't have enough to do. You started off using the word ecosystem, and as the resident ecologist on PCAST that got me going. And you may recall that Barbara Schaal and I did, with others here, the sustaining environmental capital report. And one of the things

that was shocking is the pathetic state of environmental data. And even though the federal government spends something like $600 million a year on environmental monitoring data, for very good reasons, wanting clean air, forests, oceans, fisheries, et cetera, a lot of that, A, isn't in data.gov, and then a lot of really valuable time series data may still be inside a notebook somewhere, so they're not even in digitized form, usable, available at all.

And I think there are decades of these data that could be really helpful if we could have access to them. And we were told during the course of our study that actually many industrial partners who work with us would really think of innovative ways to turn these data into usable data if they were available. So for example if water quality is changing and that's relevant to their supply chain, or sea level is rising and that's relevant to where they put their operations, or if they had some warning of extreme events they could shut down their operations in time rather than lose data, that that would all be very valuable.

So I would encourage that if you think about a phase 2 after these first five, that environmental data are so far back at where weather data or GPS data were in the beginning, that there would be a lot of value added to trying to make this accessible, and help cities, states, and the nation evaluate not just whether ecosystems are improving or not, but actually how to manage in day-to-day ways as the climate is changing.

>> Todd Park: I would love to follow up with you about that, because I think to me the work that you've done, you have an incredibly good picture of what datasets we have that would be most helpful and what state they're in. As well as actually a very clear sense of what the value proposition is to make that data available in machine readable form, and probably a way to prioritize it. So I would love to talk with you about that.

One of the things I found, in talking with folks across federal government is, you know, I would say it's sad, the majority of the people I talk to are absolutely, from just a philosophical standpoint, you know, fundamentally biased in favor of open data. That's something they actually think would be a good idea, right? The challenge for them is that they have been asked to do a zillion different things.

I think that the most valuable thing that you can do in those conversations is say there are very concrete benefits with bringing this to the American public if you make this particular dataset available. And point to all the different use cases, point to a whole bunch of people that are ready to use the data. Then in my experience changes the conversation quite significantly, because people see the business case for why to do it. And then the relatively modest investment in most cases of time. And enable the money required to actually make the data available in machine readable form, that's something that moves along much more easily.

Now, when it comes to data that isn't sitting in systems at all, right? Which is literally on paper, that's a different kettle of fish. But again, for the right business case agencies I think -- the right social business case, agencies I think get interested. So we should talk about that.

>> -- sort probably a typical doctor question which is for the health data, particularly the consumer apps and uses that you're describing, the quality of the interpretation that these various entrepreneurs are able to package and what they're saying. You know, there's a phrase in medicine called an internet-positive patient. Which is where the patient comes in with all kinds of pronounceable kinds of things they've found on the internet, and some are very valid and useful are some are not valid. And there's no filters, right?

So it strikes me that that's a concern, but that it's probably a concern that can be addressed through the same kind of crowd sourcing, right, and so my question to you is, are there apps developing that give weightings of the other apps, or that in some ways describe how evidence-based is this information and the way it's put together, are people working around that kind of an idea?

>> Todd Park: So there are absolutely rating systems for apps, you're right. The rating system of course for the Apple apps, rates I see as very highly. And I think that just as an empirical observation you definitely see apps getting traction that are delivering better information, better results.

So but there is I think, and I suggested this to a number of people, anyone who is interested in talking about it, there is an opportunity for someone to introduce another level of rating system. Not us, obviously, but someone like consumer reports, et cetera, right? Who could put experts on the case, right, to say look, in addition to the user interface being really compelling, and it's seeming okay, we've actually looked into how this thing works and we think that the kinds of information it's presenting are actually better.

So I think that would be a huge opportunity, obviously. And it would have been unnecessary a few years ago because there wouldn't be anything to rate. But as these apps and services proliferate I think there's a huge opportunity for that, I think it will get a lot of traction. And it actually is interesting. One area where the government still seems to be massively trusted is in the arena of information resources, right? So in a lot of research people conducted they found information from the government is actually considerably more trust worthy than information from a lot of other sources.

So one of the things that folks are doing like Healthline is they're attacking, their search engine that's attacking the problem, that traditional answers for help do turn up a lot of garbage. So they're using data from the government and other sources to help filter for you, prefilter search results, so you actually get the information that is actually probably the most accurate so that you can be guided directly. Google is another great example, you have a lot of search results, but then boom they have information from Daily Med API posted prominently in a huge box next to the search results for aspirin. So that's really cool.

>> Thank you.

>> Todd Park: Thank you.

>> Miraculously, this session was scheduled to end at 10:35, and it's 10:35. How it happened I have no idea but the PCAST --

>> Brilliant chairmanship.

>> Yeah, oh, I think we can describe that hypothesis there because Todd gave so many remarkable examples, it's really stunning to see what happens when you unleash the creativity of the American people.

Where else is data rattling around, Todd, uses on your list of five or six series, what's on the back of your mind of other kinds of data that are crying out to be liberated?

>> Todd Park: This is data that I want to get about our data, actually. And there are efforts underway to do that. It's to more definitively catalog everything we have, and to get a better understanding of what could be incredibly valuable. Because we actually don't, as the government, have a definitive sense of everything that we've actually got. And so I'm really, really eager to push on that frontier and identify additional sectors.

What's actually really fascinating is that complementing that, and I think potentially even more effective than that is the fact that we are now getting proactively paid by agencies and innovators across government about being data jams, doing datapaloozas, doing open initiatives, wanting Presidential Innovation Fellows to come in and help them with the right data. In fact, actually NOAA asked me for a Presidential Innovation Fellow, I

said to do wha?. They said well, to work with open data for us. I said you need someone to help work with you on open data? Because you're the grandmother of them all. But they want someone.

So I think this grassroots demand for datapaloozing, open data initiatives, and people to help with that, is incredibly encouraging. And it's coming from people who are real experts of each of their sectors, whether it's weather, or agriculture and food, just two recent examples. People who have a very clear emerging sense of how our data could be helpful. In catalyzing useful innovation in those sectors. So I think it's great. That's just huge, I think it's a culture shift they want to keep fanning the flames of.

>> Thank you. We will continue to ask you to update us on this because it's moving very rapidly and because its impact on the American economy, health, and many other things is really very clear. Thank you very much. Thank you sir. (Applause.)

We're doing okay, we're going to take a three minute stretch while we convert to the next session, then we'll begin. Three minutes, we'll convert to the next speakers.

