

Bert Quint

CERN-Open Lab Innovation 2015


**Healthcare
Espresso Format**



**Global Issue,
requiring
multidisciplinary
approach**

Healthcare:

Procedures  Outcomes

Cost  Value

SPECIAL REPORT

TIME

ONE
ACETAMINOPHEN
TABLET
COSTS 1.5¢.
YOUR HOSPITAL
MARKS IT UP
10,000%.



WHY MEDICAL BILLS ARE KILLING US

BY STEVEN BRILL

Healthcare
undergoes
now the most
dramatic
change in
history

**Plenty to
worry
about**



Chart

Map



Color

Gapminder G

Geographic regions



Select

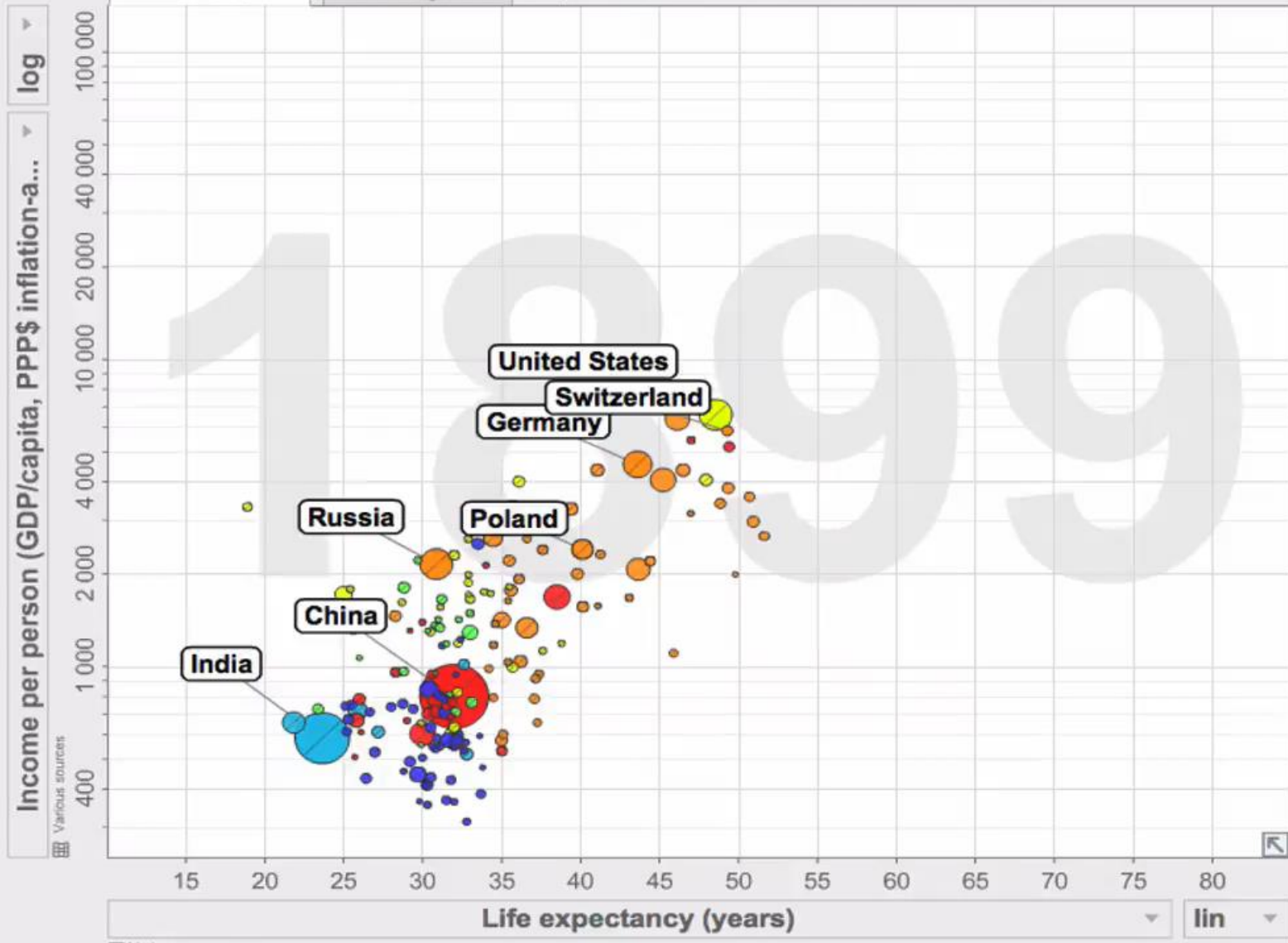
- North Korea
- Norway
- Oman
- Pakistan
- Panama
- Papua New Guinea
- Paraguay
- Peru
- Philippines
- Poland
- Portugal
- Puerto Rico
- Qatar
- Deselect all

Size

Various

Population, total

1.36 B



log

Various sources

Income per person (GDP/capita, PPP\$ inflation-a...)

Various sources

Life expectancy (years)

lin

Various sources

Population, total

1.36 B



The Telegraph

*“Legal bid to stop CERN atom
smasher from ‘destroying the
world’
(2008)”*

Countries Increase Investment in Innovation



Poland: Powerhouse, remarkable growth 25 year: €7B investment in R&D, healthcare and production (EU)



Canada announces Venture Capital Action Plan to support commercialization of R&D



China's 12th Fifth Year Plan targets biotech sector – allocates \$1.9 billion toward R&D for innovative drug development



Russian Federation Bio 2020 commits \$12 billion to grow domestic drug industry – goal of 20 new drugs by 2020



South Korea Bio-Vision 2016 has aims to make country biotechnology leader – strong focus on biosimilars



Singapore Research, Innovation, and Enterprise Plan seeks to make biomedical sector a pillar of the economy – funds public/private R&D, provides incentives to private companies

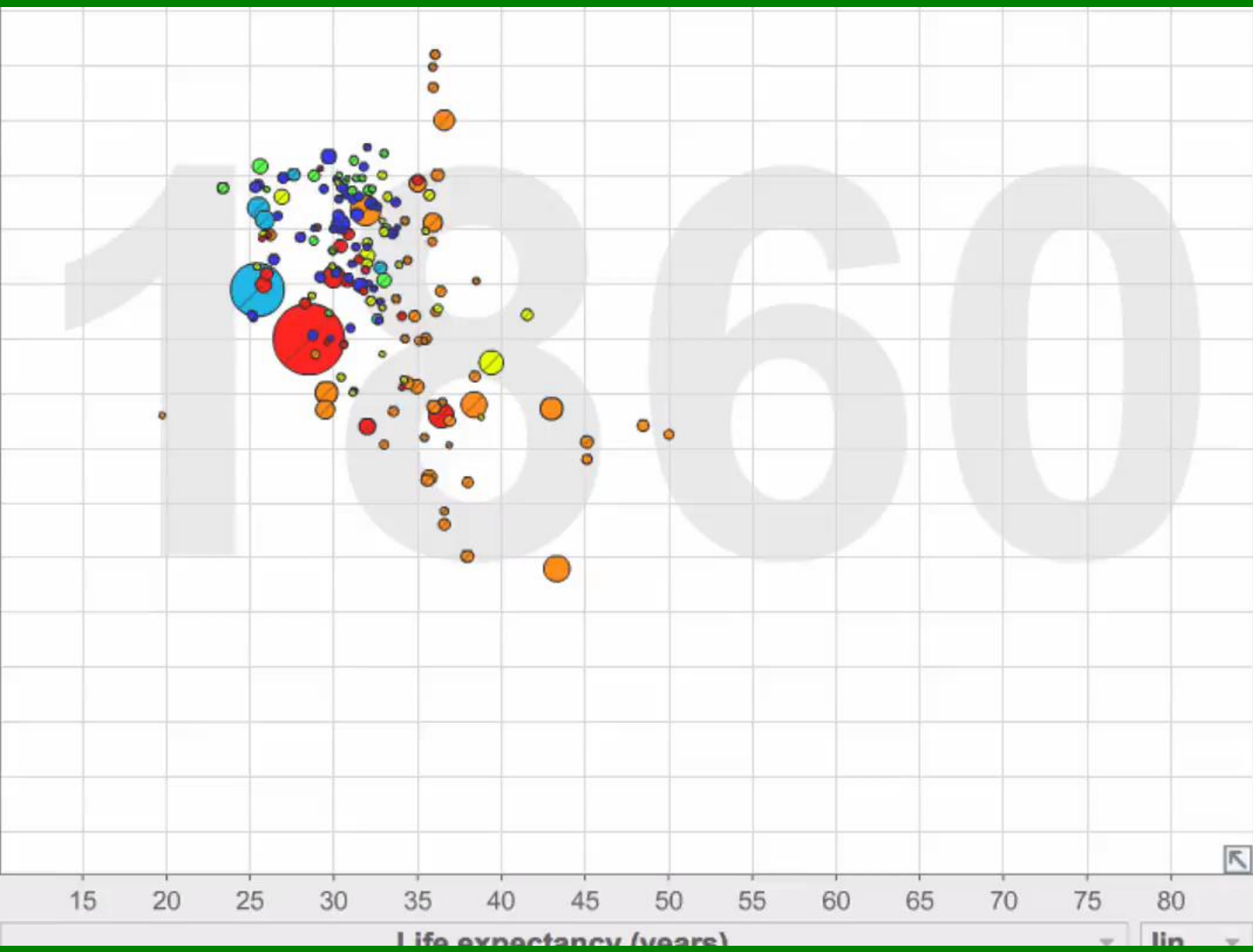


REBOOK WORLD

607



Paradigm of
Change:
World Wide
Phenomena



Select

- Afghanistan
- Albania
- Algeria
- Angola
- Antigua and Ba
- Argentina
- Armenia
- Aruba
- Australia
- Austria
- Azerbaijan
- Bahamas
- Bahrain

