

Vision 2020: The Need to Build Holistic, Personalized Healthcare Delivery Systems

Dr. George Poste
Director, Complex Adaptive Systems Initiative
and Del E. Webb Chair in Health Innovation
Arizona State University
george.poste@asu.edu
www.casi.asu.edu

International Health Forum
Munich • 7 May 2010

Challenges for Healthcare Delivery Systems

Cost



Demographics



Chronic Diseases



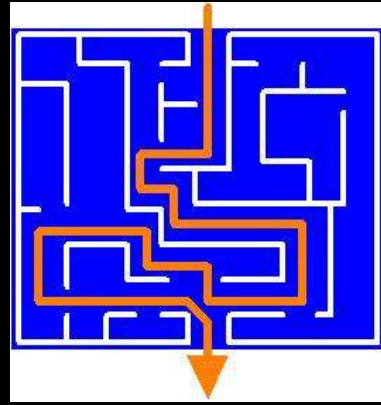
Life Style Disease



Inefficient use of Information



Fragmented, Compartmentalized Services



Protracted Adoption of Best Practices

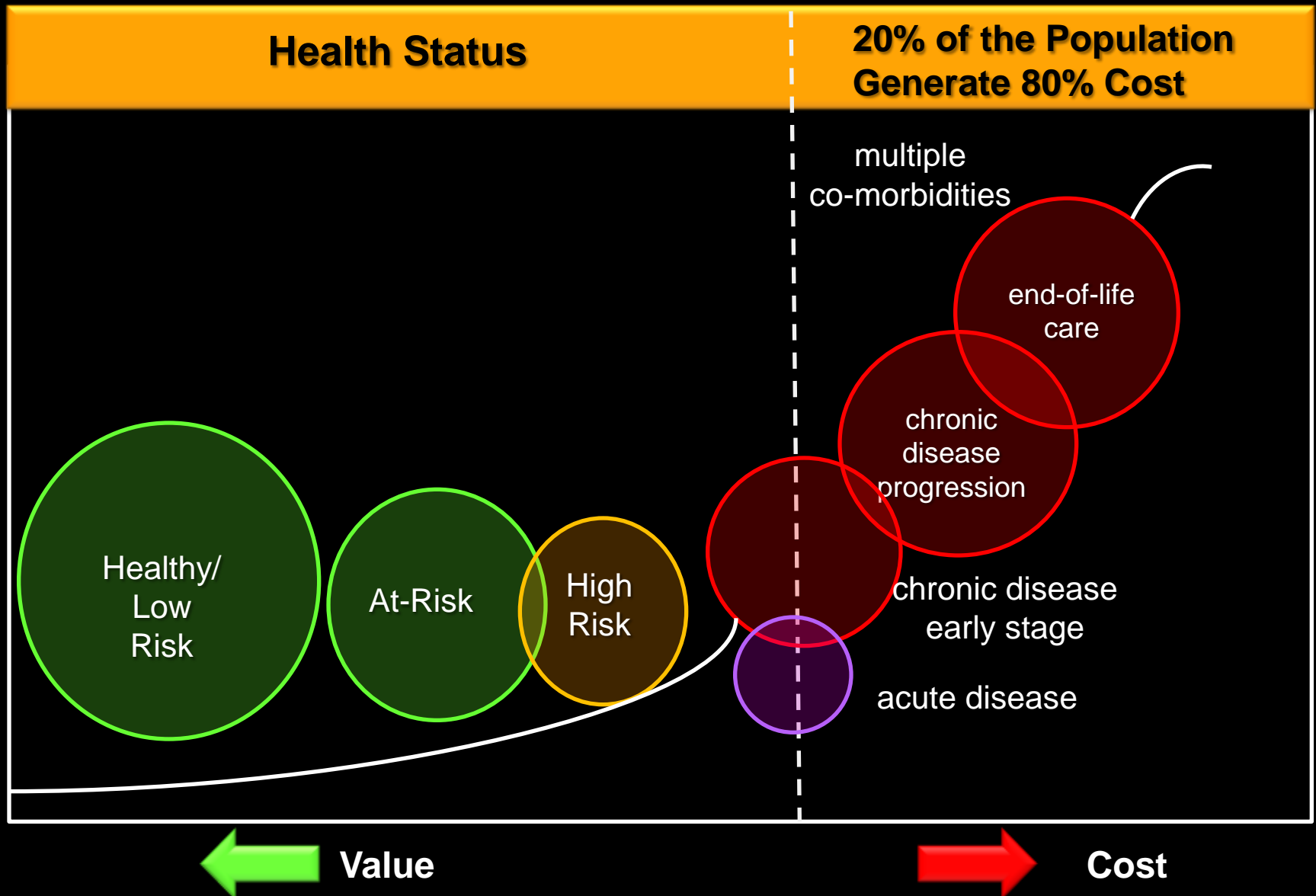


Subsidiarity and Policy Complexity

The Strategic Environment for Healthcare: Defining New Value Propositions

- **an environment of increasing economic constraints**
- **managing the limit(s) of society's willingness and ability to pay for innovation**
- **controlling costs while enhancing quality and outcomes**
- **building new alliances to optimize value-driven outcomes**
 - **integration of Dx, Rx, Ix**
 - **reliable information drives rational decisions**
 - **engagement of patients/consumers**
 - **new OTC/consumer services**

The Economic, Social and Clinical Benefits of Proactive Mitigation of Disease Risk and Chronic Disease Co-Morbidities