(Break.)

>> Eric Lander: Before we start this session I've been directed to the Twitter feed from the last session, and I'll just mention nice comments on Twitter about this last session. Listing to F. Todd Park talk to hashtag PCAST makes me feel that I'm headed in the right direction in my current educational path.

I like that. That's very good.

>> He's a law student.

>> Sorry? This is posted by somebody whose handle is @ideaofhappiness, which I'm going to guess is not in law school. Just a thought here, Rick.

We are delighted to have on our next session two members of an IOM panel that produced a report that is of great interest to PCAST, because the topic is of great interest to PCAST. And this is a report about better health care, more efficient health care, topics that matter a great deal to this administration. The PCAST itself is very interested in trying to pursue in the presence of health care reform that is going to be coming into effect, that has already in part come into effect, will be coming in more into strongly effect, we need to ensure better care at lower cost, and the emphasis here is better care and at lower cost.

So since the IOM had a report entitled better care at lower cost, we very much wanted to hear from members of this committee to tell us about it. And we have with us Helen Darling, who is president of the National Business Group on Health, formally called the Washington Business Group on Health, and we have with us Brent James, the executive director of the Institute for Healthcare Delivery Research and vice-president for medical research in continuing medical education at Intermountain Health Care. And we are enormously grateful to you to tell us about what the IOM did in this report as well as your own thoughts about it. Because PCAST is formulating its thoughts on how we might go forward based on the foundation that you have built.

So thank you both for being here, and we have an hour to really just dive into the subject.

>> Helen Darling: Great, thank you so much. And I'm going to make some introductory comments and then Dr. James will give you life from the real world, where really important changes are happening.

Before we start I'd just like to sort of step back a second and think that we've just come out of this horrendous and frankly quite heart-wrenching to watch fiscal cliff solutions, and the fact that we're going to face in two months more of the same, basically. And one of the points that the IOM committee makes and has really hundreds of pages of material to document recommendations, that we don't need blunt cuts, we don't need dysfunctional blunt cuts to the health care system. We in fact need to move towards active redesign and reengineering of the health system. That there is more than enough money, over $700 billion in waste, and I'll have some details on that from the committee.

That is either not providing any benefit, or may in fact be actually causing harm. And those resources can be reprogrammed to be used for other purposes, including not just health care. Education, training, development, infrastructure. All the things that we're neglecting because, as was said a number of years ago and continues to be true, health care has become the Pacman of the federal budget. Health care has become the Pacman of state budgets, county governments, so schools, education, all the things that really will make sure we have a good standard of living in the future, are being undermined, and really eaten up by health care.

So that's a lot of the spirit of what we were trying to do, and I know all that's really important to this group. So you can see one of the things that we were asked to do in the particular study, this also came out of some work by an institute at a round table which has defined the work. And among other things to say that we have to have a learning health care system if we're going to accomplish all the things we want to accomplish.

So the IOM committee was asked to describe, to document, what is needed to have such a learning health care system. It's a fabulous report, I'll give you the committee list, and I know you all have a copy of the report. It was chaired by physician Mark Smith, who is president, many of you know him, of the California Health Care Foundation, and of course Dr. James was on the committee. We had an all-star group, and many physicians, most of them actually working in the kinds of systems that are doing what we're talking about.

So these aren't pie in the sky ideas, they're not dreams, they're actual examples all over the country that these things have happened.

And to tie it back to the affordable care act, one of the many good things about the affordable care act is it is full of demonstrations and opportunities to establish and demonstrate a lot of things that will in fact accomplish what we are talking about and what we want to accomplish. We will just say that we all want them to go further, faster. Have, you know, faster spread, and that's we hope the kind of thing that PCAST will be helping with.

So one of the questions we were asked was why now. Because some of these issues have been around a long time. And the committee said, first and foremost, quality shortfall. There continues to be serious problems of patient safety in this country. You all know this, I'm sure. But frankly, sadly, the American people don't know how seriously how at risk they are in the health care system.

Second, and this is the work that Chris Cassel has been leading for the last few years, in the choosing wisely campaign, we know that we receive a lot of care that is not evidence-based, it's not the care that actually makes any difference. And some of the care actually is harmful, and some of them, because that's what you're getting, you're not getting what you should be getting. So there's a lot of lost opportunity.

And finally and I think you can see that last figure, if a state, if all states, had the kind of care, the quality care, that the best performing states have, we would have had fewer, 75,000 fewer deaths. So this isn't just it's nice

to do. We're talking about serious mortality issues, we're also talking about morbidity and injury. So we need to change the quality profile.

Second is unsustainable cost and waste. You I know have heard a lot about cost. Most of us feel that if what we spent in health care actually improved health it wouldn't be that big a problem. The problem is a lot of it doesn't. And it's lots of it. So it's really very wasteful. And especially when you think of the other things our society is giving up in order to pay for health care, we really have to ask questions of why are we doing this. And it's of course affecting the overall economy.

This is a chart that the committee put together which covers waste and expenditures, and this breaks it down in a very, I think a very useful way. If you look, the largest unnecessary services. So these are services that don't help anybody. $210 billion.

Inefficiently delivered services. And this is where the reengineering and that kind of work comes in. 130 billion.

Excess administrative costs. And like everyone, Todd Park is just a marvel to watch and enjoy, but a lot of the waste in our system is in administrative cost. All you have to do is go to the doctor and get four tests and most of you will get at least 16 different pieces of paper telling you what was done and not done, and you won't necessarily understand it, and even the people who do it won't.

So there's that kind of waste, and it's $190 billion. And I think even in the debates in Washington we think this is real money. Fraud is relatively small, but we certainly need to worry about it.

Missed prevention opportunities. And this is where in this country we know many of the people who don't get what they should be getting are minorities. They are people who get no care at all in some instances, and they certainly don't get the care that they should be getting. So disparities is a serious problem. And then prices too high certainly compared to the rest of the world.

So just to put it in terms that I think are quite salient, just what it would cost. So waste in the U.S. health care system could pay the entire Department of Defense budget in 2009, and have $100 billion left. Waste could pay the salaries of all first responders for 12 years.

One of my favorites, waste could pay the tuition and fees for every 18 to 24-year-old to get two years of college in the United States. And many of the people who are getting it are going in and getting loans, and going into debt and they go into a downward spiral, terrible things happen because we're spending wastefully in the health care system.