Deselect all

Size

Various

Population, total

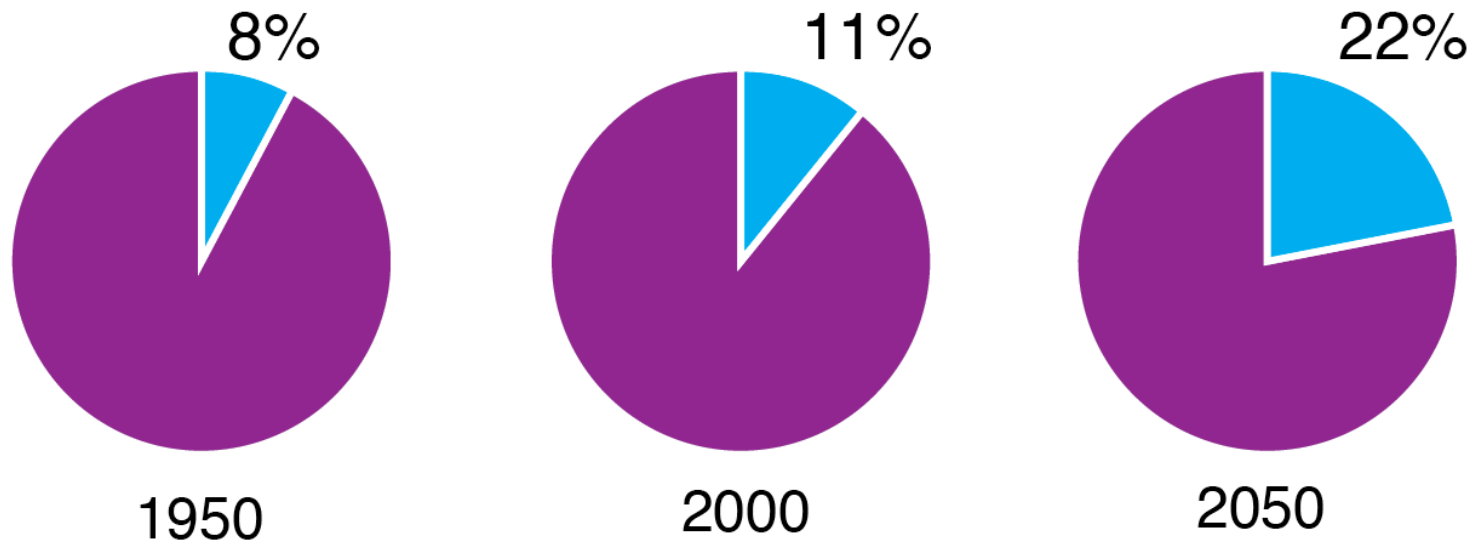


Worldwide Phenomenon

“Population aging is unprecedented, a process without parallel in the history of humanity.”

*World Population Ageing 2013
United Nations*

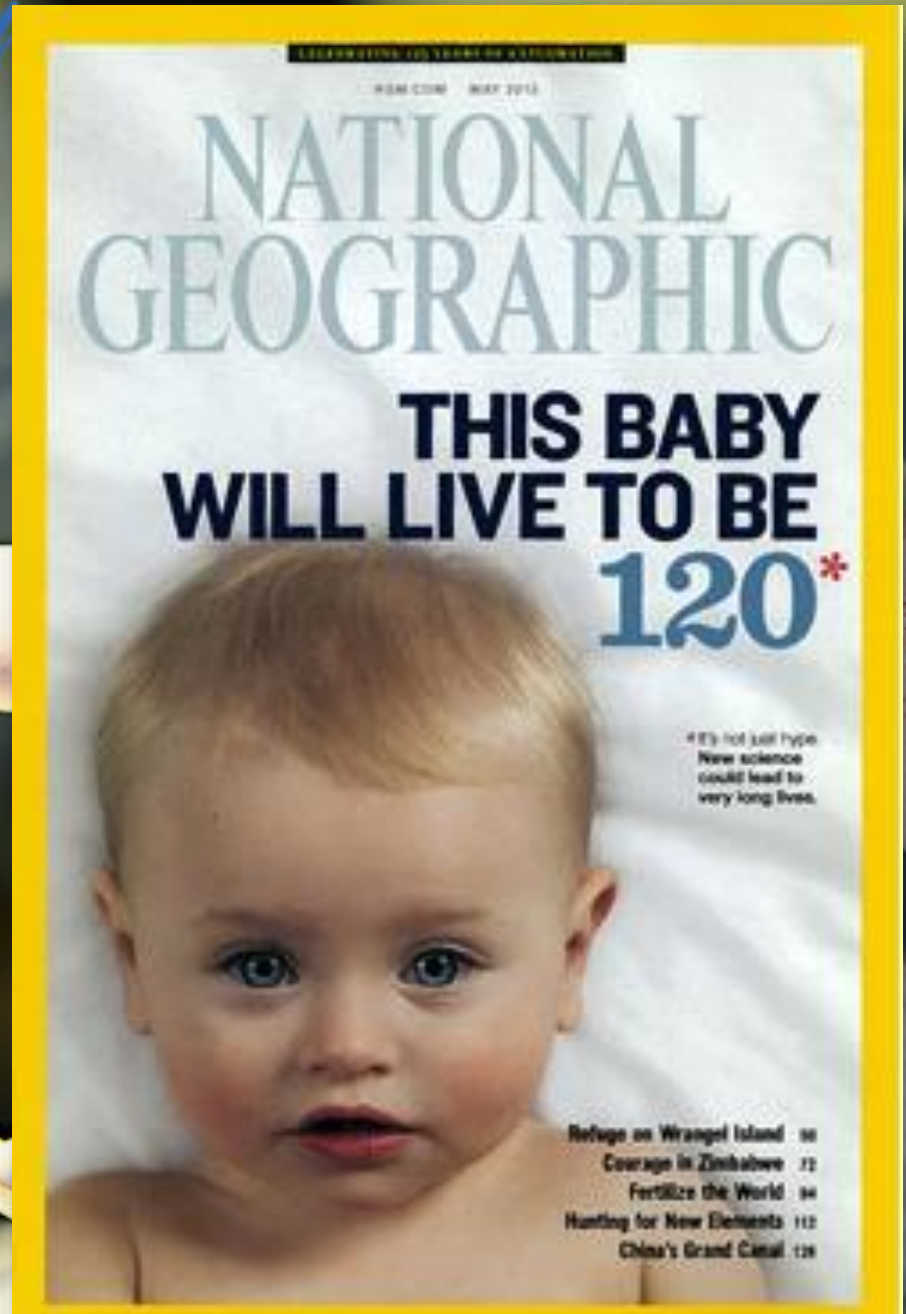
Proportion of world population 60 years or over, 1950-2050



Source: United Nations

People Are Living Longer:

1 in 3 Babies born today will live to 100

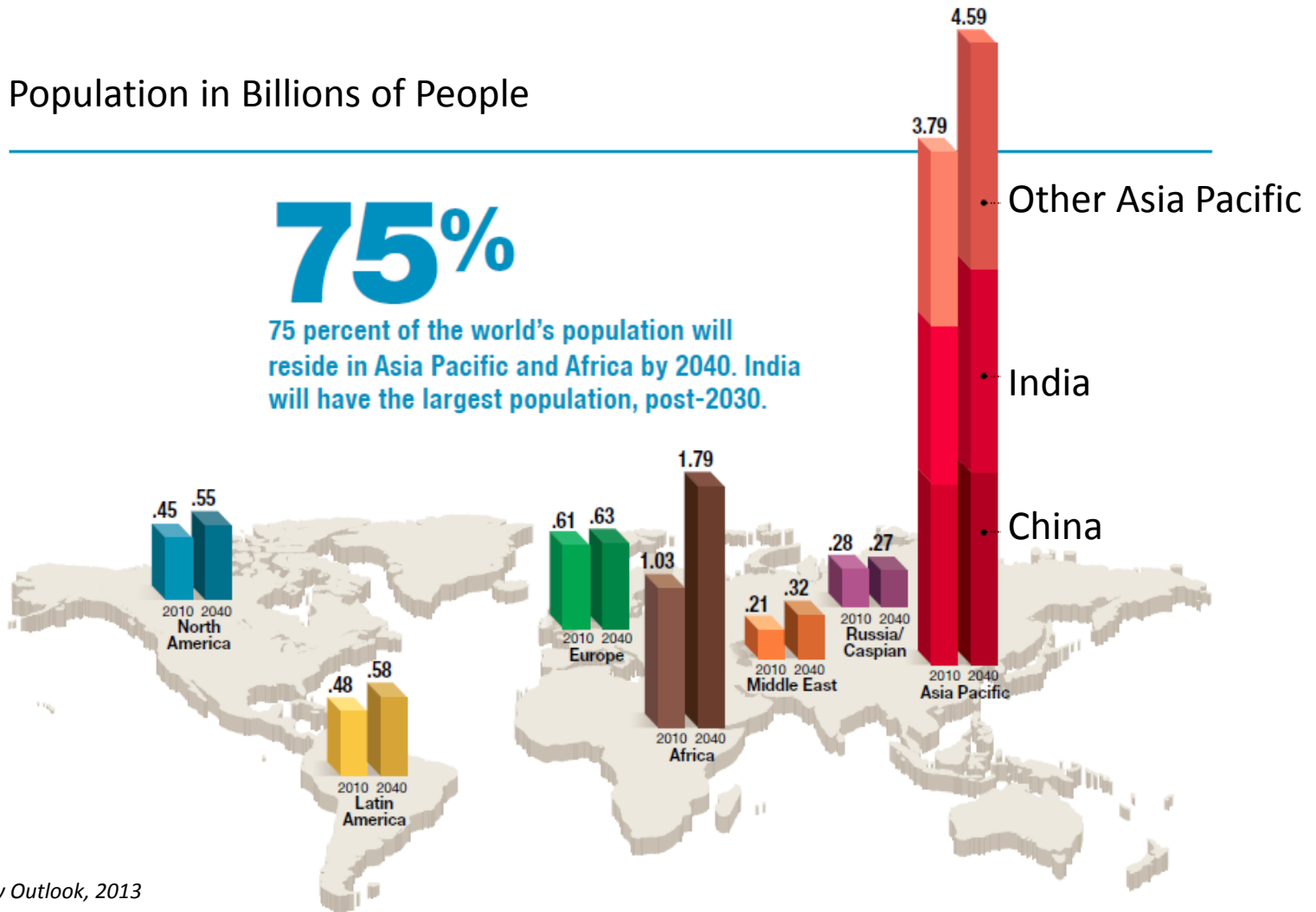


Africa and Asia Project Largest Growth for 2040

World Population in Billions of People

75%

75 percent of the world's population will reside in Asia Pacific and Africa by 2040. India will have the largest population, post-2030.