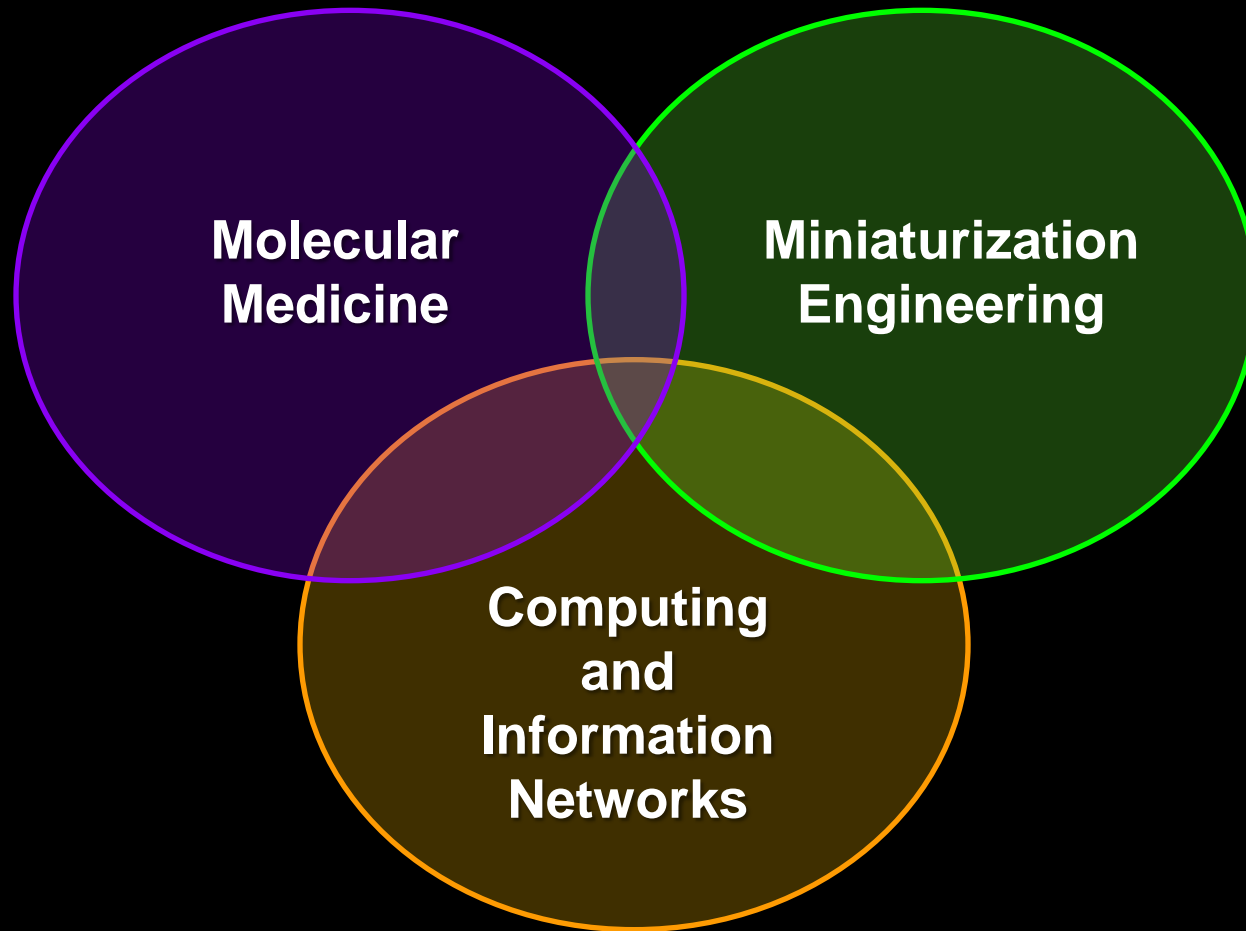


My Presentation

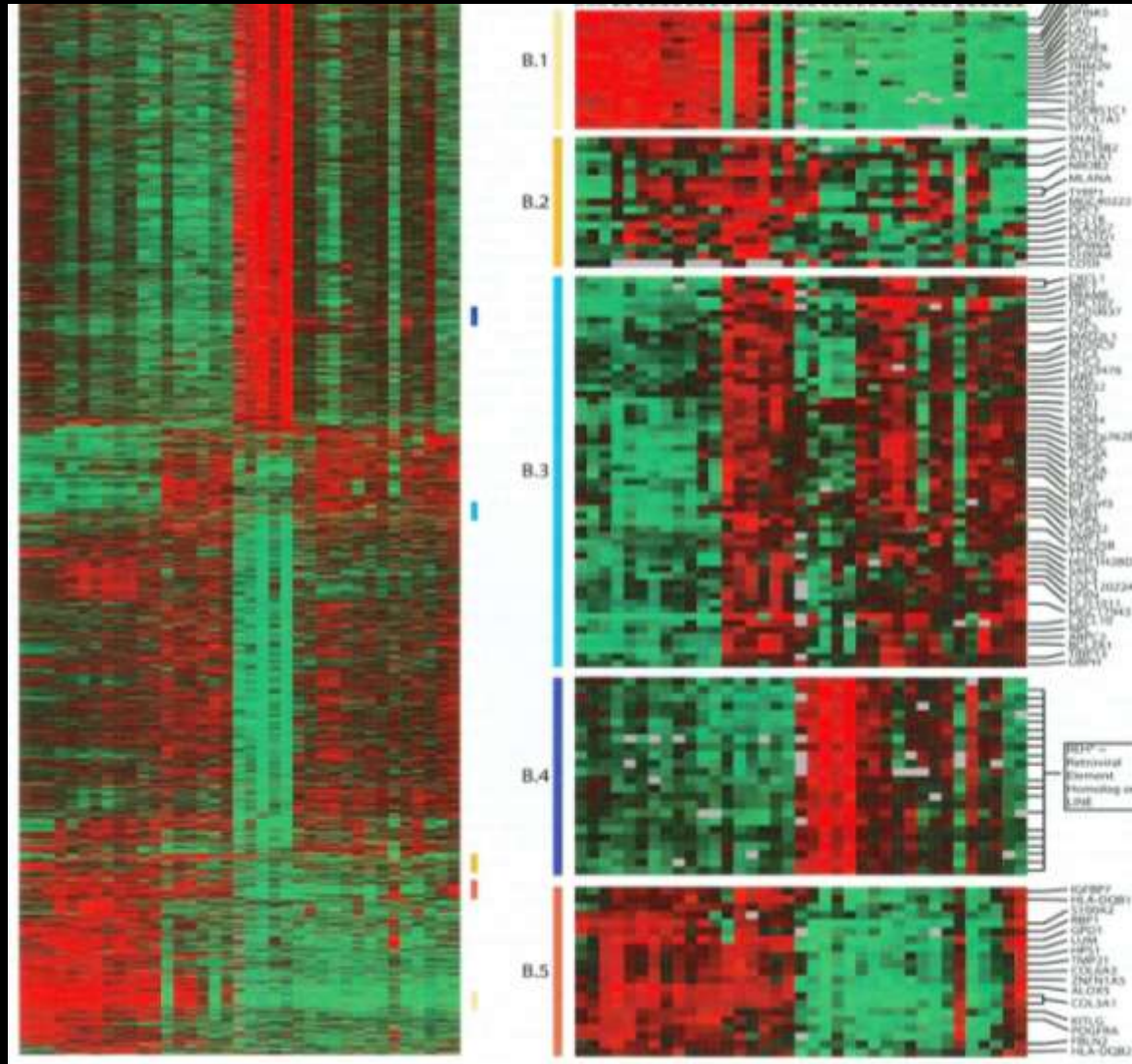
- #1** ● major forces driving the evolution of healthcare
 - technology, social, economic
- #2** ● convergence of medicine, engineering and computing
 - molecular diagnostics for rapid profiling of health status
 - devices for remote health monitoring
 - social media, e.health, m.health
- #3** ● increased responsibility of consumers for personal health (wellness)
- #4** ● electronic connectivity and healthcare information services
 - continuity of care (cradle to grave)
 - erosion of national boundaries
 - entry of new companies not previously involved in healthcare
- #5** ● social media
 - from passive consumers to greater engagement in healthcare and treatment choice

Personalized Medicine Trends in the Rx World

Technology Convergence and Personalized Medicine: The Rise of Multiplex Diagnostics and Miniaturized Sensors/Devices



Disease Subtyping: Next-Generation Molecular Diagnostics (MDx) and A New Molecular Taxonomy of Disease



MDx Platforms

- massive parallelism
- miniaturization
- automation
- rapid
- POC

**RIGHT Rx
for
RIGHT DISEASE
SUBTYPE**

Personalized Medicine: Progressive Evolution Based on Increasingly Comprehensive Profiling of Disease Risk and Health Status

The diagram consists of three overlapping circles arranged vertically. The top circle is red and labeled 'Targeted Care'. The middle circle is green and labeled 'Individualized Care'. The bottom circle is purple and labeled 'Personalized Care'. The circles overlap in a way that suggests a progression from the top to the bottom, with each level building upon the previous one.