Finally, in terms of why now, and increasing complexity, you can see the number of medical journal articles since 1970 to 2010 going up to over 300,000. We know that a human mind cannot alone deal with the increasing complexity, and so we need help for that.

And patients themselves are more complex. There are more clinicians involved in care. Some of the data that Todd Park talked about, hospital compared data, you've seen it in the last six months of life that somebody would have seen 57 physicians in Dade County, Florida, and places like that, not to pick on them. And ICU clinicians must complete 180 activities per person per day. So this is really an unsustainable situation in every way.

In the presentation we can go, we have a long list of opportunities, and we encourage you to look at those

recommendations, all of which will resonate I think very well to this group because you all in one way or another are involved in these things.

And I would just skip to the last group of slides, where we have some suggestions, because given your role, the government, the federal government in particular, as a payer, the largest payer probably in the world, but we know certainly in the United States, they also have enormous power as a payer. As a payer you don't have to have regulations; you define what you're going to pay for, and you pay. So it's a totally different process. If you think of it as the largest employer in the country, it covers 9 million different people. Then what the federal government can do as a payer, and as somebody contracting, just like a private payer, is completely different from regulation. And you have great opportunities there to advise the President, and to do work on these things.

We also have the federal government as a provider. We know very well it provides a tremendous amount of care directly in this country. So it has a lot of ability to influence things through that.

Obviously as a regulator. And I think more importantly than ever, what's happened with the Affordable Care Act, we could have somewhere around 20 million people starting in 2014, which is literally next year, millions of new people in the health system with really very rich benefit packages. This will have an effect on the workforce, it will have an effect on many different things. And we have to make a lot of changes to help get the system ready for what will be exciting and wonderful. We have 20 million more people with insurance who have never had it. We would hope to have 32 million, which was the original aim of the Affordable Care Act, and the only difference in those figures has to do with the way the Supreme Court made its decision on Medicaid.

So the 12 million difference between 20 million and 32 million is because it's possible that many states will not change their Medicaid programs, in fact many have already said they won't, so those people won't be covered. But in any event, the system needs to be changed very dramatically, and we have to find the resources to make a difference not just to have better health care at a lower cost, but also to spend more money on some of the other things that will make our country better. Not just keep giving it to health care.

So with that, I'll turn it over to Dr. James. Thank you.

>> Brent James: Thanks, Helen. I want to just make three points to get started. First, I've been at this a long time, it was my privilege to serve on IOMs round table on quality led by Mark chassen, now head of the joint commission.

In fact, in the old days as a result of that work the IOM launched something called the committee on the quality of health care in America. We produced two seminal reports, the first was called to err is human. That's where the estimate of 44,000, 98,000 preventable deaths each year from care delivery, where the cause of death was care delivery, not the underlying disease, that's where that first arose. probably the finest piece of work which I've ever been associated, though, was the crossing the quality chasm report, and IOMs prescription free form of U.S. health system. Frankly it would apply equally to any modern nation who needs similar reform, and I think it's still pertinent today.

As I reread through the report we're discussing today, the health care system, better care at lower cost, I think it's in the same quality. And I recommend it to you very, very highly. At a minimum, you should read the roughly 40 pages contained in that summary of the report. And then if you want the fine detail, that's in that massive volume lying back behind it, if you care to examine it.

Second point I wanted to make. Coming from the front lines of care delivery, the waste estimates that are

included in that report are low. I was happy with that, I was okay with it because it's good to be conservative when you're publishing a report of that scale. But particularly, though, on that category of inefficiencies in the health system, I'm an engineer by training. I trained in quality with a guy named Deming back in the old, old days directly. I took Dr. Deming's ideas of waste in care delivery, translated them into a health care delivery setting, one particularly is called TPS lien observation. We estimated that somewhere between about 20 and 70 percent of all front line workers time in health care, this is physicians, nurses, central supply people, pharmacists, the whole list, 20 to 70 percent were technically waste.

Now, that's about half of all health care expenditures all by itself. The number, $130 billion, for inefficiency in health care is grossly low. When you carefully measure that at the front lines of health care. Think of that one third of health care being waste as a low ball estimate. We estimated it was at least half. Now, this is in a system, Intermountain Healthcare, identified by the Dartmouth Atlas as the most cost effective system in the United States at a systems level. They estimated if the rest of the country were to deliver care the way Intermountain does, that the cost of Medicare would fall by 34 percent, mortality rates would fall by about 2 percent.

I'm talking about a system that by comparison to our peers is already very efficient. But compared to our potential, it's grossly inefficient. And I see it every day. It's very, very real, at the front lines of health care.

That's where I really wanted to focus. I wanted to take the recommendations, which you can read at your leisure and turn them into what it looks like down at the front lines, that's taking some liberty with the report. I like the way that we stated the report is a policy document. But in the end, it comes down to what you can do, at the front lines of care delivery.

First idea, the foundational requirement. It permeates the report, but I don't know if we were explicit enough about it. It requires an organized system of care delivery. Everything that you read in that report assumes that structure and organization. For most of American care delivery that organized system does not yet exists.

On the other hand, we helped to organize something called the high value health care collaborative, 18 big integrated delivery systems, many waiting in the wings to join. Those 18, though, represent about 15 to 20 percent of all health care delivery in the United States. And we're watching a world evolve into organized systems of care delivery, the time could not be better for helping to formulate that evolution and to drive it ahead, make it more effective. More a system, if you will.

The key competencies involved in those systems are, first, process management and improvement, that's the engineering link right there. Knowledge, generation and management, I'll come back to that. Taken together, it forms I would add not just a learning health care system, but a learning and execution health care system.

Core problems of complexity at the front line play out in two ways. The first is the idea that context matters. Clinical trials, the main research tool that we use in medicine, are explicitly designed to eliminate context as a factor.

That's probably one of the major reasons that when we try to apply clinical trials results in daily practice, it doesn't work consistently. We've routinely shown that the care we give in routine practice doesn't match what the trials demonstrated. The reason is it loses that context, you get different results in different settings. Now, there's a seminal text to my mind on this, possum, Tilley, a couple of British statisticians, a book called Realistic Evaluation, where they proposed new study designs, tapping heavily into engineering principles, in terms of how you would organize a research enterprise for context matters.

It applies in another way, though, that I think is more direct. With a very few exceptions I can demonstrate that I can't write practice guidelines that perfectly fit any patient.

One part of the complexity is that every human being who comes to care is different. Different genetics, different environmental factors, different exposure to pathogens in the environment, different response to those pathogens because of their different genetics, different expression of disease, different response to treatments. Where you layer on top of that difference in personal preferences, resources, values. Easy case to make.