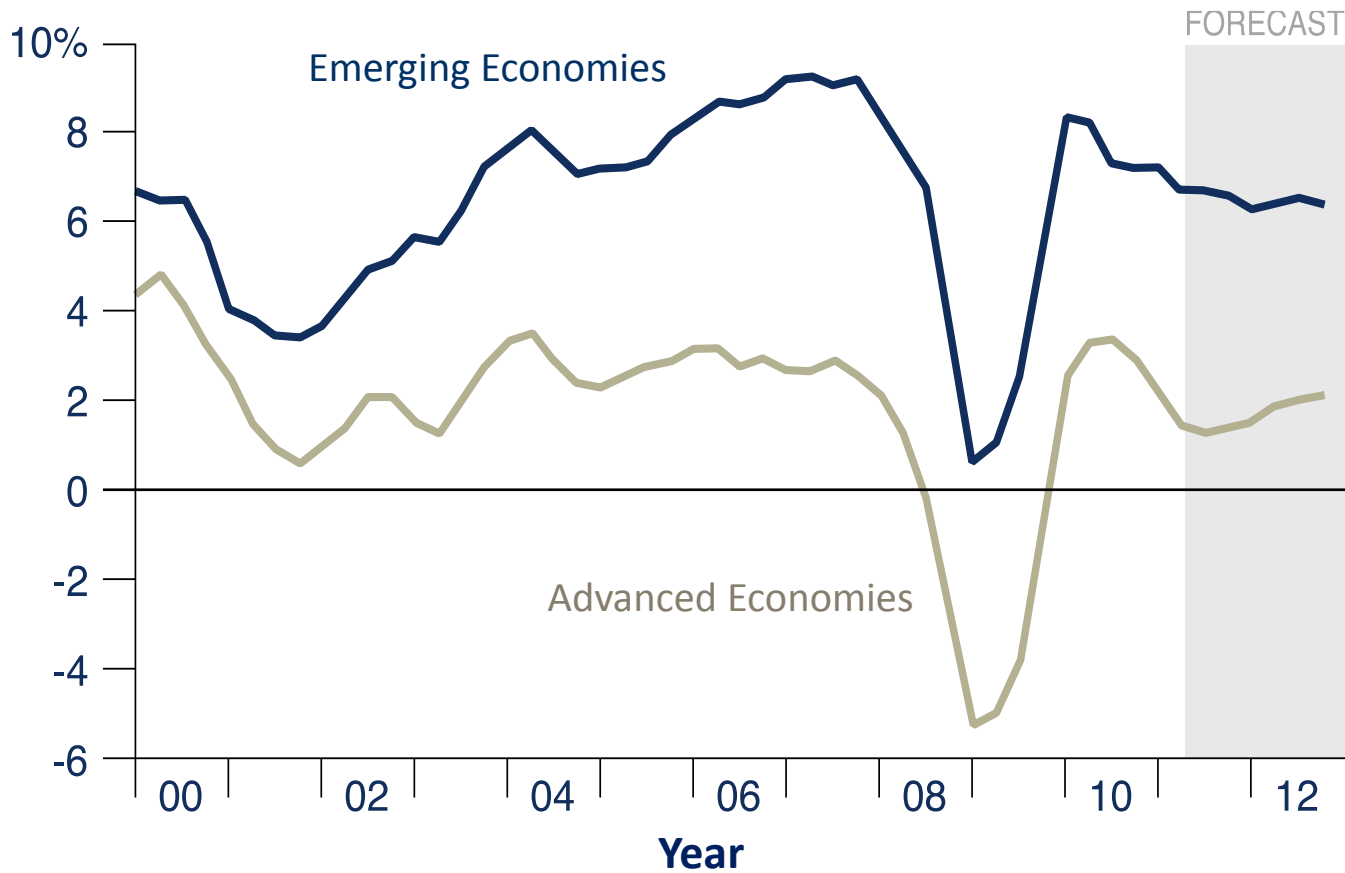
FINANCE

BILLS

SAVINGS

Prosperity Is Spreading

Annual change in GDP, adjusted for inflation



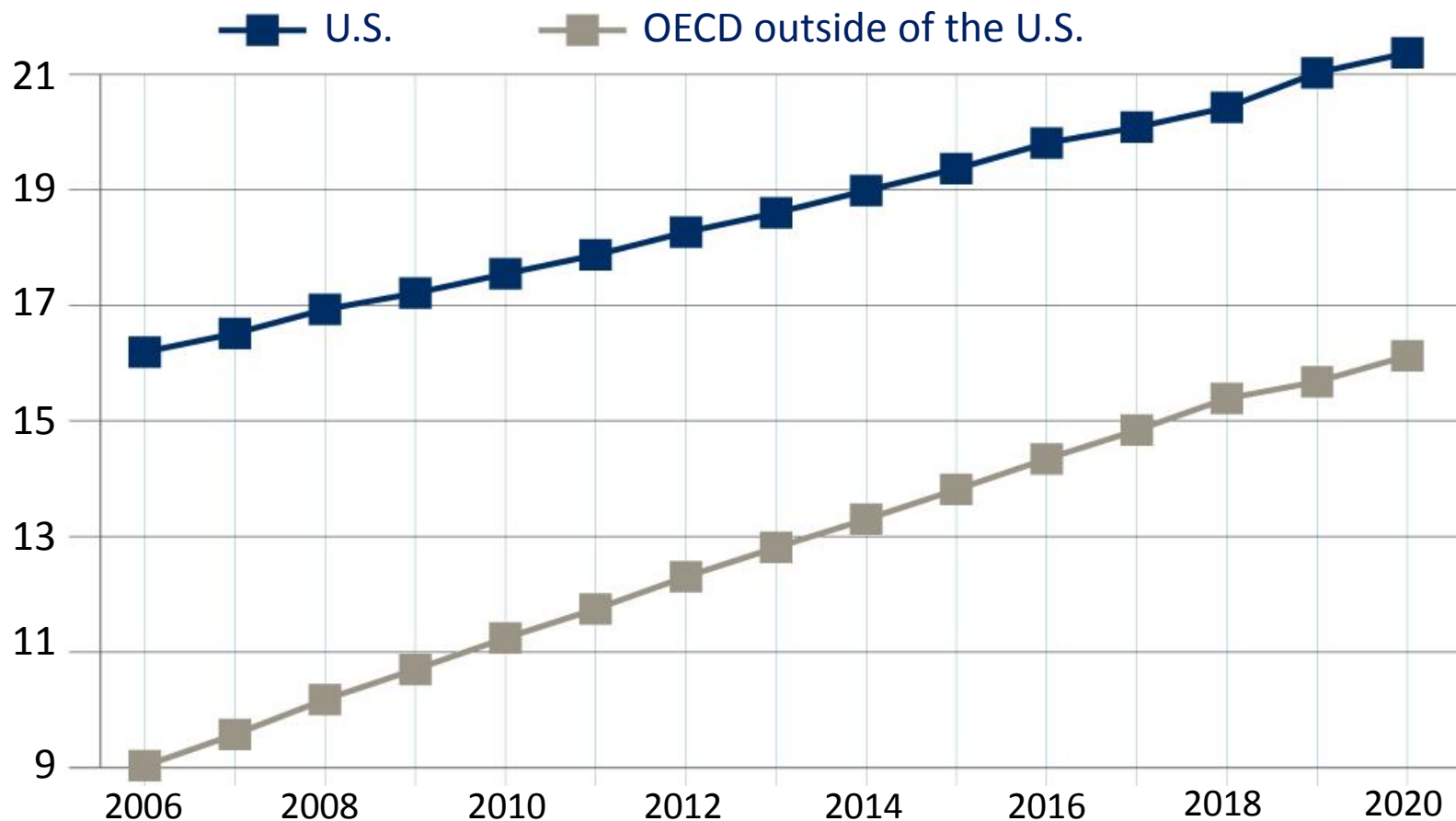
By 2020, 900 million people will move from poverty into the middle class in Asia, according to Mckinsey



**Healthcare
costs rising:
unsustainable
levels**

Healthcare Cost Rapidly Increasing not Only in the U.S.

Health Costs as a Percent of GDP



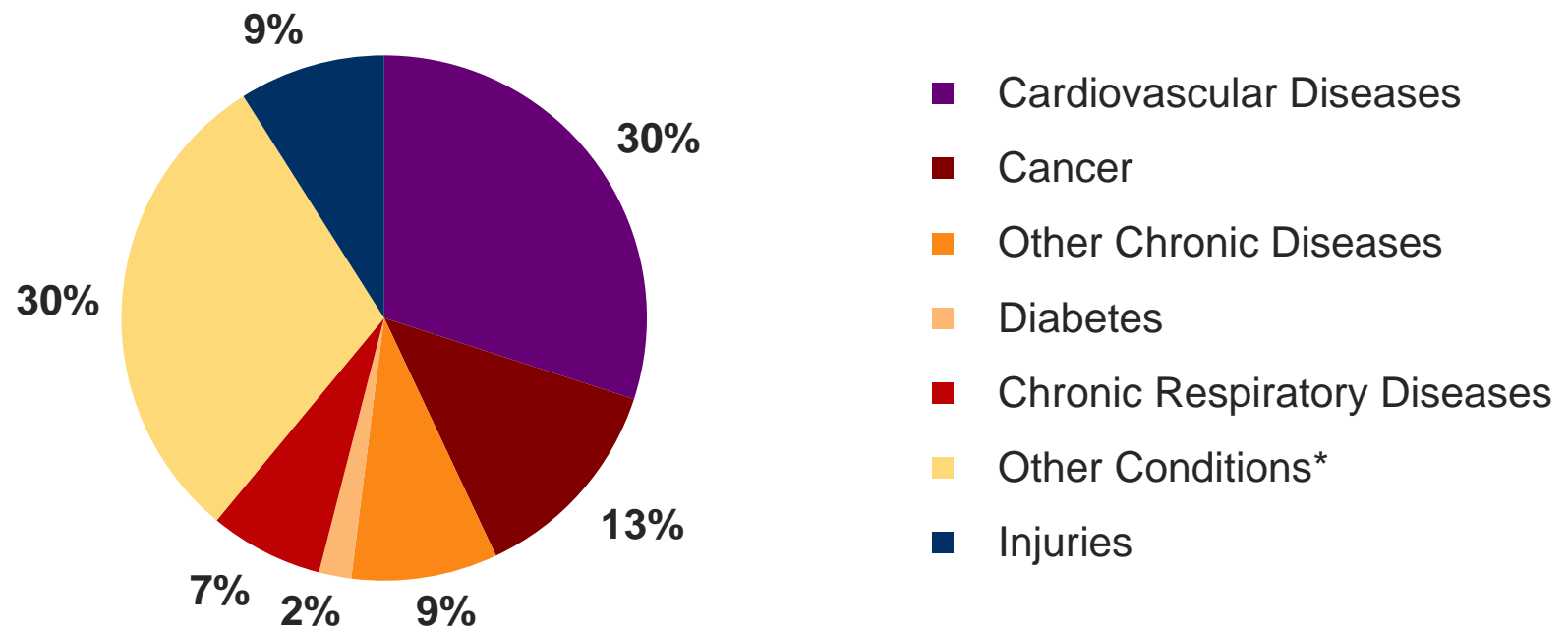
Source: PricewaterhouseCoopers Health Research Institute

..but Changing Lifestyles Fuel Chronic Disease...