**Targeted
Care**

- rational Rx based on profiling of underlying molecular pathology
- MDx and disease subtyping

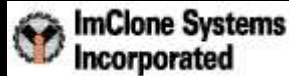
**Individualized
Care**

- rational Rx based on comprehensive molecular profiling of individuals
 - disease subtypes and optimum Rx
 - Rx adverse event risk
 - disease predisposition risk and mitigation

**Personalized
Care**

- real time remote health status monitoring
- transition to disease prediction and preemption
- integration of clinical medicine and consumer health (“wellness”)

K-RAS Profiling and Anti-EGFR Monoclonal Antibody Therapy



- higher response in patients with K-RAS versus mutant-K-RAS
- estimated \$604 million/year savings (ASCO)

clinical guidelines

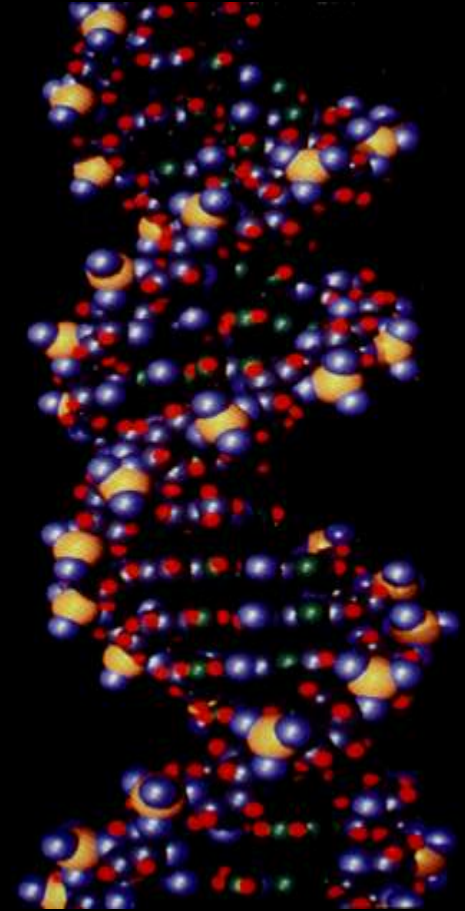


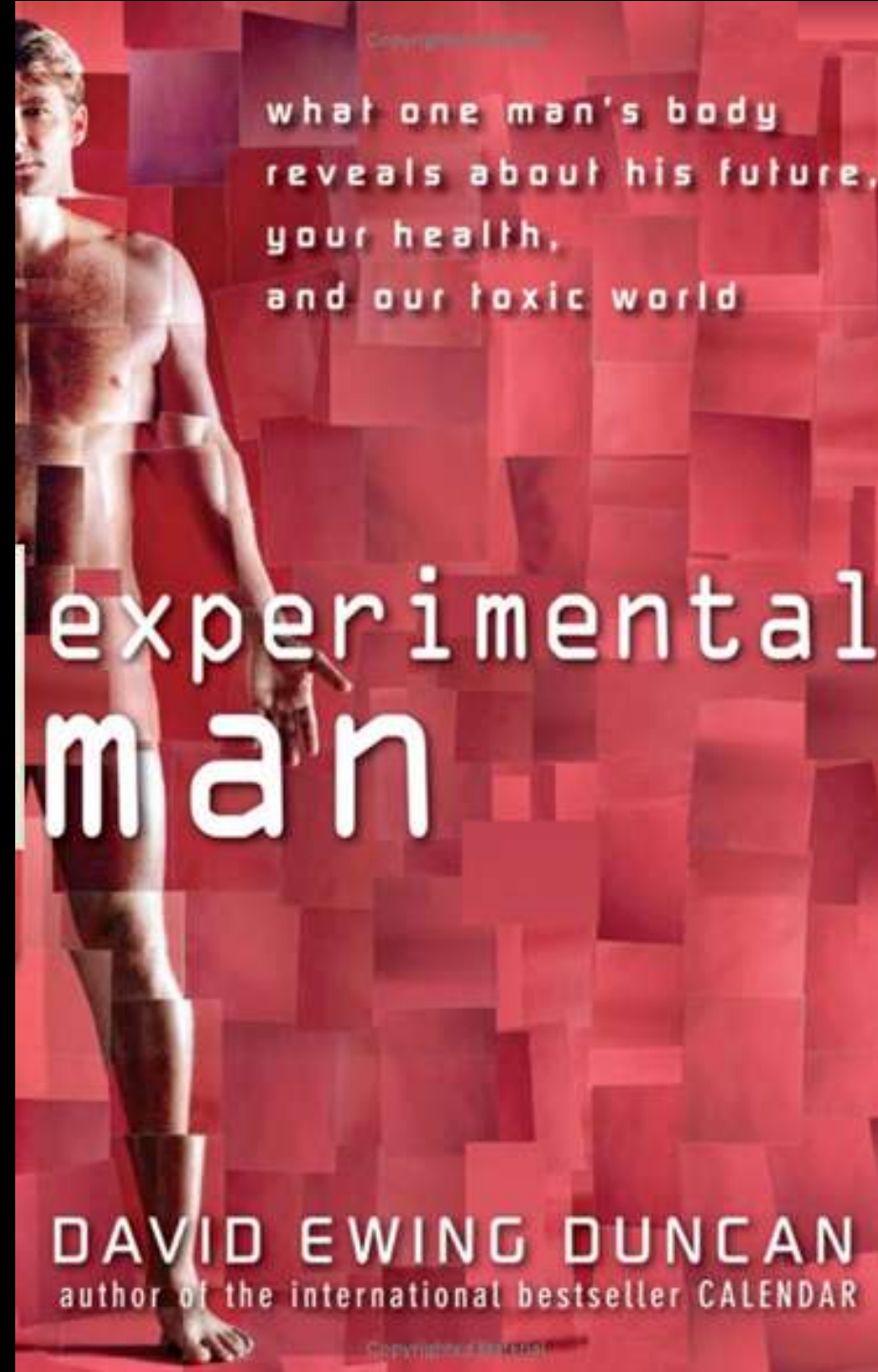
- regulatory endorsement in product labeling