One of the seminal break-throughs, in our recommendations this idea that I'm just showing you picks up recommendations number 3, 4, 5, 6 and 7. Just in passing at a functional level. Learning health care system. Sometimes we call them bundles. It's the idea of an evidence based best practice guideline deployed into the front lines of care in an organized system.

You first identify a high priority clinical process, a body of engineering co-key process analysis, you build an evidence based best practice protocol, fully understanding it's imperfect. Easy case to make, again, that they never quite fit.

The hard one is number 3, that's where the rubber really hits the road. You blend it into clinical work flow so that you don't rely on human memory. You make the lowest energy state, just let it happen, alternative being the evidence based best care.

The fourth element, you build in a data system. The data system has two purposes. First, to track protocol variations, which are going to be common as we'll see in a moment.

And number two, it tracks short and long-term patient results. Not just clinical outcome, but also cost outcomes, and patient experience, care, service and satisfaction outcomes.

Number five is the surprising one. Technically in quality theory, part of Weem, it's called mass customization. Part of the theory. The way I say it to my physician and nursing colleagues, pharmacist colleagues back at Intermountain, ladies and gentlemen, it's not just that we allow or even that we encourage, we demand that you modify our shared baseline protocol based upon individual patient need. I can demonstrate that my protocols never perfectly fit any patient.

That's why we have you. Your job is to modify based upon individual need. Having quite a number of these under measured operation today, I can tell you that they'll modify about five to 15 percent, of a typical shared baseline protocol, to meet the needs of an individual.

And that's where the learning kicks in. You build a formal learning loop. Feed the data back. That requires organizational structure, some fairly sophisticated data systems, to make that happen.

Now, the thing you need to know, this stuff works. And it doesn't just work for Intermountain, but it works for many different organized systems of care across the United States, we're far from alone in this anymore.

Just number one quick example, the number one cause of death in hospitals today in the United States is sepsis, a body-wide infection. About half of those cases went into the hospital through the emergency room.

A few years ago Dr. Jerry Clemmer one of our ICU physicians, Dr. Todd Allen, an ER physician, put together a shared baseline bundle, one of those guidelines as I described it shows compliance rates over time as they deployed that out. It turns out that nationally the mortality rate for sepsis coming through the ER ranges

between 20 and 50 percent. As many as half of these people die.

When we started we were pretty good, we were right up at the top of the country, we had the 20.2 percent mortality rate. I checked before I came, the last few months we were at 6 percent.

A new standard for care? It's about another 115, 120 lives per year for Intermountain. People who didn't die, who would have in the past.

Now, the first take-away from this. We count our successes in lives. At Intermountain I can document over a thousand lives per year. A relatively small integrated delivery system. People who would have died a few years ago, who don't today.

And that's the first principle, we count our successes in lives. Without going into the details of Deming's core theory, we've also demonstrated that in almost all instances better care is cheaper care. When you do this, the total cost of care declines dramatically, it is a tool for eliminating waste within the care delivery system.

Not by rationing care, not by death panels, not by withholding necessary care. But by delivering the best possible care. In fact, I would like to believe, I'm not sure this is too wrong, Intermountain's short version of our mission statement for the last 15 years has the best medical result at the lowest necessary cost. Every time I read the title of our report I think wow, that looks just like Intermountain's mission statement. So there you go.

Now, turns out that learning systems have a second part. Imagine that I build a system of managed care, we've been investing in this heavily for the last 15 years, and it's been a big investment. You have to build, number one, data systems specific to this application. Oh, that's recommendations number 1 and 2 in the report, is the digital infrastructure and the data systems necessary for this purpose.

That's how they played out for us. We justified the investment for care delivery system performance, the best medical result at the lowest necessary cost. We were generating literally hundreds of millions of dollars of savings for Intermountain using these tools by eliminating waste. But it had a third implication, number three on my list. Imagine that I took the resulting critical management data system and I used it to, number one, generate something called true transparency. I need to come back to that in just a moment.

But number 2, torn from every patient, we've built into that in our structure. So here we are, a community based care delivery system. We're not a research organization, we're not an academic microzone we have a couple of them but, that's not our primary mission.

Last your my best clinical development team published 12 peer reviewed articles. It was the NICU development team chaired by Bob Christianson, two of them were seminal breakthroughs in care improvement. My cardiovascular team, that's three clinical development teams, the management structure for this thing. 45 peer reviewed articles, 54 abstracts, about an additional 12 book chapters, other academic production. We are producing, out of a community based care delivery system, more academic production, more knowledge generation than a typical university on a similar scale or equivalent departments, I guess, would be the way to say it. Because we've integrated it into care delivery, so that it's possible to learn from your experience with every patient.

That's part two of the learning system. It's not just applying the knowledge, but it's generating the next generation of new knowledge in formal, rigorous, defensible ways.

Effectively what you've done is built cost effectiveness research into every care delivery interaction. So

organizational structure and data systems, that's the idea behind it.

Now, I need to talk about transparency. Dr. Cassels and I served on the strategic framework board of the National Quality Forum for seven years. This is one of the outputs of that, an article, lead author Don Barrywick, I was second, Molly Quaid also contributed significantly. We talked about the idea of measurement for performance and have pointed out there are two main. Pathways here on the left we called it measurement for selection, this is the way the government usually thinks about transparency. So you produce performance results, measurements, for selection is the idea that you route knowledge about performance to consumers, purchasers, regulators, patients, contractors, referring physicians. And the idea is the patients are able to vote with their feet, purchasers are able to vote with their contracts, if you will. It has the belief that it will motivate a pathway to -- which is change or improvement, or a better name for it might be learning.

The learning system is the right-hand side of this whole graph that we've produced in that medical care article. Measurement for improvement, you produce measurement not focused on individuals, the people, the institutions, but about the processes. The engineering level.

Now at a process level. Knowledge about processes and their results. The main consumer of that is care delivery organizations and care delivery teams, you see. What you need to know is everything I've described in the learning system comes from the right-hand side.

The next thing you need to know just in a very brief running by. Measurement for selection assumes four things, each of which is scientifically challengeable. Not just challengeable, but difficult to defend. That yo can sufficiently accurate rank in terms. That consumers will respond to the rankings to vote with their feet, it turns out they don't.