Non-Communicable Diseases Takes a Growing Toll Worldwide

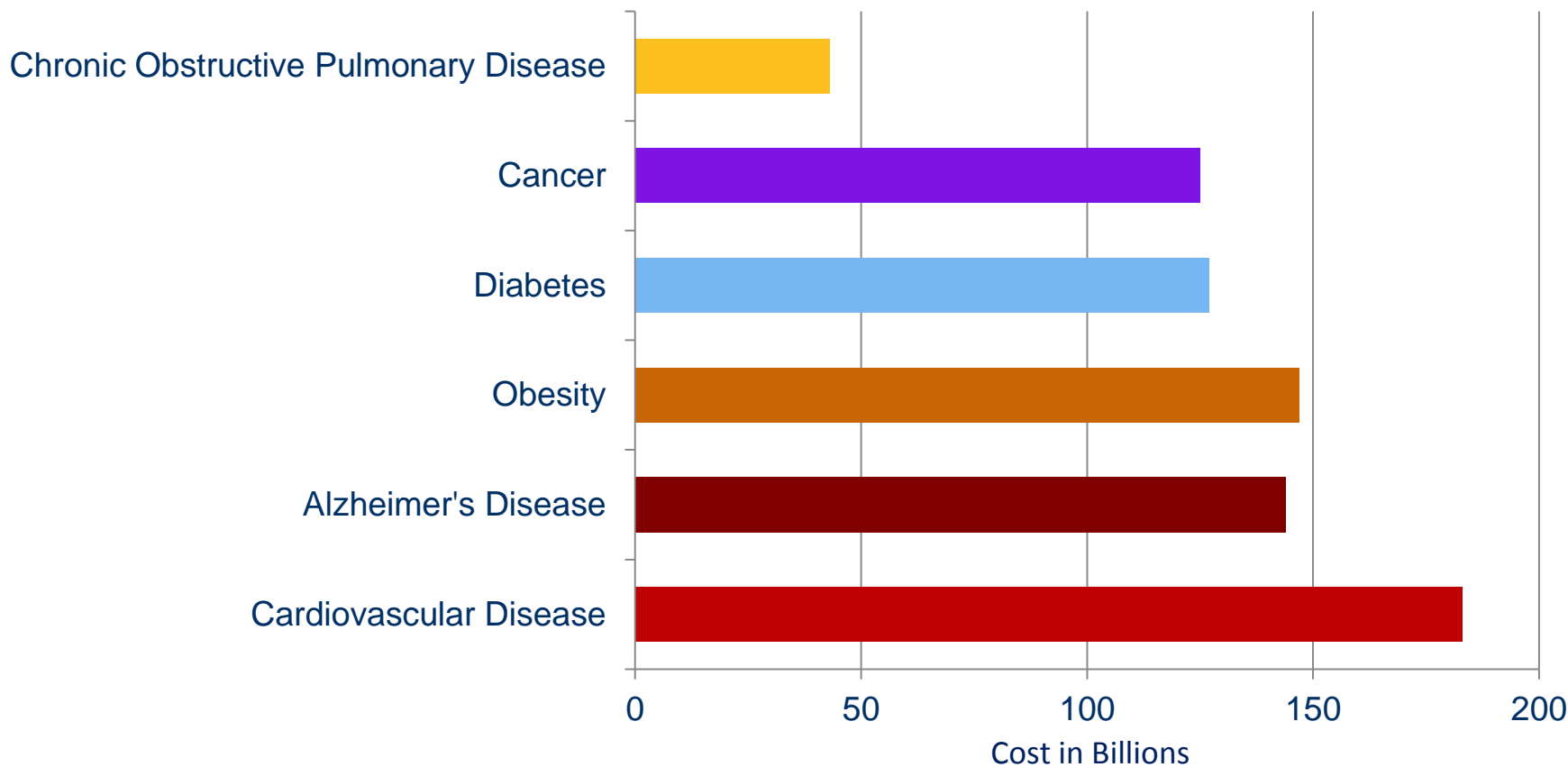
- Account for **63%** of deaths worldwide
- Cost more than **\$30 trillion** over the next 20 years
- Cause nearly **80%** of deaths in low- and middle-income countries



Source: World Economic Health Forum and the Harvard School of Public Health; World Health Organization

Diseases of Aging Push System to the Brink

The direct annual costs of diseases of aging in the United States:

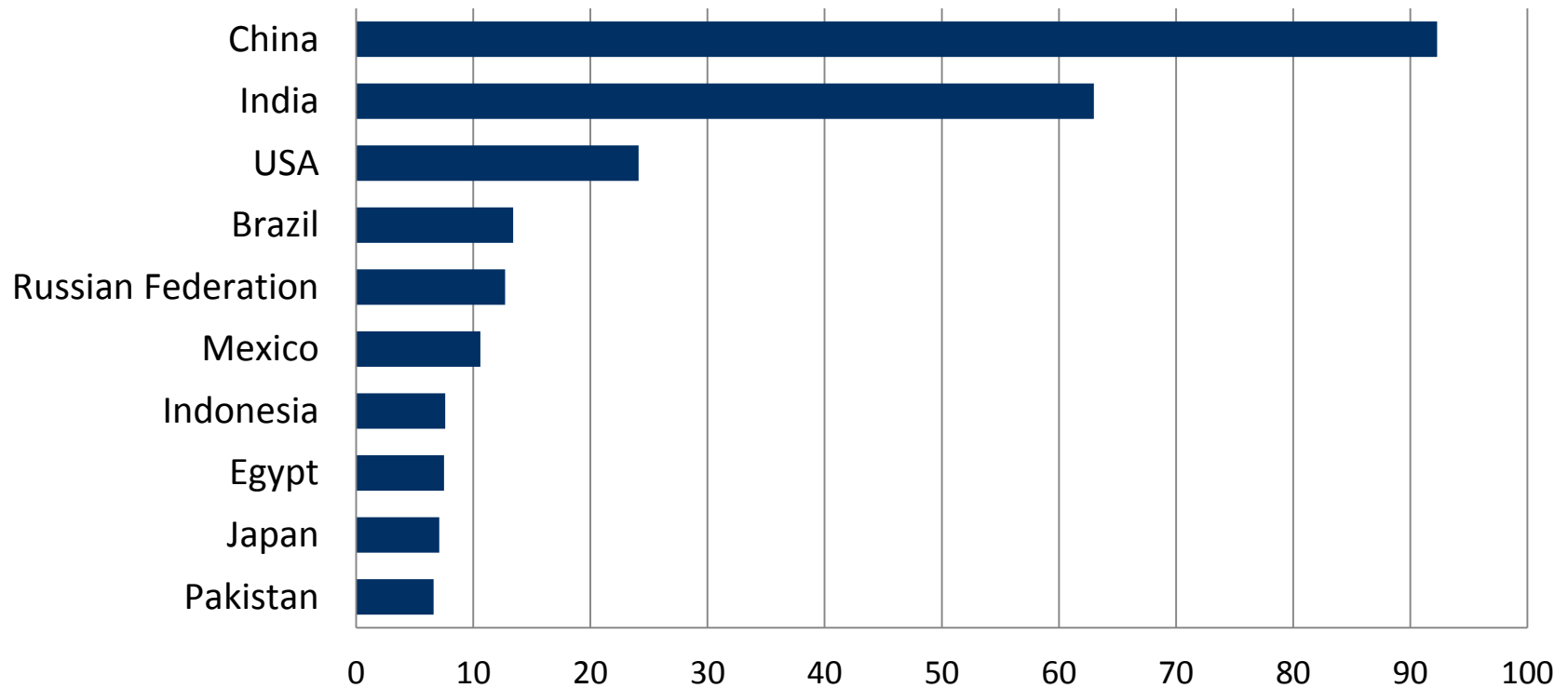


Source: National Cancer Institute, American Lung Association, American Alzheimer's Association, The Hastings Center, American Diabetes Association

The Impact of Urbanization, Longevity and Better Lifestyles

More than **371 million** people have diabetes.

Top 10 Countries/Territories for People with Diabetes



Source: International Diabetes Foundation

China

**...if China could reduce
cardiovascular risk by 1% - 30
years period:**

**Economic value of \$ 10,7 trillion –
equivalent to 68% GDP 2010**

**(Julian Chang – Hong Kong Inst of Diabetes &
Obesity)**



\$380 billion wasted in 2013

- Some 90% of drugs only work in 30% to 50% of the population
- Global drug sales estimated at \$956 billion in 2011

**Billions
Wasted On
Ineffective
Therapies**



Patients & Hospitals have conflicting interests

Surgical complications can yield 330% profits for hospitals.

“Evidence based: reducing harm and improving quality is perversely penalized”

(A.Gawande: Harvard Health – JAMA 2013)

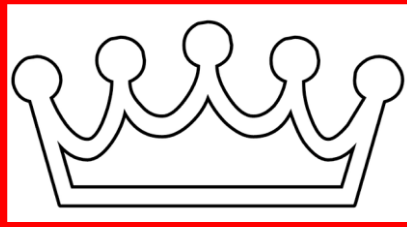
Big Questions Without Easy Answers

- Who should pay?
- Who should decide on care?
- Individual responsibility & societal costs?
- Should safety and efficacy alone be the standard?
- What does innovation mean today?
- How do we determine value?