- payor adoption

The Hunt for Gene Loci Associated with Predisposition to Complex Human Diseases





what one man's body
reveals about his future,
your health,
and our toxic world

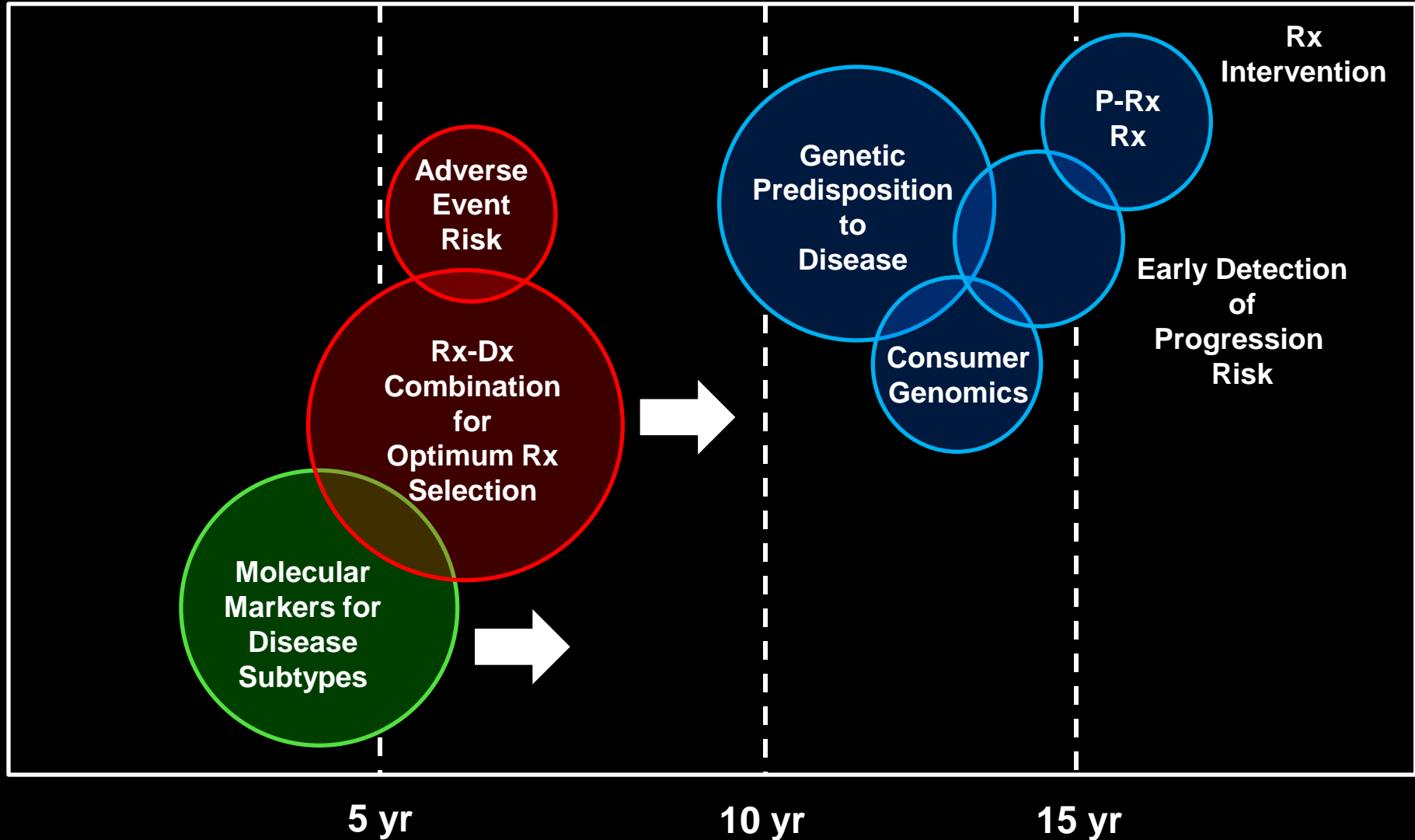
experimental man

DAVID EWING DUNCAN
author of the international bestseller CALENDAR

Consumer Genomics

- **probabilistic future risk(s) versus absolute risk**
- **effect of environmental factors/life style on risk**
 - enhance
 - reduce
- **ethical and legal implications**
 - insurance
 - employment
 - privacy

Evolution of Molecular Profiling and Diagnostics for Improved Disease Detection, Classification and Risk Evaluation (Rx Markets)



**Technology Convergence
and the
OTC and Consumer Health Worlds**

Implications of Personalized Medicine for OTC Sector: Expanding the Horizon of Traditional OTC Products and Services

Traditional Categories of Products/Services

- Rx to OTC conversion
- relationship with Rx industry
- M&A activity to acquire brands/market position
- product launches increasingly affluent NICs

New Opportunities

- in-home diagnostics
 - remote health status monitoring
- new life-style product classes
- e.health and m.health
- new entrants and new business models for OTC product promotion and adoption

Rx to OTC Conversion

- attraction of cost-shifting to consumer for payors
- regulators will continue to focus primarily on safety of eligible product categories
 - known risks and adverse event profile of Rx
 - drug interaction risks in OTC setting
- availability of diagnostic tests to identify ‘at risk’ individuals for Rx classes with regulatory concerns may facilitate conversion
 - myopathy in ‘statins’
- new diagnostics for use of OTC anti-infectives in developing countries
 - definitive diagnosis of organism before purchase allowed to reduce growing resistance problem
 - residual challenge of extensive use in food animal production

Wellness:

**The Most Broad and Most Valuable
Definition of Successful Healthcare**

Consumer-Centric Health

After a Short Stay in America, Michelangelo's David Returned to Europe



Consumer Behavior and Healthcare Costs



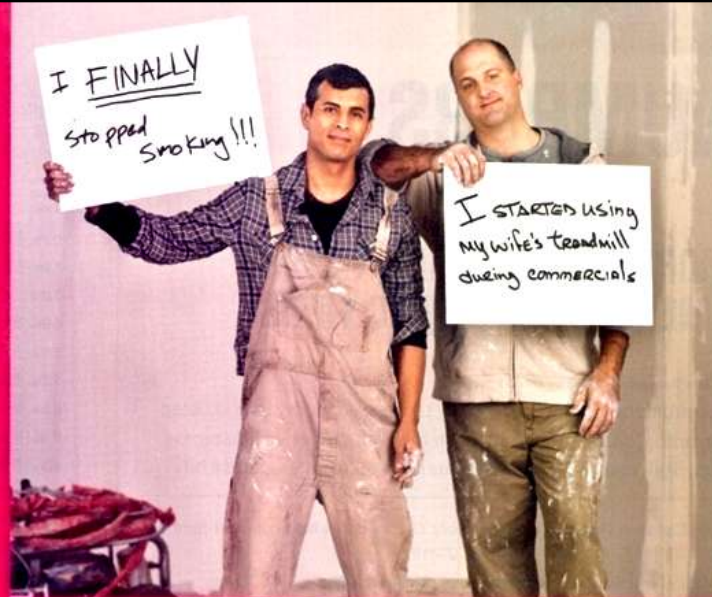
“diabetesity” \$200 billion



**smoking \$190 billion
alcohol \$20 billion**

The Case for Wellness

- **30-60% of health plan claims are related to health risks that are modifiable by nutrition, exercise, stress reduction, etc.**
- **well-managed employer health and productivity management programs return \$6-15 for every dollar spent**
- **cost of smoking: healthcare cost of smoking over a lifetime = \$220K per person = \$40 in healthcare cost per pack of cigarettes smoked!**
- **67% of the US population is overweight or obese, and 22% of current healthcare costs are obesity-related**



No two employees are alike. And neither are their health decisions.

Your employees' decisions impact not only *their* health, but also your company's costs and productivity. To enable better decisions, UnitedHealthcare is leading the way with personalized health care solutions designed to help people – and businesses – stay healthy.

- Personal health assessments
- Personal wellness programs/tracking
- Personal care consultants
- Personal care plans
- Personal doctor selection
- Personal cost estimators
- Personal health records
- And more

Personalization is the heart of health care.™ Better decisions lead to better results.

Find out how we can personalize your employees' health care to help your bottom line.

1.877.232.8821

uhctogether.com/bizweek
Or contact your broker.