This is the performance measures subcommittee, another IOM subcommittee carefully reviewed the evidence on these factors just in passing. That there's sufficient good system capacity to handle the volume of people who do vote with their feet, there isn't. Finally, the poor performance will respond with real improvement. It happens sometimes, but far more common they focus on changing their documentation systems, they focus on risk selection, and resource concentration. Which damages the overall system. The main point around it, though, when you're building data systems for change or learning, you get very, very different data systems than if you build it around selection.

The data systems you get for change or learning tend to be very parsimonious, they also avoid availability bias, a major problem with many of the datasets we have available today. They minimize burden on the frontline teams. That number three is maybe the most important. It would work if we had infinite resources.

But when we get top-down demands for data for selection, what it does is basically shove out, push out, data for improvement.

The idea that data for selection leads to improvement is not correct. Is the point.

The funny thing is if you build data systems for change and learning, they contain selection measures. You get them free, basically. We call it roll-up, when you start to build up systems that way.

True transparency. When a government agency says transparency, they usually mean selection. The fact is on the evidence that most patients, when they come into a care delivery setting, at least with major disease, their primary need, their primary ask, their primary expectation, is a trusted advisor, a wise counselor. Usually a physician.

They want to sit down with someone who understands what's happening, so that they too can understand and make wise choices about the options in front of them.

This is another IOM committee, by the way. In the past. We define transparency as a situation in which those involved do not protect choices. Not just patients, but also their professional advisors and payers, have sufficiently accurate, complete and understandable information about expected clinical results to make wise decisions. That's a long step beyond the traditional view of transparency in the health care system. If you actually want a learning system, you see.

Well, the third element I want to emphasize, I'll do it in short because I'm taking too much time, it turns out that about 75 percent of the time when Intermountain has improved clinical outcomes and reduced waste, this is just one particular example, we are financially and significantly penalized. This particular instance, we drop the rate of newborn children being intubated for something called respiratory distress syndrome from 78 percent to 18 percent with a much less invasive technology. It saved the payers of care $872,000 at the small community hospital where we first ran the trial.

Just one little hospital. Fairly large birthing service. But it cost Intermountain $330,000 in lost annual revenue to eliminate that waste. We created windfall savings for purchasers.

The trouble, it's not just that current payment mechanisms actively incent overutilization, which they do. It's far worse that I am paid to harm my patients. And frankly, the systems the government is able to deploy to prevent that are limited at best, don't reach nearly far enough. It's the third item on the list. It actively disincents innovation that reduces costs to better quality. It activity disincents waste elimination.

I work for an organization who is philosophically committed to this demonstrated buyer behavior. It costs money to run those projects. What happens is when we're successful, our internal funding sources dry up.

We don't have the money to do the next project, as we strive to somehow recover funding, as we create those windfall savings for others. By the way, the evidence for this is very wide, strong indeed, throughout the U.S. health care system.

Well, I came up with my own list of recommendations. This is my slides. I think the first and most important thing that you could do as a group is to align financial incentives. While I appreciate what's in the ACA, I really do, it's too slow. And not fast enough. I think we know enough to act at this point.

All of these new payment mechanisms, ACOs, accountable medical homes, bundled payment, are

sophisticated forms of capitation. The tide has changed, I mean the world has changed, since we last experimented with this in the 90s with HMOs. The difference is we have better measures of quality so that we don't have to fight the fight about whether it's death panels, whether it's withholding necessary care, you see.

The second, pick your agency. I picked AHRQ. We need to empower an agency to help organize the structure necessary for this to evolve. They need to perform key process analysis so that we have not opinion, but science to base prioritization upon -- I call them care process models, is what I showed you earlier, those evidence based best practice guidelines with embedded data systems. You know, diabetes in Utah is pretty much the same as diabetes in Washington, D.C. or New York or in California. We shouldn't have to redo this a hundred different times. That's sort of a scientific enterprise, now it's the engineering level. It's building it down at the engineering level is what it really represents.

And finally number three, develop a plan for true transparency. So that we extend our vision of what transparency means in the care delivery system. So with that I'm going to stop, Helen. I'll open it up, I guess we're going to open it up to comments, questions, and you ought to be first.

>> Helen Darling: Actually, thank you, but I just want to add an example of the kind of recommendations in the report. You remember Todd Park's anecdote about HIPAA, and one of the things that the committee talks about is how a combination of real problems with HIPAA and misunderstandings about it, and real problems with institutional review boards, and misunderstandings about it, get in the way very actively. I mean, they are huge barriers to all that we laid out is needed in the learning health care system. And those are some very specific ways I think that this committee could look at some of the problems and help to resolve some of them.

>> Thank you both. No small visions you've laid out here, but pretty clearly the right vision. I think it's becoming enormously clear that this is the direction we have to move, and I think the world has recognized it. Your report gives us a nice roadmap to get there.

And I appreciate very much your sense of urgency, that we actually have to get on with this right now. It's an area that PCAST takes very seriously, and very often the PCAST finds itself between the role of IOM, able to do really very scholarly studies about things, but not necessarily able to make certain types of specific recommendations. And the PCAST is in a position sometimes to make those more concrete implementation recommendations building upon the foundations that have been laid by bodies like IOM, and more broadly NRC, and of course our own research as well.

So it could not be more timely. I would like to turn to my PCAST colleagues for -- to start the discussion, and I am not at all surprised to see the first flag is our expert in this area, Chris Cassel. Chris?

>> Christine Cassel: Thank you, Eric. Although I think Maxine got her flag up before I did, but --

>> Eric Lander: Well, in any case, I apologize. Maxine is next. Yes.

>> Christine Cassel: I wanted to take the opportunity particularly of having Helen, in her role as head of the National Business Group on Health to talk about the potential alignment with what's going on with the employer world and the private insurance side of things.

So Helen, you were very clear about the payment being a tool, and a lever, and clearly that's true for PCA, that's kind of how the whole thing is modeled.

And yet, there's limits. As you started your remarks reminding us of this cliffhanger we've just gone through,

and the fact that because it's the government, and understandably there are many stakeholders and it becomes a political -- everything becomes a political discussion.

And in health care you have I think now it's roughly half of health care is public sector and half is private sector, that's going to shift a little bit with the full implementation of ACA, probably. But there's still an important role for the insurers and the people who actually buy insurance for the employees.

And so my question is whether there is a role for PCAST in bringing those groups together, and beginning to not only think through how to -- what kind of recommendations could lead to the sort of high performing systems that Brent is describing, but what's the appetite for is there a leadership structure, maybe it's the National Business Group that would help us identify ways to get the best wisdom from the private sector approaches, from the payment side.