Move towards value-based
healthcare





KEEP CALM

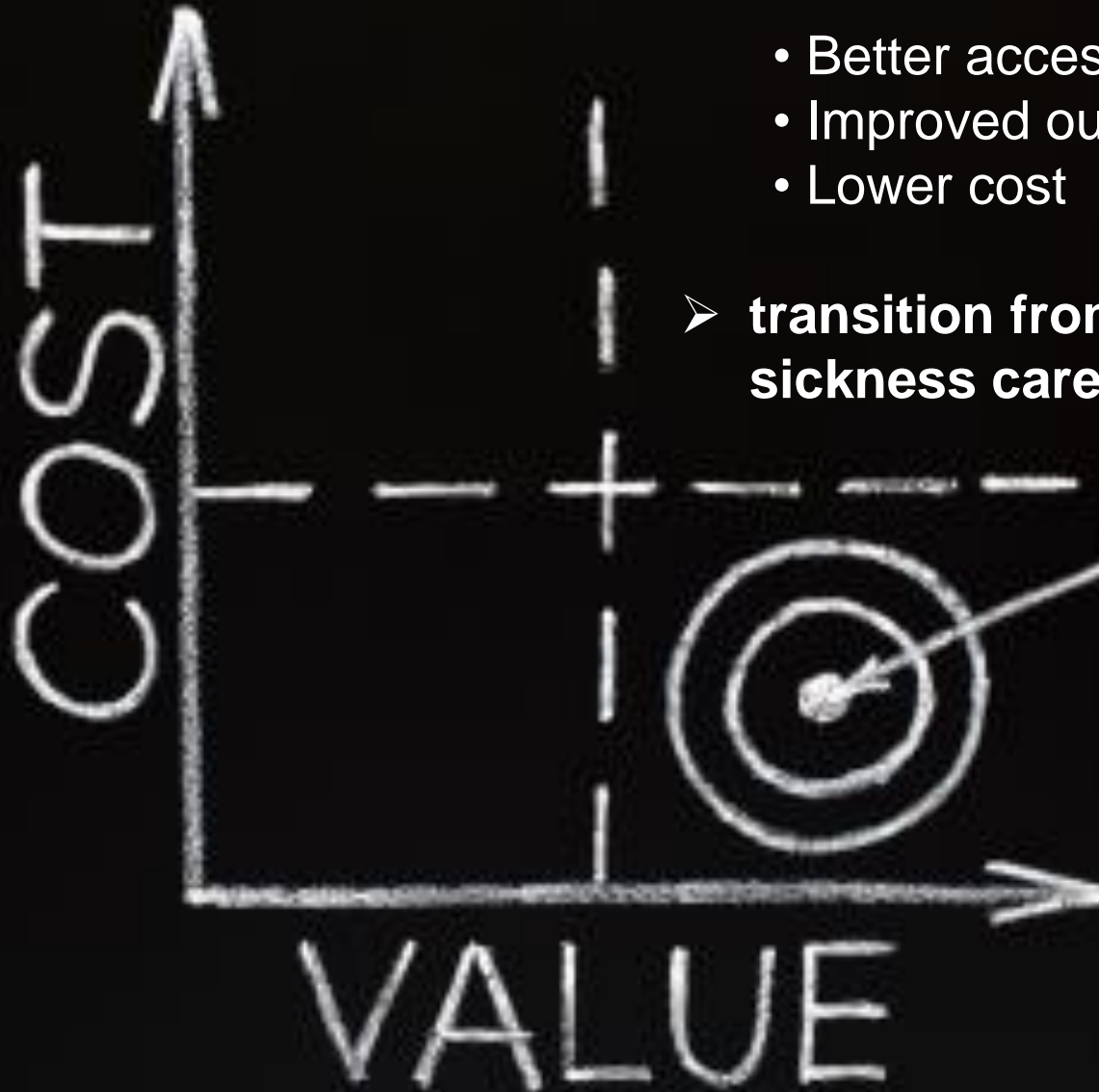
the

OPPORTUNITY

is

here

Future

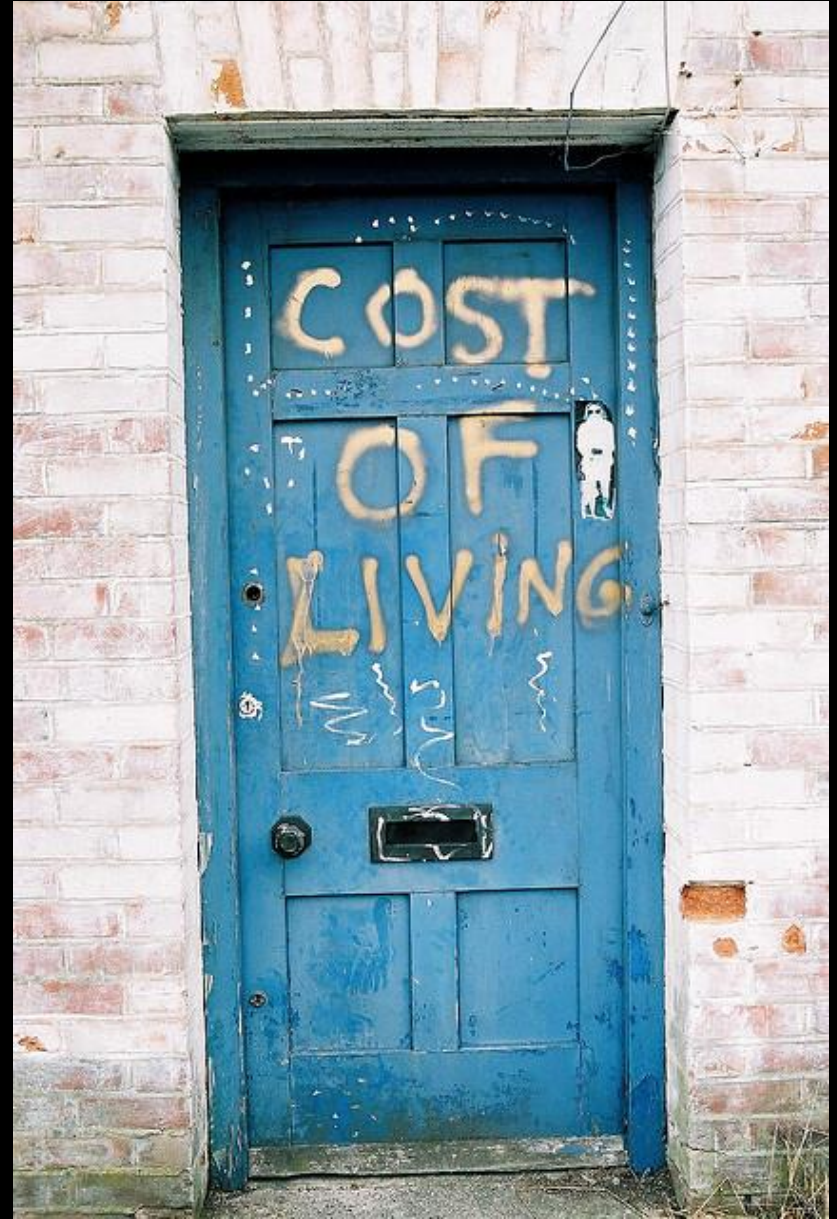


- Better access
- Improved outcomes
- Lower cost

➤ **transition from our dysfunctional sickness care**

Patients: value conscious & informed

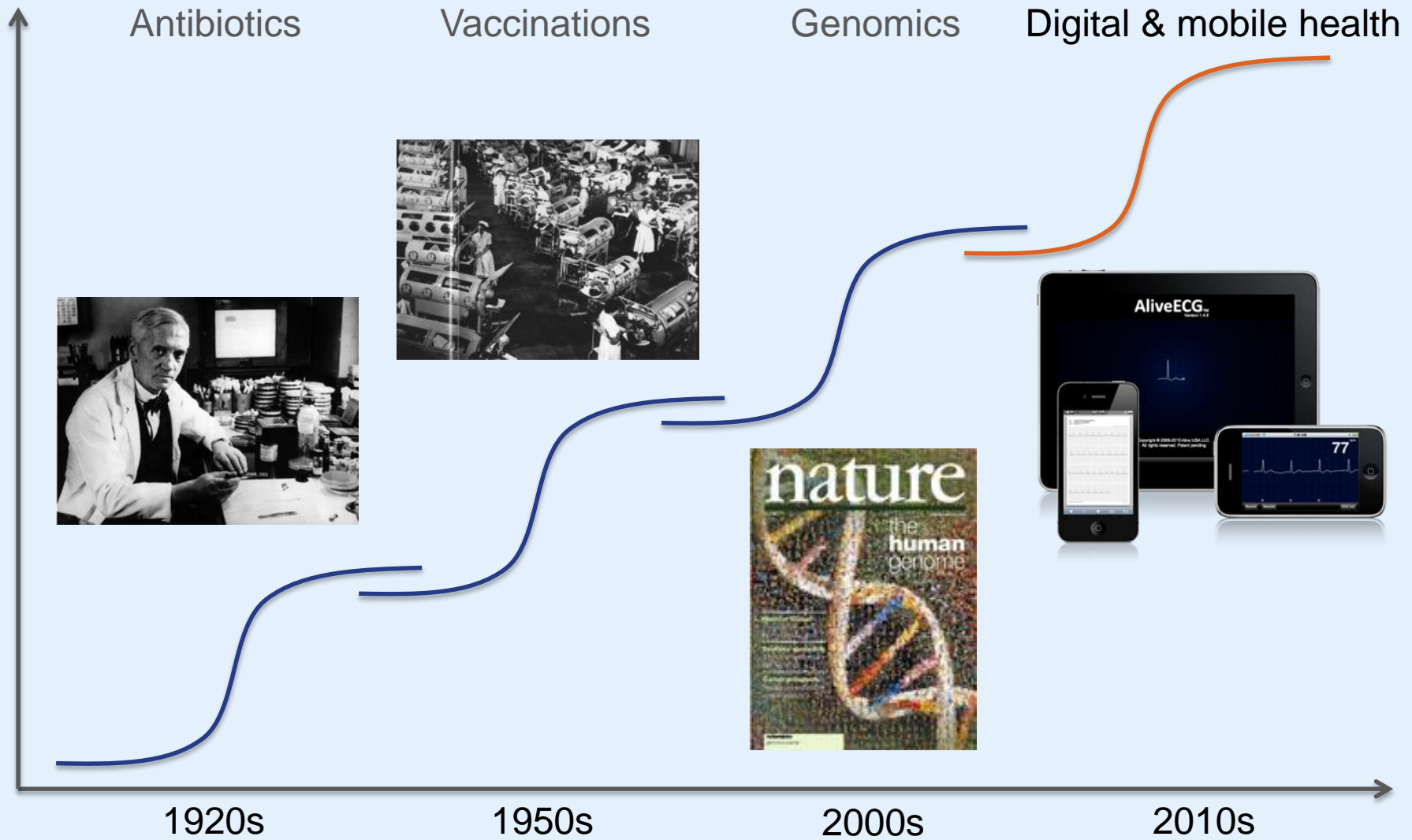
(Dr. Google...)



THE
FUTURE
IS NOW

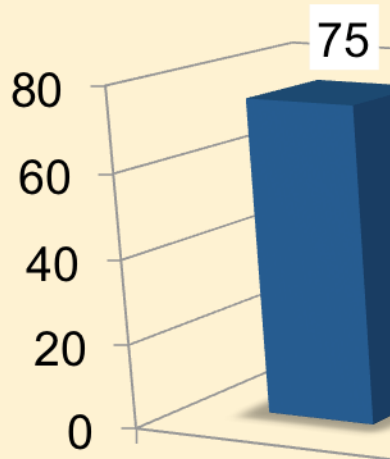


The Big Paradigm Change in Healthcare & Wellness



Personalized, genomics....

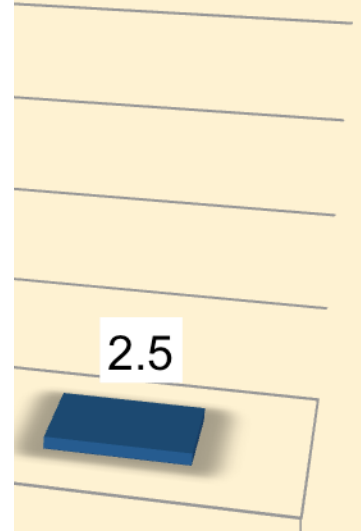
We Are Living in Exponential Times



Telephone



50 million consumers



iPhone/
iPod Touch





Healthcare Shopping





Telehealth Comes to You

- HealthSpot Care4 Station – 1,000 locations
- Walk-in kiosk provides acute care via high-definition videoconferencing
- Automatically captures height and weight
- Booth is wiped down between visits and automatically disinfected



arPlay



HomeKit



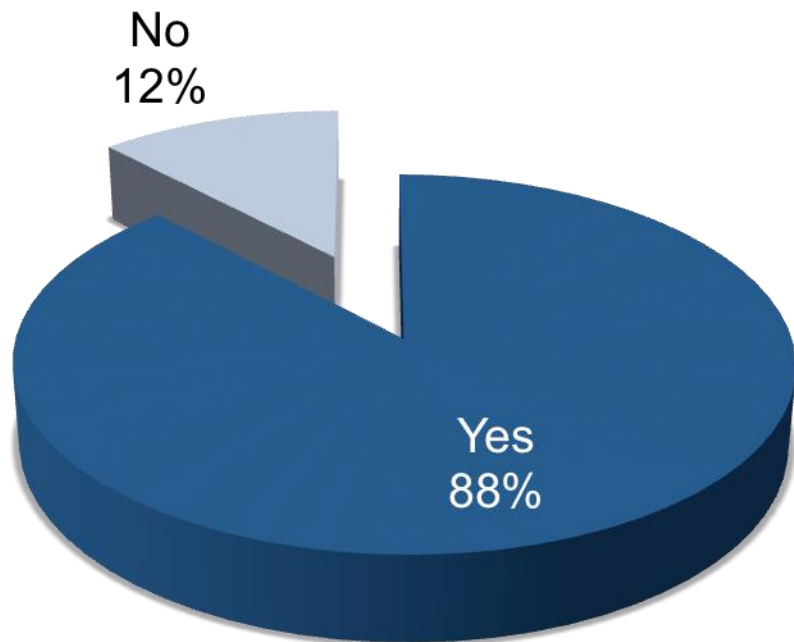
Health



Innovation solve the
issue?