UnitedHealthcare®
Healing health care. Together.®

Health Status Monitoring and the Promotion of Wellness

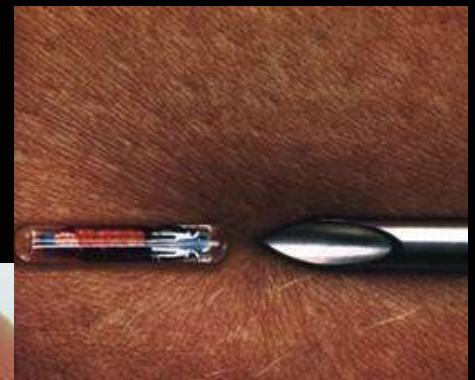
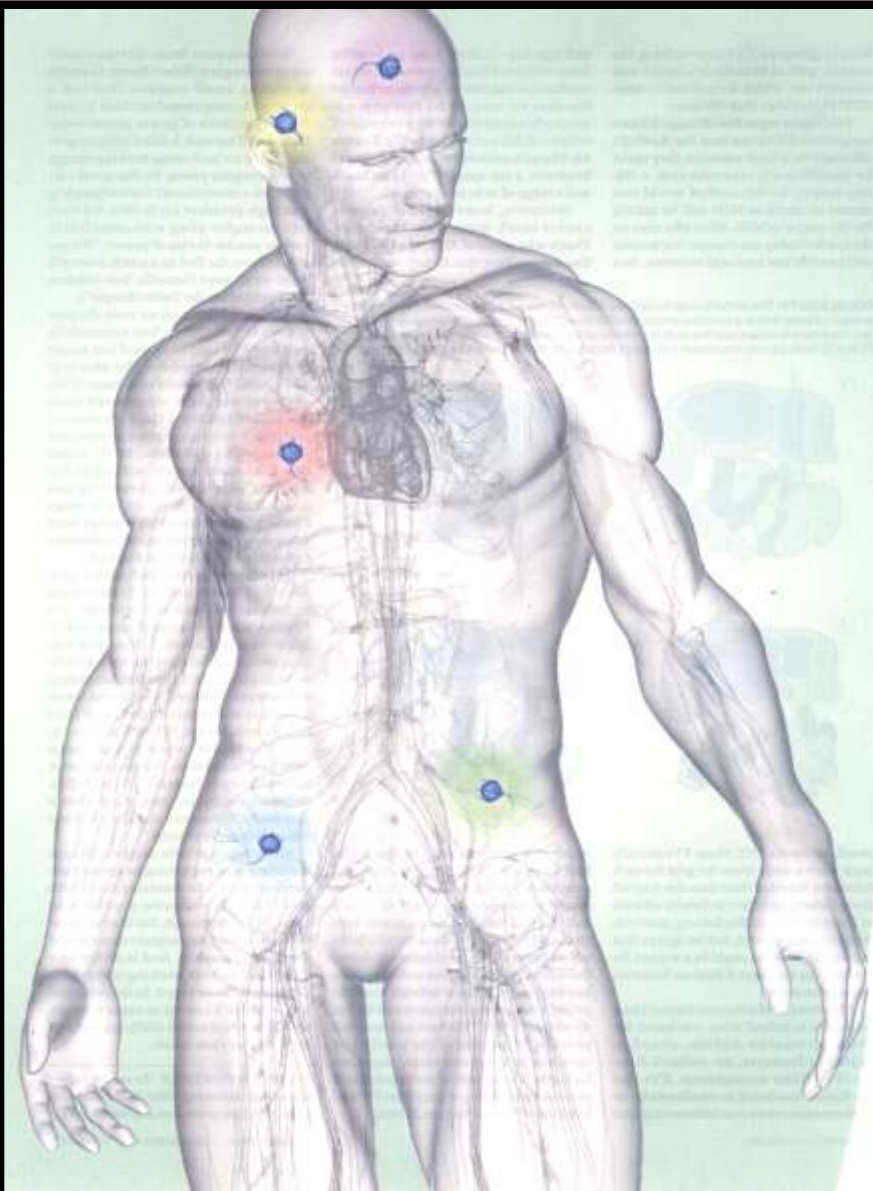
**On-Body: In-Body Sensors (OBIBs)
and
Remote Monitoring of Health Status**

Personal Health Systems: On-Body: In-Body Sensors (OBIBs)

- wearable
- portable/mobile
- point-of-care
- implantable
- multi-parametric
- interoperability with electronic records

Mobile Health (mHealth)

On Body: In Body Sensors/Devices: Real Time and Remote Monitoring of Individual Health Status



On Body: In Body Sensors and Devices

Objective

- remote monitoring of health status



Applications

- multi-feature monitoring and broadband wireless networks
 - ubiquitous sensing
- enhanced autonomy for in-home aged
- proactive alerting and intervention to mitigate health incidents
- monitoring of patient compliance
- coupled linkage to remote Rx dispensing for efficient disease management

**Parallel Opportunities in
OTC and Consumer health markets**

Major Target Markets for Wireless Medicine

Disease	Parameter
Alzheimer's	vital signs, location, activity, balance
Asthma	respiratory rate, FEV, air quality, oximetry, pollen count
Breast CA	ultrasound self-exam
COPD	respiratory rate, FEV, air quality, oximetry
Depression	medication compliance, communication
Diabetes	glucose, hemoglobin A1C
Heart Failure	cardiac pressures, weight, blood pressure fluid status
Hypertension	continuous blood pressure monitoring, medication compliance
Obesity	smart scales, caloric in/out, activity
Sleep Disorders	sleep phases, quality, apnea, vital signs

Modified from: West Wireless Health Institute, Medtech Insight, August 2009

The Costs of Non-Compliance with Rx Regimens



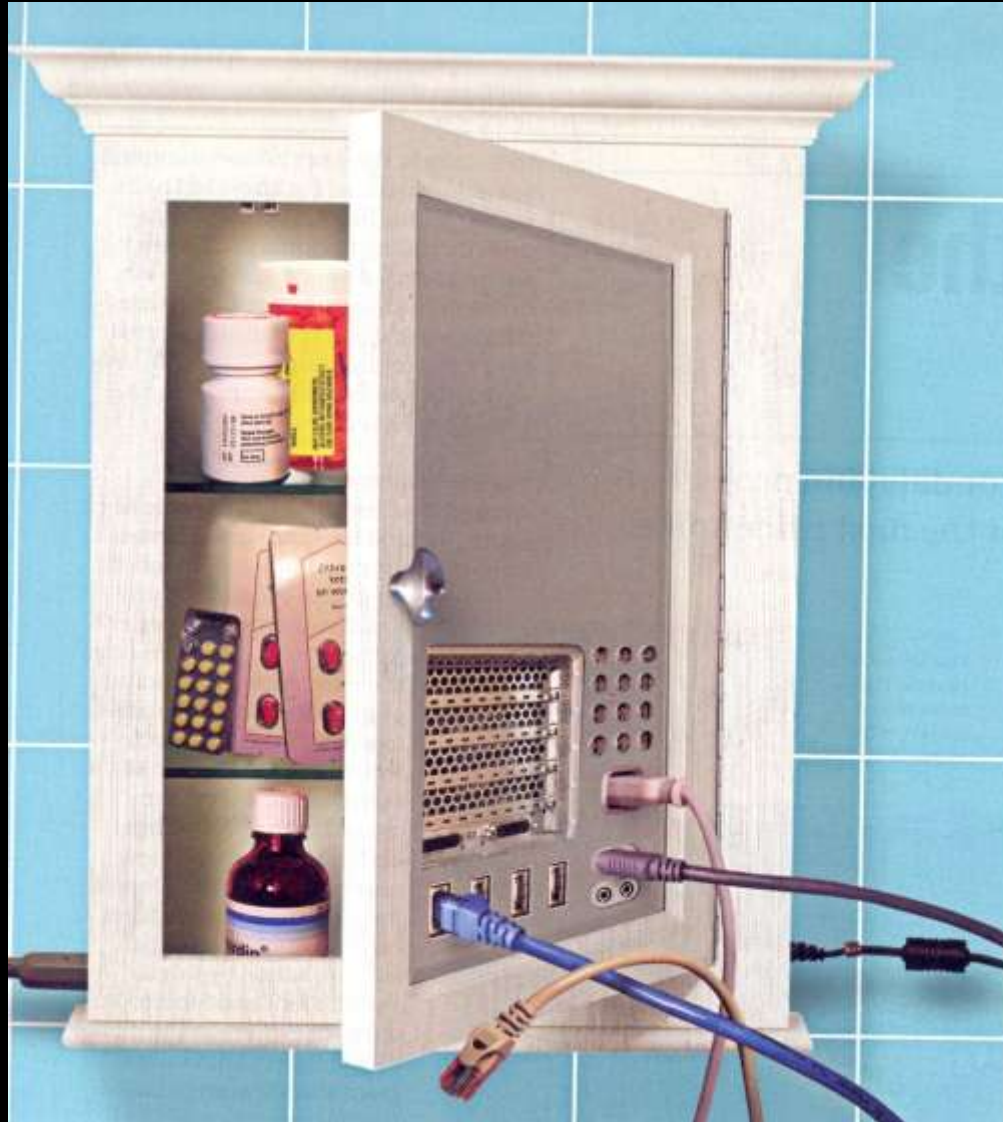
- **\$177 billion projected cost**
- **20 million workdays/year lost (IHPM)**
- **40% of nursing home admissions**
- **projected 45-75% non-compliance (WHO)**
- **50-60% depressed patients (IHPM)**
- **50% chronic care Rx (WHO)**