>> Helen Darling: Well, thank you. From the payment side. Well, we are in fact the private sector, and as an organization we are trying to use for all private payers models that say when you decide what you're going to pay for, look at the evidence, have actually evidence-based benefit design. In fact, we have a national committee on that. And we are working with the ABIM foundation and the groups that you're working with in achieving widely campaign.

What we're doing, and by the way we have the chief medical officer of the schedule employees, a retired admiral, who is the first chief medical officer, and she is putting into her contracting and payment policies true health plans requirements around, for example, significantly safer, better maternity care. They deliver -- I mean they're responsible for something like 2700 babies a week, or some phenomenal number like that, in their program.

So what we're doing, we are involved in groups, there's a group called the National Priorities Partners, which I know you've been a founding member of, your organization, and you, so we brought together all the public and private stakeholders to take very specific things like readmissions in hospitals, and overuse and misuse of maternity care, for example.

And say as payers, we're all going to stand together and say we've got to focus on quality and safety. One of the things that we've learned through like the death panel debacle is that if anybody talks about something that's going to be perceived as a take-away to the public, they're going to react. And frankly politicians tend to react to that. Not always fully understanding what's going on, but they will take it.

So what we found, all of us, is that on the private side we learned this lesson from managed care. It was a disaster in some ways. It did save money for about five or six years, but what we learned is that if you focus on quality and safety, and you do all the things that Brent talked about and you talk about in your choosing wisely campaign, if we all stand together and do that in our individual payer categories, and we're doing the same thing, and it's not -- because it's focused on quality and safety, it will have a much bigger impact on the people that are involved.

So, you know, you don't have the managed care backlash that we had, you have clinicians and others saying this is a good thing that we're trying to do together.

So that's very important, I think. And we are doing it.

>> Let me, if I might, just follow up with a question for Brent. The fact is the world is changing, in terms of payment impact, and we can certainly add our voice to that of IOM and all the others who said that. But the

skill set, the knowledge base to do the systems -- and this is where the system science comes into it -- really isn't embedded in most health care organizations. It is in yours, and you described a rather slow -- you've been doing this for about 25 years now, right? And you described a rather slow process of some other high performing systems beginning to adopt this. You described some of your innovators publishing papers in the literature, but it isn't like this is taking off. So the question is sort of the science spread, and how do you get things that are known to work, in terms of reengineering, to then be adopted more broadly. Do you have thoughts about that?

>> Brent James: Well, a couple of thoughts about it, Chris. The first is I think the first key thing is to align incentives. One of the things I find most troubling, I work for an organization that's committed to this course and theory, but we're still top line driven, revenue driven. The thing about revenue enhancement, under a fee for service system that's almost unavoidable. You're trying to shift that whole philosophy to not be revenue driven but to be cost driven, see what I mean?

And the bad player in that is that fee for service payment system. And we just made a decision as an organization to shift to full capitation in everything we do. I think it's the best thing we ever considered.

I've watched in Massachusetts where Blue Cross/Blue Shield as a payer purchaser has pushed in that direction, and it's already starting to have a salutary effect. That's the first thing to be said. The big dog, though, is Medicare. If Medicare were to push heavily in that direction, that would be very, very positive. How would you modify Medicare Advantage so that it became a more attractive functional system, would be one way to ask the question. Because that's already, Medicare part C is capitated payment. Which will solve this. You'll have to modify it a bit, though.

The second piece, as you know, I run the advanced training program in clinical practice improvement, I'm now up to over 5,000 graduates, senior physician and nursing leaders from around the world. I have about 50 daughter training programs running, and one of them -- well, two of them, Massachusetts, and I'm watching Beth Israel partners go after each other on these models. Their rate of change is massively more rapid than ours.

That's actually one of the things that I worry about. I watched the myna adopt this model in three years, and they're up and running on some big heavy processes. Pregnancy, labor and delivery being one big one. So they're moving much more rapidly now. I'll say in our defense that we were the weird guys out in Utah, wandering in the wilderness apart from the rest of the profession, kind of. Not the first time we've been in that position. And that we were cutting new ground. And that we didn't feel the kind of pressures that are in place today.

But I think, Chris, that I've watched the rate of change accelerate exponentially, we're well past the tipping point, it really is moving rapidly and picking up speed. It couldn't be a better time for this report, I think it defines our future, I really do. When I talk about those 18 big systems, 15 percent of our care delivery volume in this country, that's what I mean. And it's gaining ground rapidly.

Put your shoulder to the wheel, push it ahead. Give it some structure, and some form, so that people will be more successful.

I sometimes tell people that I can tell you at least 15 or 20 ways not to do most things, because we stepped in every hole imaginable. Sounds like science, doesn't it. Well, we don't have to step in those holes again. And you could really help us with that along that way.

>> The scalability and transferability was one of my questions, first I want to thank you both. Maybe we just

need more engineers to be heading the various hospitals and systems of the profession.

My question for Brent is how much training did you do as part of your investment in your organization, to get it started. And then what is your -- do you have a continual training program so that it improves. In the aerospace industry we had the entire organization of AlliedSignal, 80,000 employees went through training in total quality and implementing. And every year everybody committed to 40 hours, every bottom line committed to 40 hours of training of their personnel. I just wondered what's the scope of the training and continuous improvement?

>> Brent James: You've hit on a key element. If I were to move to an organization that's the first thing I would start. The advanced training program officially started, the earliest version of it, in 1987. And frankly I spend roughly half my time at Intermountain teaching. That's how I spend the bulk of my time.

I'll have three more courses starting up this month, later this month. I thought that after 25 years I sometimes get tired and I go to my senior management and suggest that maybe we ought to back off on this, haven't we done enough. I can barely keep up with turnover, right? And they look at me aghast.

The reason is that our professional training groups, the medical schools, the nursing schools, pharmacy schools, are not building this in. I have to retread all of my health professionals coming out.

My real trouble is of course the short version of the course lasts nine full days. Turns out basically a black belt level quality improvement expert, is what it turns out. We have a long versions that adds policy aspects, the full ATPX is a full four weeks, so 20 days of education. We just launched a 100 percent participation model based on DVD materials. You have to build infrastructure to support it, we should have done that earlier. But you're absolutely correct, it's maybe the first element.

>> Now are other people following you at all in doing this training? You mentioned the 18.