Physicians Embrace Mobile Monitoring

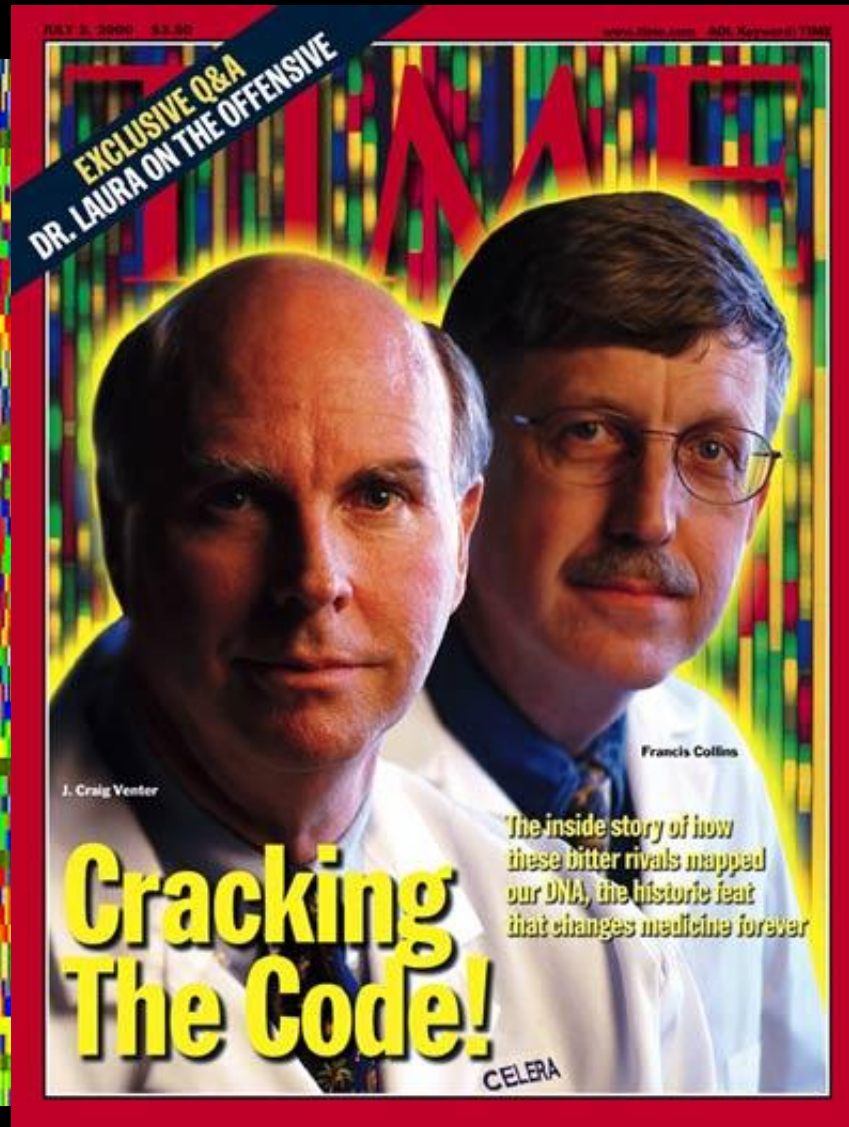
Percentage of physicians wanting to monitor patients at home



- 65% - Weight
- 61% - Blood sugar
- 57% - Vital signs (e.g. blood pressure, heart rate, respiratory rate)
- 54% - Exercise/physical activity
- 36% - Calories/fat content taken in
- 36% - Pain level
- 35% - Sleep patterns
- 28% - Cardiac rhythm
- 17% - Bladder control
- 16% - Acid reflux/indigestion
- 13% - Digestive health

Source: PricewaterhouseCoopers HRI Physician Survey, 2010

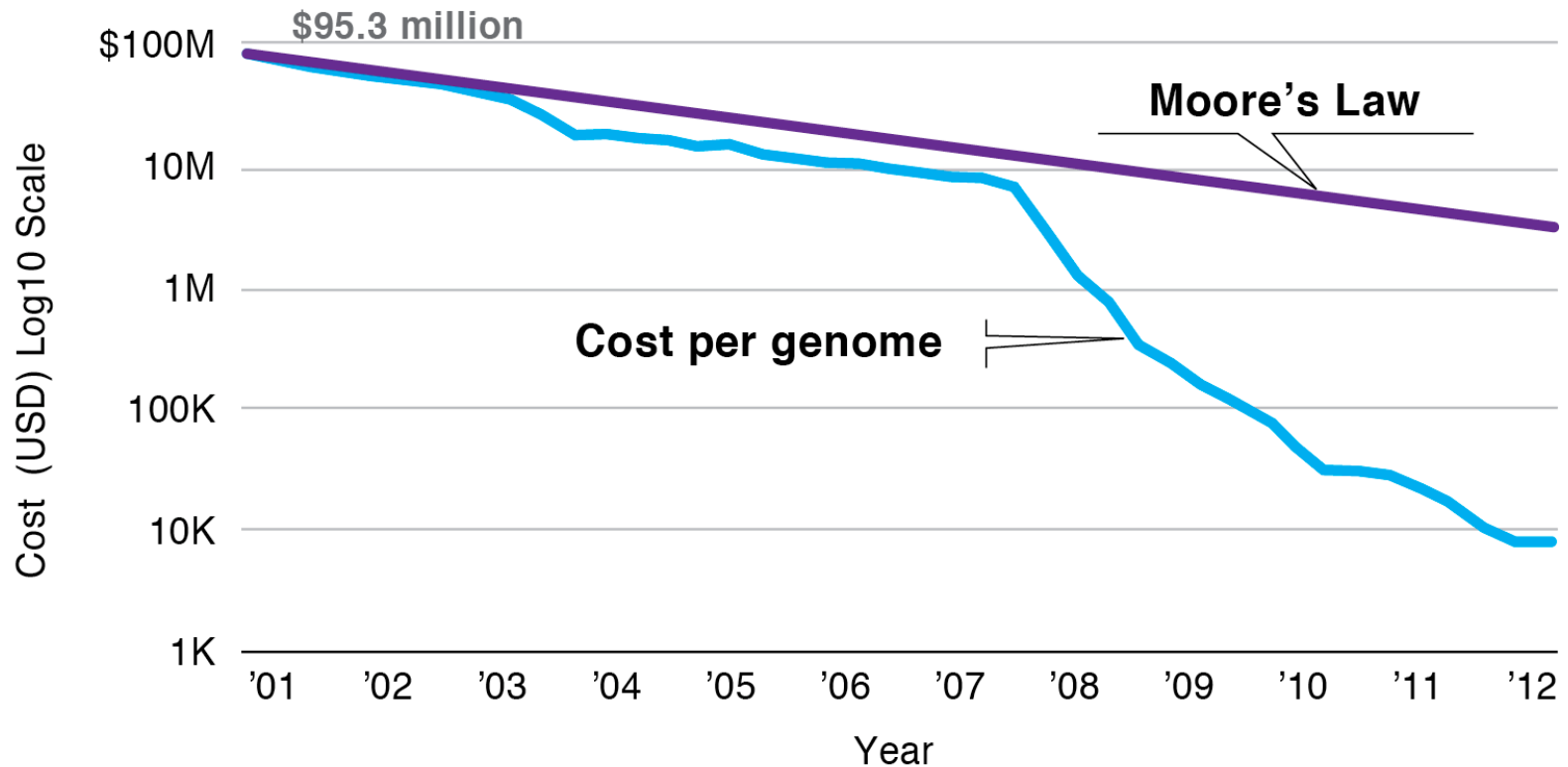
Human Genome – April 2003



Rapidly Falling Cost of Sequencing Transforms Medicine

Baseline information

Cost of genome sequencing compared with Moore's Law for computers



Source: Broad Institute



Explore your DNA with a personalized genetics kit.

With over 1,000,000 people in our database, you could discover hundreds of matches, more data, and more discoveries.

\$99

add a kit

In this order

Price



Who will be using this kit?