The Non-Compliance Problem

- **non-compliance rates in both long-term and short-term treatments reach 50% of patients**
- **non-compliance “a worldwide problem of striking magnitude” (WHO, 2003)**
- **non-compliance is a major barrier for realizing the benefits evidence-based therapies**
- **lack of effective policies toward the problem of non-compliance at both national and European levels**

In-Home POC Health Status Monitoring

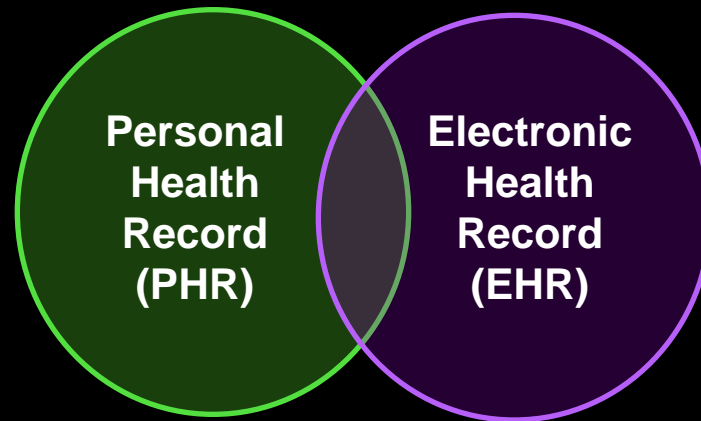


The Infocosm: Emerging Networks of Global Connectivity



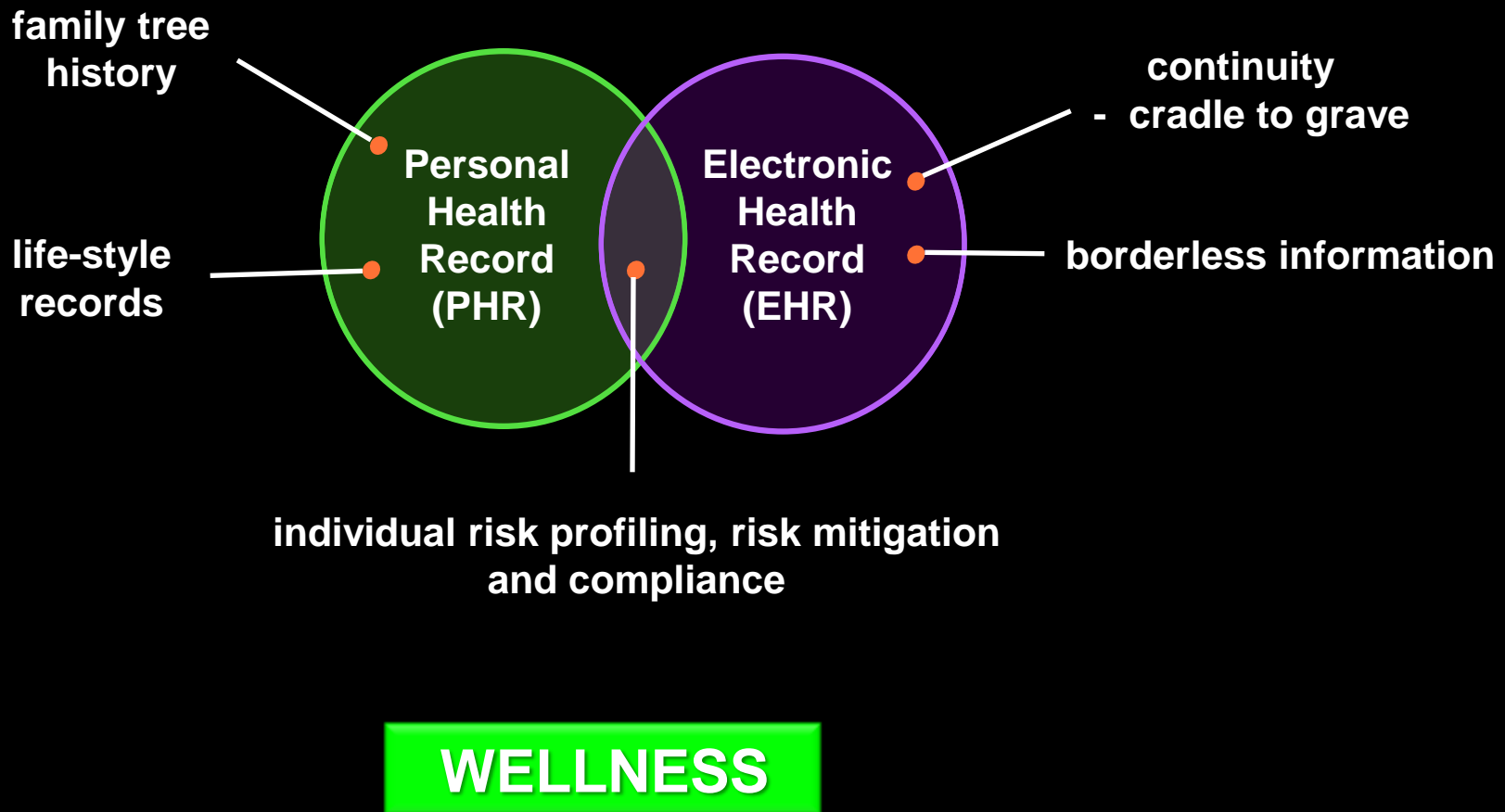
Digitizing Health Information

AORTA: Always On, Real-Time, Actionable



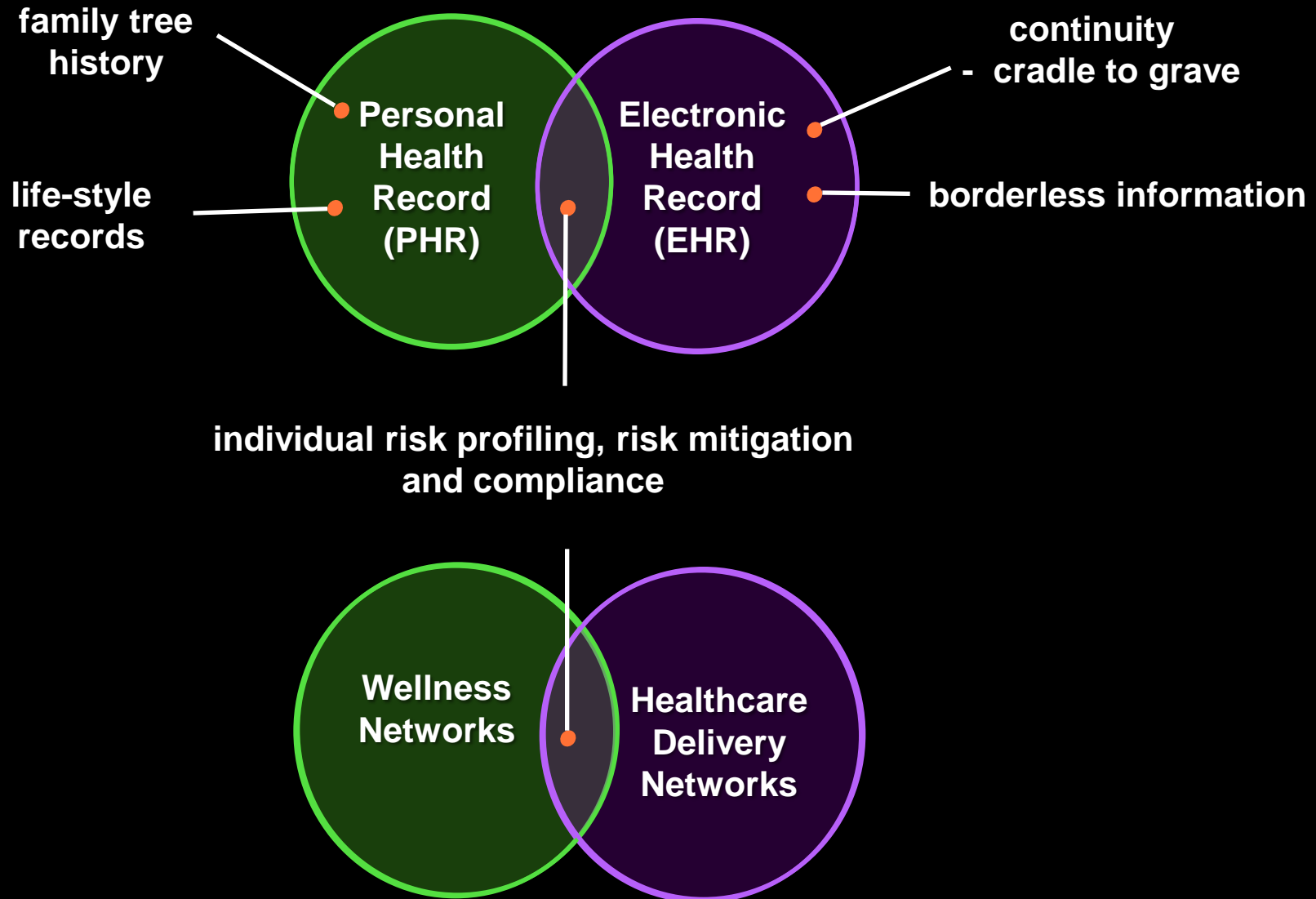
Digitizing Health Information

AORTA: Always On, Real-Time, Actionable



Digitizing Health Information

AORTA: Always On, Real-Time, Actionable



**Telecommunications and Media Industry
Convergence:
Implications for Healthcare Delivery
and Consumer-Centric Care**

e-Patient Revolution