>> In a typical full ATP about 80 percent of the people come from outside Intermountain, and I currently have about 50 daughter training programs, sister training programs. My strongest is at MD Anderson Cancer Center, but Partners in Boston has one, Beth Israel has one , Mayo Clinic has one. So some of them very, very strong, some of them it's a mix. On the other hand, I don't think you can roll this out without that kind of a program. And let's just say you cannot send enough people to Boston or Salt Lake City to learn it. You're going to have to pull it inside.

>> Helen Darling: If I could just add to your question, something that Brent said earlier about changing incentives. We actually have a natural experiment going on already. About four years ago when the government announced that providers are going to start being paid based on -- and it's a small amount of penalty, or they'll be penalized on quality measures and safety measures

What we saw around the country was for the first time a lot of hospitals who frankly many had not paid attention to some of these things, they then went looking for the training program, and they began having internal training going on that had never happened before. Because for the first time, number one, their scores are going to be public, and number two, even though the financial penalties were very modest, they were the financial penalties. And because any extra -- if you will, extra cash, because Medicare fees as you know are set by the government, and basically they don't completely match their underlying cost. The only people who pay more than the actual cost of care delivery are private payers.

So that small percentage is really very important to hospitals. So one of the things that we can do, and we certainly hope you all support these ideas, is use financial incentives in a direct way. Not just how things are

paid, but also what's paid and how much is paid, in a way that allows them to -- I think it's another man like Gary Kaplan from Virginia Mason was on our committee, he talks about -- and Denny Cortez, retired from the Mayo Clinic, talks about how organizations self-organize around a set of incentives.

And so if in one way or another, whether it's a complex mix of bundled payments, some sort of adjusted capitation, however you do it, one of the ways they're going to get there and come out with an operating margin -- may or may not be profit, actual operating margin -- is if they self-organize around these, what they need to accomplish. And we've seen that work. The good news is for small amounts of money, hospitals have in fact, and health systems, have changed their behavior. So we have a lot of good evidence that these things matter.

>> Eric Lander: Great. This is really a fantastic foundation. Can we count on you guys for continued collaboration as we think through this question? I think this is a topic PCAST will be taking on over the course of the year, and you and members of your committee that have done this great report would be a valuable resource to us if we could continue to work with you. We appreciate your coming very much, taking time out so early in the year to come, but if I may, we'd really love to continue to have this dialogue with you.

>> Helen Darling: I'm sure we'd be delighted. Everyone on the committee was passionate about this topic, and as you saw, a number of people on the committee, and we have excellent staff in the person of Rob Saunders and his team. We all care deeply about these issues, and there's just no way you can look at the debate about the federal budget and leave this kind of money on the table, and see good things be caught or not supported when we have so much waste in the health system.

>> Eric Lander: Yes, and as you say, lives at stake, as well, with the quality of care. So thank you so much. (Applause.)

We've got a few more things to do. We're going to get a report from Dan Schrag on some of the PCAST discussion about climate. And then we have our public comments session as well.

But first, Dan.

>> Daniel Schrag: Thank you, Eric. I just want to give PCAST a brief overview of our discussions on leading towards a PCAST report on climate change that we hope to deliver to the President soon.

And let me just start out with some very basic review. This is just of course the model of CO2 curve, sort of remind people that carbon dioxide in the atmosphere is still rising. The worldwide recession did not slow it down very much, and in fact it's now accelerating. Getting very close to 400 parts per million. We're not going to cross that threshold this year, but we'll probably cross it next year. And to put this in perspective, this is higher than CO2 has been probably for several million years.

I think for me as a climate scientist, just a few months ago this is a picture of what the arctic looked like with the arctic sea ice. This is really remarkable, you see the northeast -- both the northwest and the northeast passages completely wide open. It's a stunning change in the geography of the arctic. It's also there is some evidence that it's actually beginning to affect weather patterns in the northern latitudes. Including weather patterns that may have contributed to the movement of hurricane Sandy. We are still working on this, but it's a very important change, this shift in the arctic which may be affecting the distribution of a jet stream all around the northern hemisphere.

Of course, last summer this country experienced really a devastating drought. This is a picture from Illinois from the mid-summer. More than half the counties in the U.S. were in emergency drought conditions.

This was a very serious thing, as we talked about in our report on agricultural research that was released last month.

And then of course this is hurricane Sandy, really just an enormous storm that had a devastating impact. I guess the House is debating funding for relief today as we speak, to provide the first input of relief. But the cost, it looks like it will be in excess of $60 billion. And you can just see the kind of devastation that Sandy wrought on New Jersey and also New York City as well. Okay, a picture of the New York subway system.

So one of the lessons that comes after the drought, after Sandy, and I think we've known this for a very long time, but I think it's now really front and center on the public's consciousness, is that national preparedness for climate change has to be a central pillar of climate change policy. The point is that the time scale of carbon in the atmosphere, of energy systems, and of climate, is very long. So even as we reduce greenhouse gas emissions, the climate is going to continue to change for decades. We will continue to experience impacts of climate change. And therefore, we need a national strategy to prepare for impacts of climate change that
both decrease the damage in terms of -- in building our robustness, but also increase our resilience, which means being able to recover from that damage as quickly as possible, and with as little cost as possible.

The national climate preparedness strategy has to include a variety of things. Mechanisms to communicate climate preparedness plans, mechanisms to communicate to the broad public the best indicators of climate change at a variety of scales, but at particular regional impacts and forecasting.

We of course also have to improve our ability to forecast climate and weather events. And we've seen that quite a bit, actually hurricane tracking has improved dramatically over the last several years, and we need to continue to invest in the best satellite systems and the best data analysis so that we can actually provide that information and help people get out of harm's way.

But finally, a very important point is that we have to take a look at the way we do disaster relief, and federal insurance, which includes flood insurance and crop insurance. To think about whether we can align economic incentives with long-term safety and security.

Ultimately, when we rebuild a region after a disaster, like after Sandy, there's an opportunity to rebuild better. And if we only rebuild the same, we are really wasting a very important opportunity for investment in both robustness and resilience.

In addition to preparing for climate change, that will not be enough. If we lose sight of the incredibly difficult but important goal of mitigating the pace and magnitude of climate change, if we do not ultimately mitigate the problem, then adaptation efforts will ultimately be overwhelmed by the scale of what is coming. So we have to continue to push for reducing our greenhouse gas emissions. This is a global problem, but the U.S. has an opportunity to take the lead and lead the world towards a safer and more secure future.