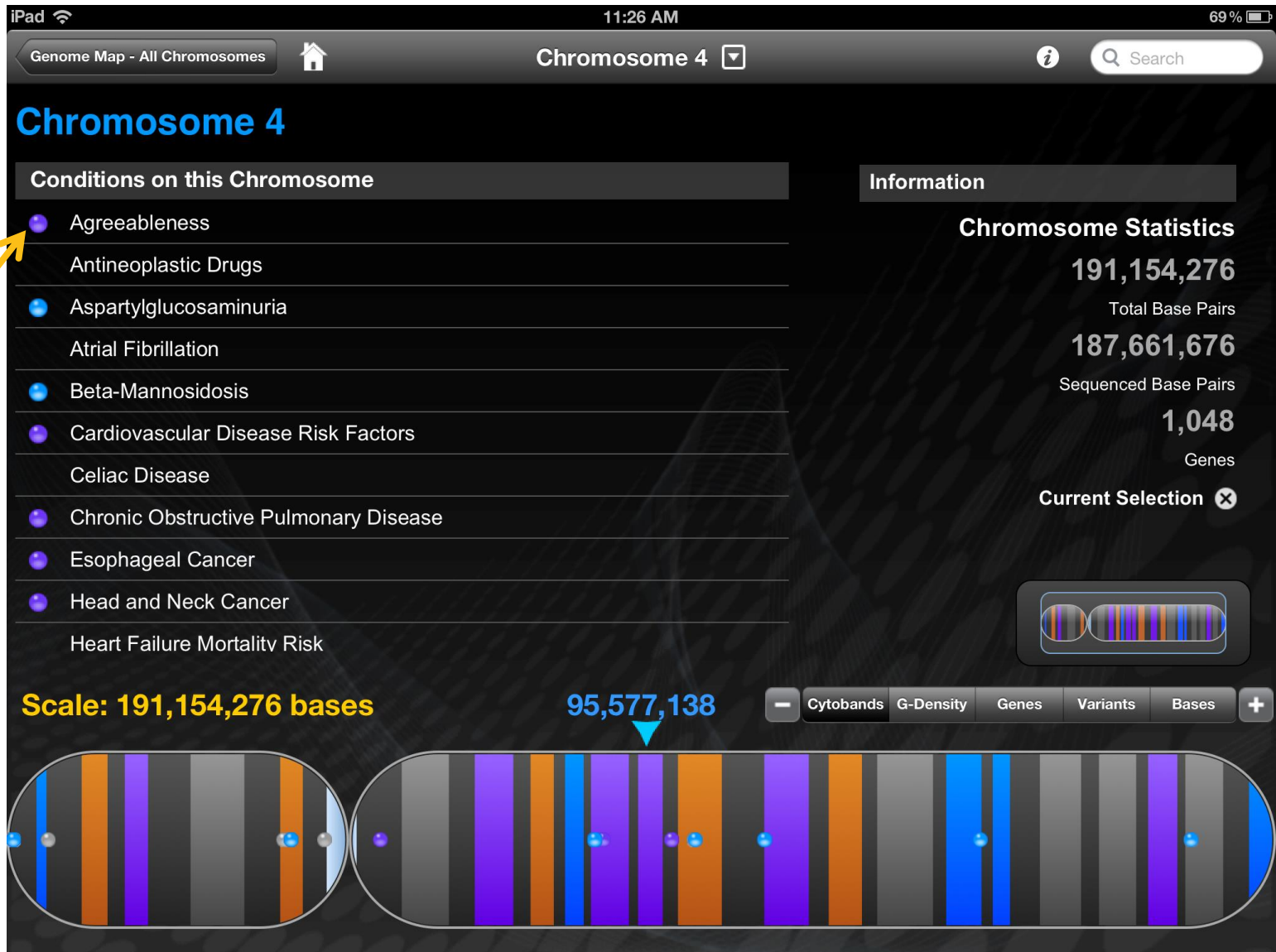
\$99.00

Click to add notes

Slide 42 of 68

75%

Uncovers a Potential Hazardous Condition (now on your smart phone)



Agreeableness

Personalized Medicine Omics Are Here...

Genome

All the genetic information in an organism

Transcriptome

All the RNA transcripts formed from a genome

Proteome

The locations and functions of all the proteins in the body

Metabolome

All the metabolites produced by a person

Connectome

The locations and functions of all the proteins in the body

Robotics: soon portable





Don't play with magnets!





Bionics: paraplegics



Products Are Merging into Consumer Retail

Monday, August 15, 2011 As of 12:05 PM New York 73° | 65°

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digits: AliveCor Hearts the iPhone 8/15/2011 3:05:08 PM

AliveCor is one of a growing number of companies aiming to turn the iPhone or other smartphone into a monitor of the body's vital signs. The wireless heart-monitor maker has raised a \$3 million Series A round, which the company hopes will get its product onto the market. Timothy Hay reports on digits.

Alivecor's iPhone ECG





intel
inside



Home Diagnostics



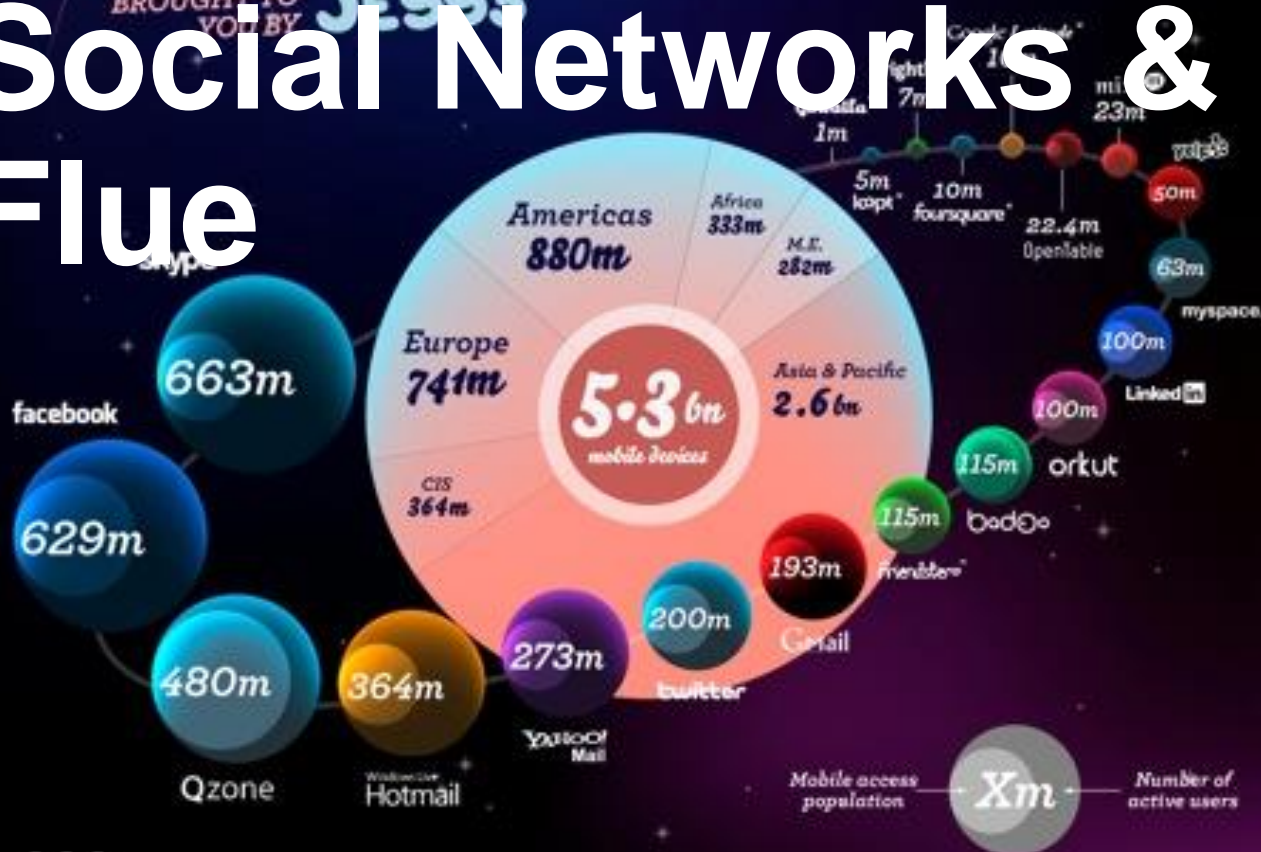
THE Geosocial universe

BROUGHT TO YOU BY JESS3

Social Networks & Flue

Remember when Friendster dominated the U.S. social space? Like the universe, the geosocial landscape is constantly changing. While new stars are being born, black holes are also developing.

We looked at the current size of the major social networks and overlaid their current mobile user base.



Sources: TechCrunch | SocialMediaToday | Facebook | Wikipedia | Mashable | BuzzFeed | Daily Mail | TechCrunch | SocialMediaToday | Brightkite | SocialTimes | Bebo | Mashable

* 100% mobile access

May 2011

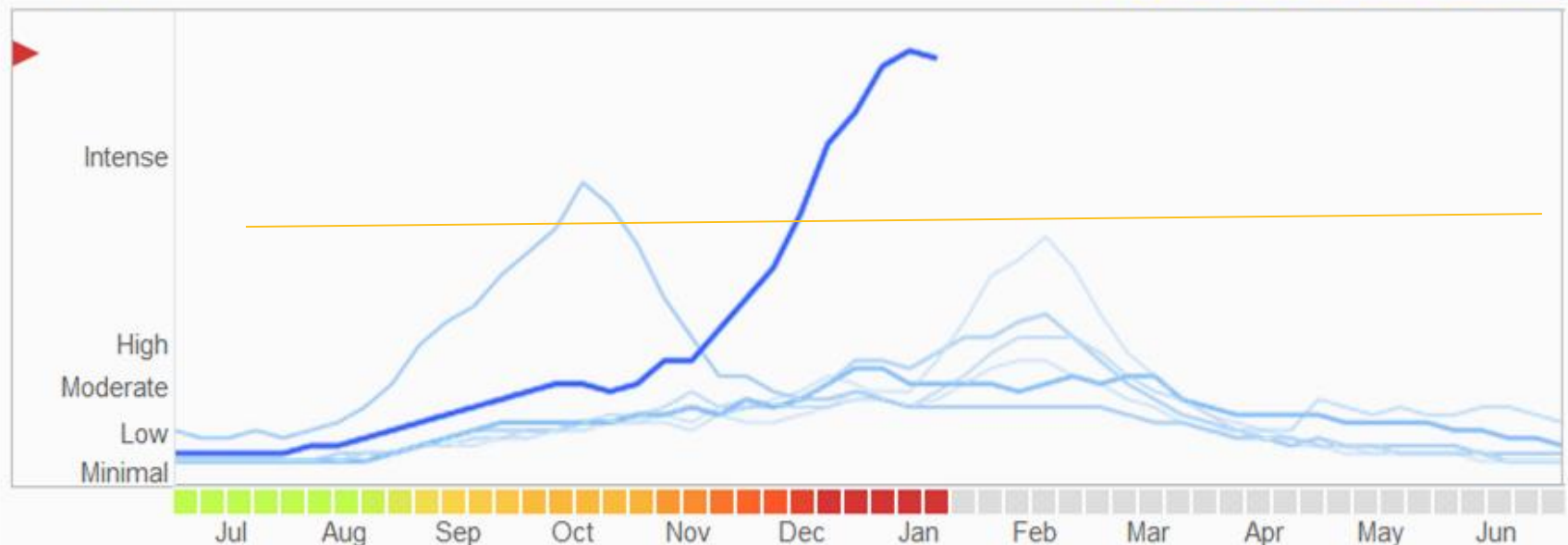
Real-Time Data Will Influence Behavior

The U.S. Centers for Disease Control sees a moderately severe flu season while Google warns of one of the worst flu seasons on record

We've found that certain search terms are good indicators of flu activity. Google Flu Trends uses aggregated Google search data to estimate flu activity. [Learn more »](#)

National

● 2012-2013 ● [Past years](#) ▼



RESULTS
SOCIAL YEARS
DRIVE SAN NAS
REPLICATION
HANDLE SOURCES SOFTWARE
CHALLENGES
COMPLEX LIMITS
ANNOUNCED
PAST
LARGE STORAGE
MILLION SETS
INCLUDE NETWORKS
HYPOTHESIS
SCIENCE
END
MOST NEARLY
MAPREDUCE
FUTURE
CRITIQUES
BILLION
PARALLEL
STATE CRITIQUE
PEOPLE TRAFFIC
USE CURRENTLY
NEW
INITIATIVE ECONOMIC
VARIETY
PROJECT ANNUAL
NOW
DISTRIBUTED
RELEVANT
USED
TERABYTES MARKET
RELATED TIME SENSOR
WOULD
FLOW NATIONAL
INTELLIGENCE
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INSIGHT
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PROCESSING APPROACHES
SEARCH
PRIVATE LEAVE
EVERY BODY
B
SEARCH