Wireless Technologies: Consumer and Clinical Markets Converge



iPhone Apps for Health and Fitness

Gym Buddy



8 months, 2 weeks ago



WebMD Mobile



8 months, 4 weeks ago



Happiness



9 months ago



Calorie Calculator



11 months, 2 weeks ago



Indice de masa



11 months, 2 weeks ago



Gym Technik



11 months, 4 weeks ago



Pocket Workout



9 months ago



Shake Jump



9 months, 1 week ago



iFitness



9 months, 1 week ago



8h2o



1 year ago



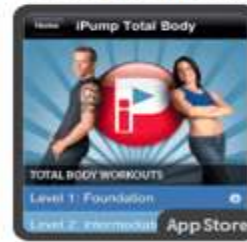
Track'n Trail



1 year ago



iPump Total Body



1 year ago



Steps



9 months, 2 weeks ago



CareConnector



9 months, 3 weeks ago



GottaKickit



9 months, 3 weeks ago



Total Coach



1 year ago



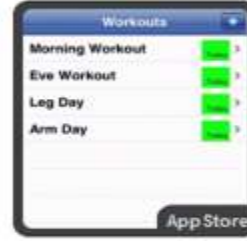
Anatomy Flash



1 year ago



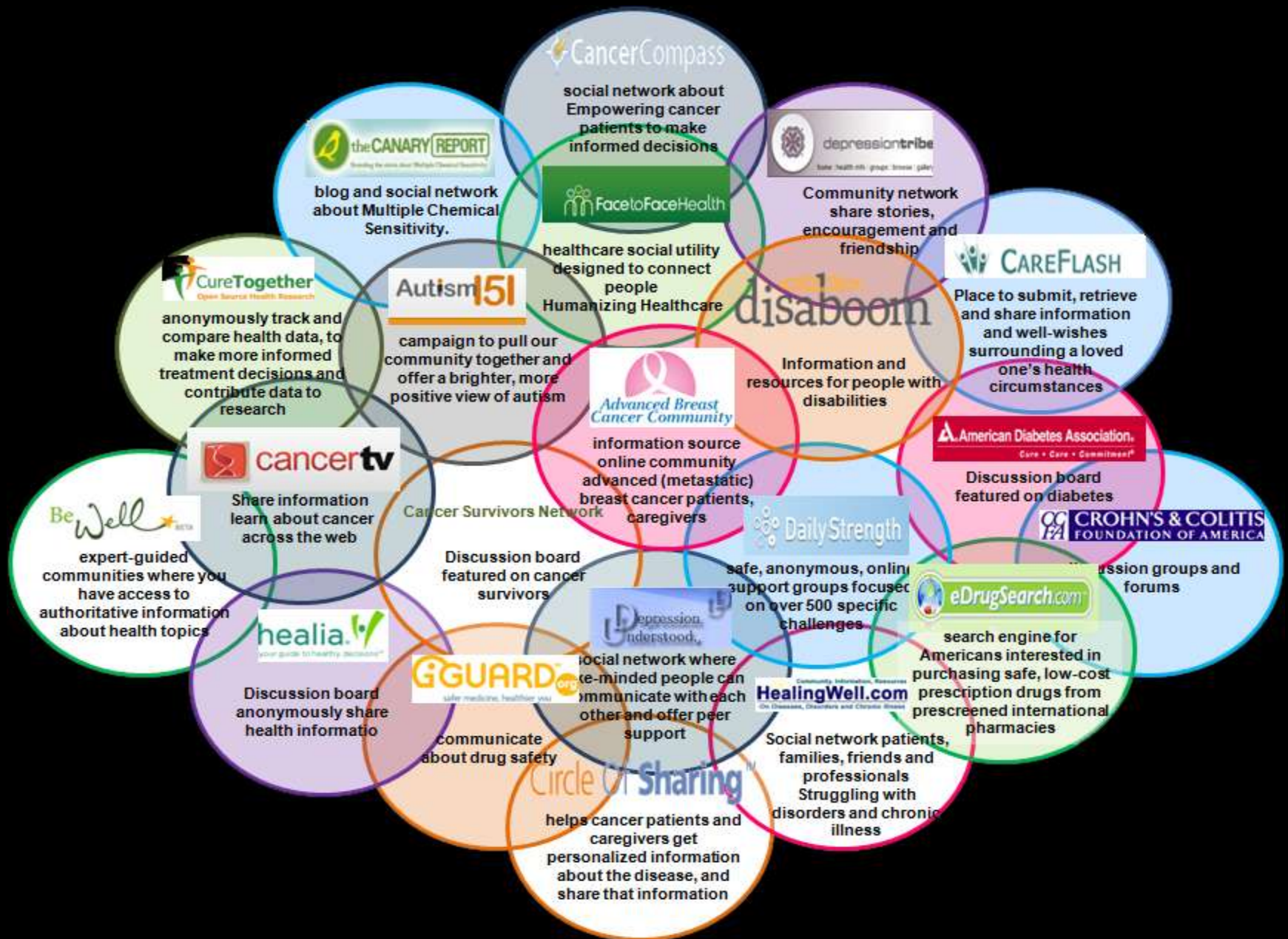
Workout Buddy



1 year ago



Pharma and Healthcare Social Media (Non-Brand Sponsored) Patient Communities





(@) myFoodPhone

'Take a photo and get advice'



