Information and communication technologies are *still* poised to transform healthcare ...

preventing the onset of diseases, improving diagnoses and treatments, enhancing the quality of health care delivery, and empowering us to participate in our own health and well-being

Same two slides for last 3 years.
Health and Activity Monitoring Devices
.....are on the shelves
The innovative and entrepreneurial software developers have surfaced

Consumer Health Apps for Apple's iPhone - MobiHealthNews.com

- Cardio 16.36%
- Diet 14.15%
- Other 15.36%
- Stress & Relaxation 11.44%
- Women's Health 7.27%
- Strength Training 6.97%
- Calculator 6.03%
- Mental Health 5.80%
- Chronic Conditions 5.45%
- Sleep 4.13%
- Smoking Cessation 2.23%
- Emergency 2.73%
- Medication Adherence 1.36%
- PHR 0.71%

13,000 Health Apps
Progress? YES

...But we remain a long way from achieving *disruptive innovation* in healthcare and well being

*Clayton Christensen, The Innovator’s Prescription

Same two slides for last 3 years.
The Barriers

- Hospital and Physician Business Models
- Reimbursement System
- Pharmaceutical Industry
- Medical Education
- Regulatory Reform
- Social Awareness and Acceptance
- Technological knowhow
Some Fundamental Research Challenges

• Computation
  – Multi-scale computational modeling – virtual physiological human
  – Domain specific data mining, automated discovery
• Safe and secure distributed home healthcare
  – Fool-proof application even under cognitive decline
• Mental health and cognitive decline – understanding brain function
• Behavior modification
  – Obesity, smoking, exercise
• Networked cooperative medical devices
• Assistive robots and prosthetics
• Augmented human:
  – Integrated sensory, cognitive and mobility assist
Charge: Help NSF Find a Path Through the S&T Challenges to Realization of a Learning Health System

Can the LHS be more difficult than planning to put a man on the moon?

- What’s the missing science?
  - Fundamental gaps in our understanding
  - Hypotheses lacking; pending new discovery; exploratory ventures
- What are the engineering challenges for which we lack the know-how?
  - Scaling, ubiquity and performance are fundamental requirements
- Are there infrastructure requirements?
  - Enabling prototyping “at scale”; experimentation; validation
- Public-private partnerships and industry-wide standards necessary for progress?

Can we resolve a research, development and implementation roadmap?
Can we speculate the outputs of it by the end of the decade?

Bonus Points

• Can we resolve a research, development and implementation roadmap?

• Can we speculate the outputs of it by the end of the decade?