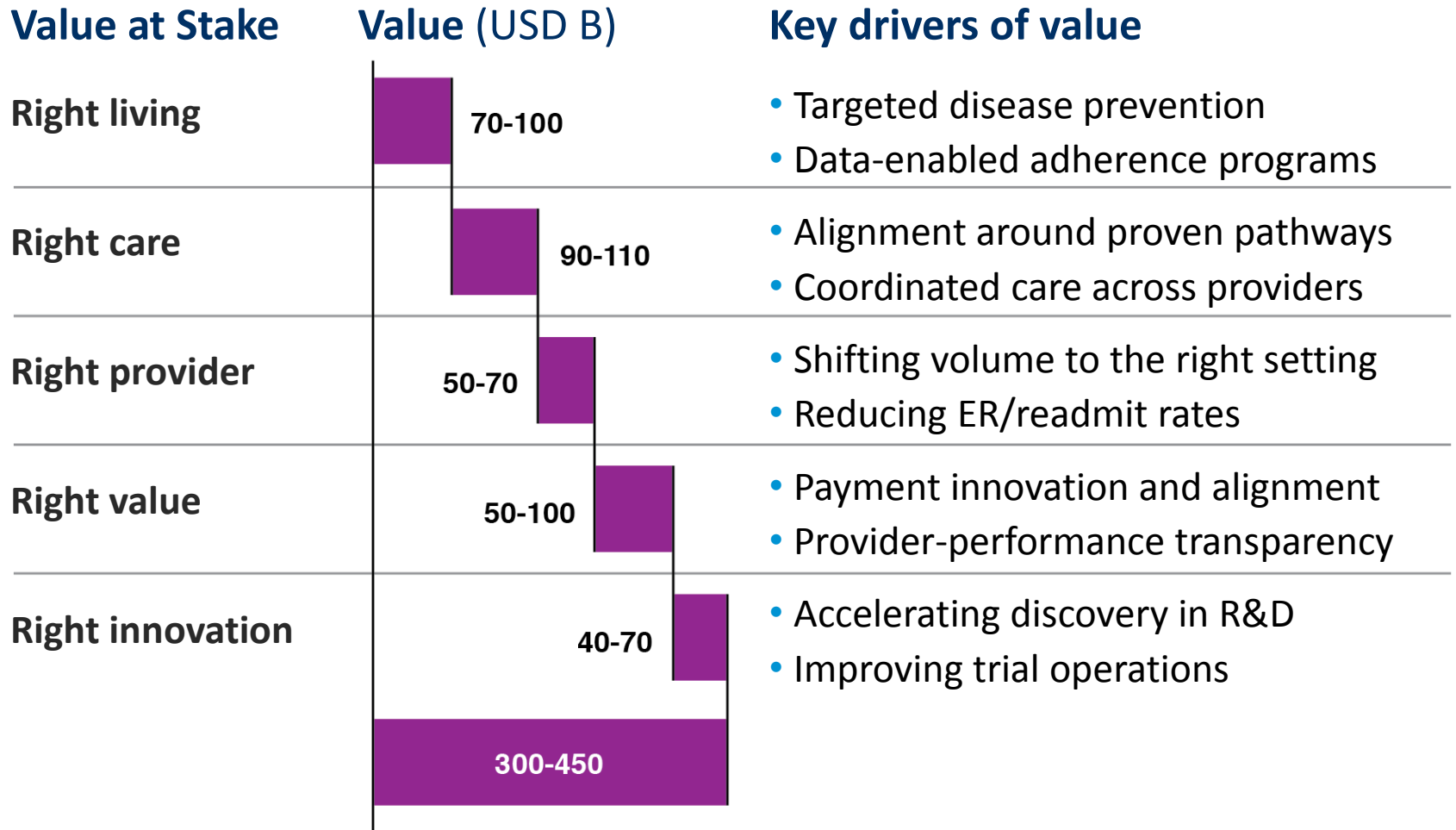
GOVERNMENT
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ONLINE DAY
MANAGE
WORLDWIDE
PROCESS
MAKING INTEGRATION
VOLUME
TECHNOLOGIES
MASSIVE
FRAMEWORK BETWEEN
BUSINESS EFFECTIVE
STATISTICS
VISUALIZATION
DATABAS ES
ANALYTICS
SIMULATIONS
SIZE
EXABYTES
DETERMINE
WELL
SET DEPARTMENT
CURIES
HIGH USERS
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ALGORITHMS
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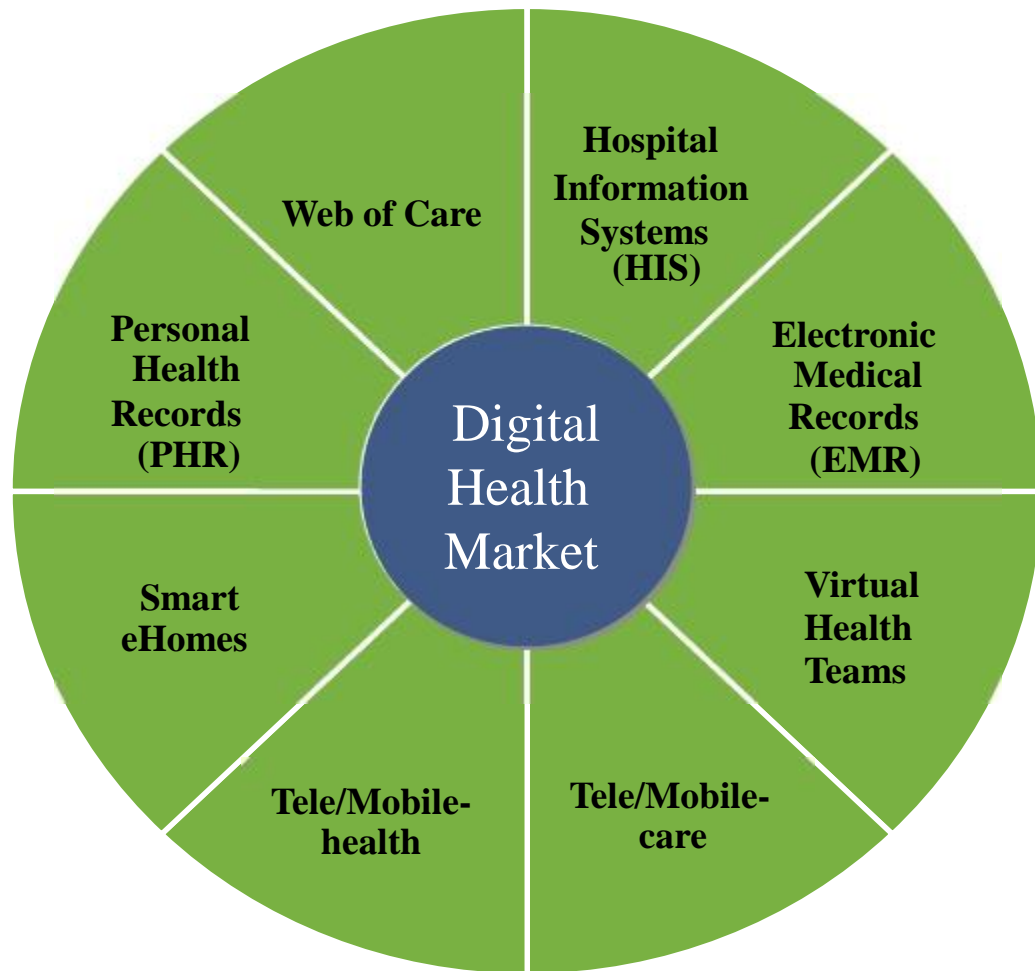
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Using Big Data to Drive Value: Potential \$300M to \$450M Savings



Source: American Diabetes Association; American Hospital Association/ HealthPartners Research Foundation, McKinsey Global Institute; National Bureau of Economic Research, US Census Bureau.

Leading to New Markets for Healthcare IT/Digital Health



Source: Frost & Sullivan

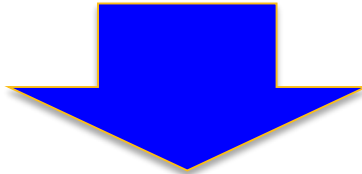
The Present



The Future



Bigger Impact: Connecting Patient Data to Doctor



**Improve compliance, provide early interventions,
collect better quality data**

Glow Caps



Compliance

Zio Patch



**Long-term
cardiac monitors**

Care Innovations



**Monitoring elderly
at home**

**Doc: are you ready for
all this?**



Pricing Pressure on Drugmakers Increases





Personalized Medicine

- ✧ Gen therapy
- ✧ Anti body conjugates
- ✧ Cancer vaccines
- ✧ Rare disease
- ✧ Regenerative medicine



Turning Failures into Success

DRUG	FAILED	SUCCEEDED
AZT 	Cancer	AIDS
Rogaine 	High blood pressure	Promote hair growth in balding men
Viagra 	Angina	Erectile dysfunction



Where are we heading?

Healthcare Systems Change

Past

- **Treat Illness**
- **Acute care**
- **Place: Hospital**
- **Targeted therapies**
- **Payment:**
Cost based care

Future

- **Promote wellness**
- **Prevent onset**
- **Early intervention**
- **Place: Home**
- **Behavior
modification**
- **Financing:**
Value-based-care

Robotics

Genomics

Diagnostics

Digital health

Bioinformatics

Changing Roles of Doctors

Past

- Unquestioned authorities
- Trial and error
- Treat disease
- Disconnected from others in the healthcare system

Future

- Health advisors
- Data driven decisions using health IT and diagnostics
- Focus on prevention and wellness
- Integrated with specialists, labs, and pharmacists

Changing Roles of Patients

Past

- Passive about their healthcare
- Armed with family history
- Relied on doctors to maintain health records
- Relied on doctors as primary source of medical information
- Received annual check-up

Future


- Active managers of their healthcare
- Armed with knowledge of genetic risks
- Have access to their own digital health records
- Rely on Internet, social networks, for medical information
- Monitor health and wellness with digital devices

Where Are the Biggest Opportunities

- Transformational healthcare delivery
- Disruptive therapeutics / vaccines / diagnostics...each with a special pathway to market
- Personalized and predictive medicine
- Medical devices / platforms / tools
- Data analytics
- Significant opportunity to address global needs for food, energy, fiber
- Emerging market opportunities

Healthcare:

Procedures  Outcomes

Cost  Value

= NOW!

- Scientific advances continue to fuel the life sciences industry
- Disruptive technologies are radically changing healthcare
- Emerging economies can leverage advances to improve healthcare delivery in underserved areas
- The patient at the center of healthcare & in control

The message:

It's a fabulous time...

Thanks & Enjoy Lunch!