There has been some progress over the last four years, emissions are down in the U.S., primarily from a reduction in oil consumption. Also from a switch from coal to gas in the electricity sector. And a primary pathway for reducing CO2 emission in the short term is going to be a continued shift from coal to gas and to some renewables in the electricity sector, as well as the new CAFE standards in the transportation sector. In the residential, commercial and industrial sectors a primary source of reduction of emissions in the short term is going to come from efficiency savings, and in the longer term probably from some amount of electrification coupled with decarbonization of the electricity sector.

We know the cost of electricity from renewable sources has been dropping substantially in some parts of the

country, in California and Arizona, for example in solar, photovoltaic. But still unfortunately higher than fossil fuels in particular because of cheap natural gas prices. Very low natural gas prices is inhibiting investment in renewables across the country. However, there's also some issues about uneven fit -- a question of an uneven playing field. Regulatory hurdles, market failures that inhibit the development and deployment of renewables. And there's an opportunity for the federal government to remove some of these regulatory barriers, correcting market failures, and ultimately accelerating the investment in these. This also applies to energy efficiency investments, and we need to look at those very carefully.

The same time, while we focus on things that can be done in the short term, we also have to pay attention to the long term. Some technologies today are far from being economically competitive but are very likely to be essential in getting to a very low carbon economy in the long run. And it's critical that the federal government balance the portfolio between investments that are going to lower emissions in the short term and also invest in those technologies to make sure it continues to develop and are ready when we need them down the road. And so there's a balance, and some of these longer term technologies include advanced nuclear power, carbon capture and storage, advanced biofuels, electrical cars, and all the technologies associated with those.

Those are critical investments now even if they are going to have only a marginal impact on emissions in the short term. I haven't listed any recommendations because we as a group are still working on those, but we hope to come up with specific recommendations for the President over the coming days and weeks. Thank you.

>> Eric Lander: Thank you very much. This is a topic that I think PCAST will be discussing further quite soon as we put our thoughts together for what I suspect will be a report.

We have one more order of business on today's agenda, and that is Maxine seems eager to be moderating our public comments session today.

>> Yes, we have only one public comment today, we do encourage the public to speak, and each person you have two minutes. Paula Stern, who is the chair woman of the Stern Group will.

>> (inaudible)

Thank you. Sorry. Thanks again. And particularly to Dr. Holdren for meeting with me and with Lucy Sanders, who heads the National Center for Women in Information Technology, NCWIT, and for inviting us to provide him a letter concerning unimplemented recommendations for K-12 computing and computer science education. Made in prior PCAST reports, specifically your September 2010 report on K-12 STEM for America's future, and your December 2010 report, designing the digital future, federally funded research and development networking information technology.

PCAST K-12 STEM for America's future report recommends a definition of K-12 STEM education that includes computer science. A definition that unfortunately is not yet in common use in federal and local STEM policy and education discussions. The PCAST states that computer science and engineering are critical subjects, quote, whose concepts K-12 students should be familiar. This language seems innocuous, lacking in controversy, but PCAST deserves sights. Why? Because explicit mention of computer science as a critical STEM discipline is important. It reinforces the efforts of a growing national coalition called computing in the core, the focus --

>> 30 seconds.

>> -- mainstream, the computer science into the K-12 core curriculum for all American students regardless of

their gender and ethic background. It's urgently needed for young people, to fill the pipeline demand for skilled workers.

There's a growing community of organizations advancing computing in the core, and it's no coincidence it includes forward leaning efforts by two companies whose leaders members are PCAST members. Microsoft and Google. Because NCWIT is in this computing in the core, because we understand we can't attract more girls to computing if America's K-12 educational system doesn't teach computing at all or doesn't teach it well.

There's another PCAST report which I would quote to you, but I don't have the time, but I would say we throw -- we thank you for throwing the spotlight on the need for computer science education throughout the U.S. Unfortunately, many of these recommendations however are yet unimplemented, and we urge you to recognize the unheeded recommendations in these reports do cry out for a form of a national action plan.

Your December report says that, quote, every citizen, not just NIT, IT professionals, need to be fluent with information technology. Then American people need to provide their children with curriculum to master, innovate and apply information technology to their lives.

Every child that graduates from U.S. high school needs access to rigorous, relevant and inclusive computer science curriculum. Much thanks, again, to you for breaking new ground in this conversation, and we hope you continue to do so.

>> Thank you, and we do have your letter, too.

>> Oh, yes, thank you so much.

>> We'll make use of it, and we appreciate.

>> Thank you so much. Ernie do you have a comment?

>> Question.

>> Sure, please.

>> In the letter you mention the introduction of some legislation.

>> Yes.

>> Two years ago. Do you know, is that being reintroduced, what's the status of it?

>> Yes, we do, and thank you for asking the question. Congressman Jared Polis, who represents mostly I think Boulder, Colorado, was behind this legislation, and he does intend to introduce it again in this new 113th Congress. We are hopeful that there will be greater support, both in the House as well as in the Senate, and that it be bipartisan.

>> Thank you very much.

>> Eric Lander: All right, well, that brings us to the close of the formal agenda. A lot of good stuff. I mean, between the amazing work of opening up government with data, and this really important study on better care at lower cost, both of these are very relevant to the work of PCAST and the work of this administration, and of course the report of PCAST's own deliberations on climate.

I'm going to turn and thank you to our one public commenter, we very much appreciate. Absolutely. I'm going to turn back over to my cochair Dr. Holdren for closing remarks.

>> John Holdren: Thank you, Eric. And thanks to all of the members of PCAST who made it to this first meeting of 2013. Let me thank as well the audience, both in the room and watching over the web.

And I want to give a particular thanks to our extraordinary supporting staff at OSTP, who helped with the work of managing the whole PCAST operation. Amber Hartman Shultz, our acting executive director for PCAST, natoki Ford, our triple AS fellow who is supporting PCAST, and our PCAST intern Caitlin bernell, whose term has alas expired, but who continued to serve in this meeting to tie this over. We could not do what we do at PCAST without the work of these very dedicated staff members supporting us, nor could we do it without the staffs of the members of PCAST, who support us as well.

And I would mention also STPI, the Science and Technology Policy Institute, well represented by its director and two other of its staff members sitting behind us, who provide analytical support to PCAST and OSTP. It's a continuing pleasure to work with all of you, and I look forward, as I know the President does, to the next round of inputs relating to his policy priorities that come from this group. So thank you again, everybody.

(Applause.)

(Meeting adjourned.)