As seen on:



Social Networking Sites (SNS) and their Role in Clinical Care and Personal Health

- **logical extension of rapid rise of SNS in mainstream culture**
- **information on both treatment and wellness options**
- **OTC advertising**

- **Quality**
- **Trust**
- **Security**

A New Economics for a Digital World

- **information is not limited by its transportability or number of times it can be used**
- **networked technologies offer new, powerful ways to analyze and manage consumer behavior economic data at increasingly fine-grained scale**
- **new sociometrics**
 - **product use and advertising impact**
 - **product refinement**
 - **product relationships and new promotion channels**
 - **inventory and distribution logistics**

A New Economics for a Digital World

- **information is not limited by its transportability or number of times it can be used**
- **networked technologies offer new, powerful ways to analyze and manage consumer behavior economic data at increasingly fine-grained scale**
- **new sociometrics**
 - **product use and advertising impact**
 - **product refinement**
 - **product relationships and new promotion channels**
 - **inventory and distribution logistics**

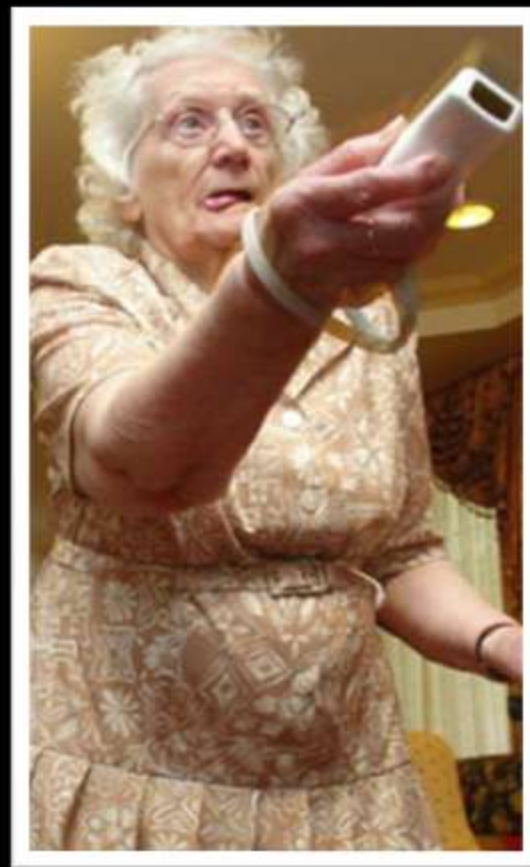
CUSTOMIZATION

In-Home Health Connection: Engaging the Elderly





Wii **Fit** Plus



**Electronic Networks and
Expansion of Locations for Healthcare Delivery
and Support of Consumer Wellness**

Copyrighted Material

THE DECISION TREE

TAKING CONTROL OF YOUR HEALTH
IN THE NEW ERA OF PERSONALIZED MEDICINE



THOMAS GOETZ

Copyrighted Material

“Real personalized medicine should begin long before we’re faced with pharmacology”

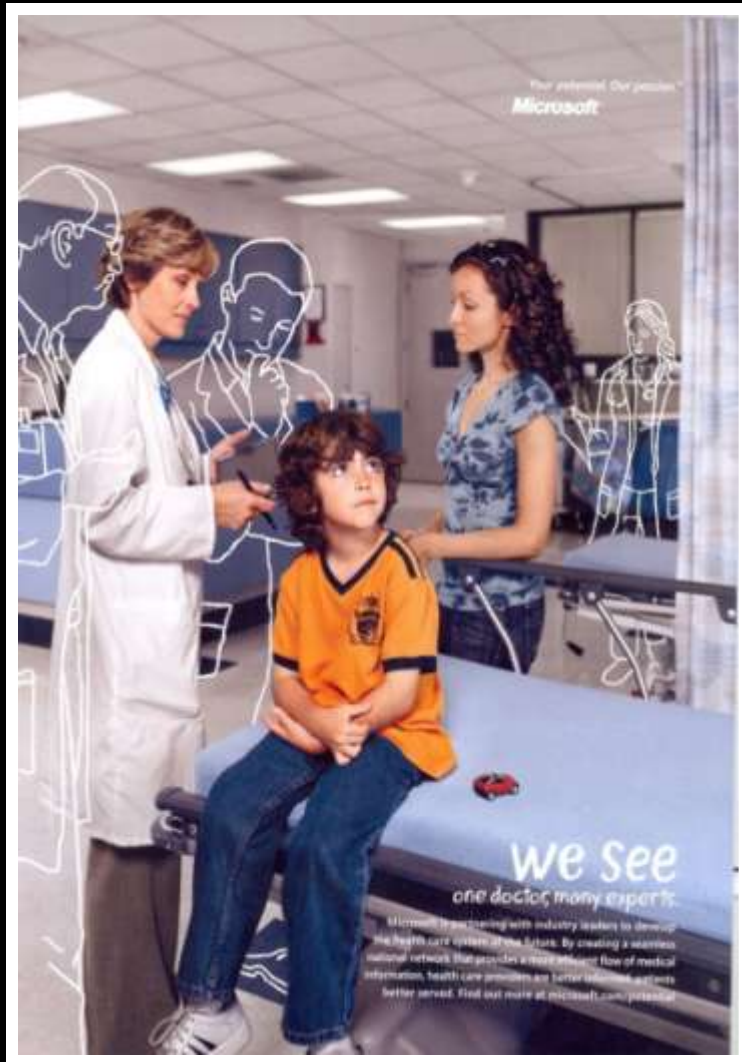
“Our health information is too important to leave to an archaic, insular system.

If there’s no longer a need to rely solely on a doctors advice for treatment and care, why should we be expected to artificially limit our options.”

**Thomas Goetz
Deputy Editor of Wired**

The Decision Tree: Taking Control of Your Health in the New Era of Personalized Medicine (Hardcover)
Thomas Goetz (Author) . Image Source: [Amazon.com](https://www.amazon.com)

Virtual Medicine Networks: Increasingly Integrated Care and Continuity of Care



Rx

- rapid, real time access to expertise
- broader range of clinical specialties
- integrated health records
- availability of lab and Rx lab data
- drug interactions risk
- electronic Rx prescribing

OTC

Consumer Health

- electronic analysis of diagnostic accuracy for optimum use of 'wellness' products and
- controlled electronic oversight of Rx to OTC conversion for products that regulators would otherwise be reluctant to grant full OTC approval

OBERE APOTHEKE



OBERE APOTHEKE



Smart Cards and Personal Electronic Health Records



```
graph LR; A((Accelerating Technology)) --> B((Consumer Choice Point)); B --> C((Market Discontinuity));
```

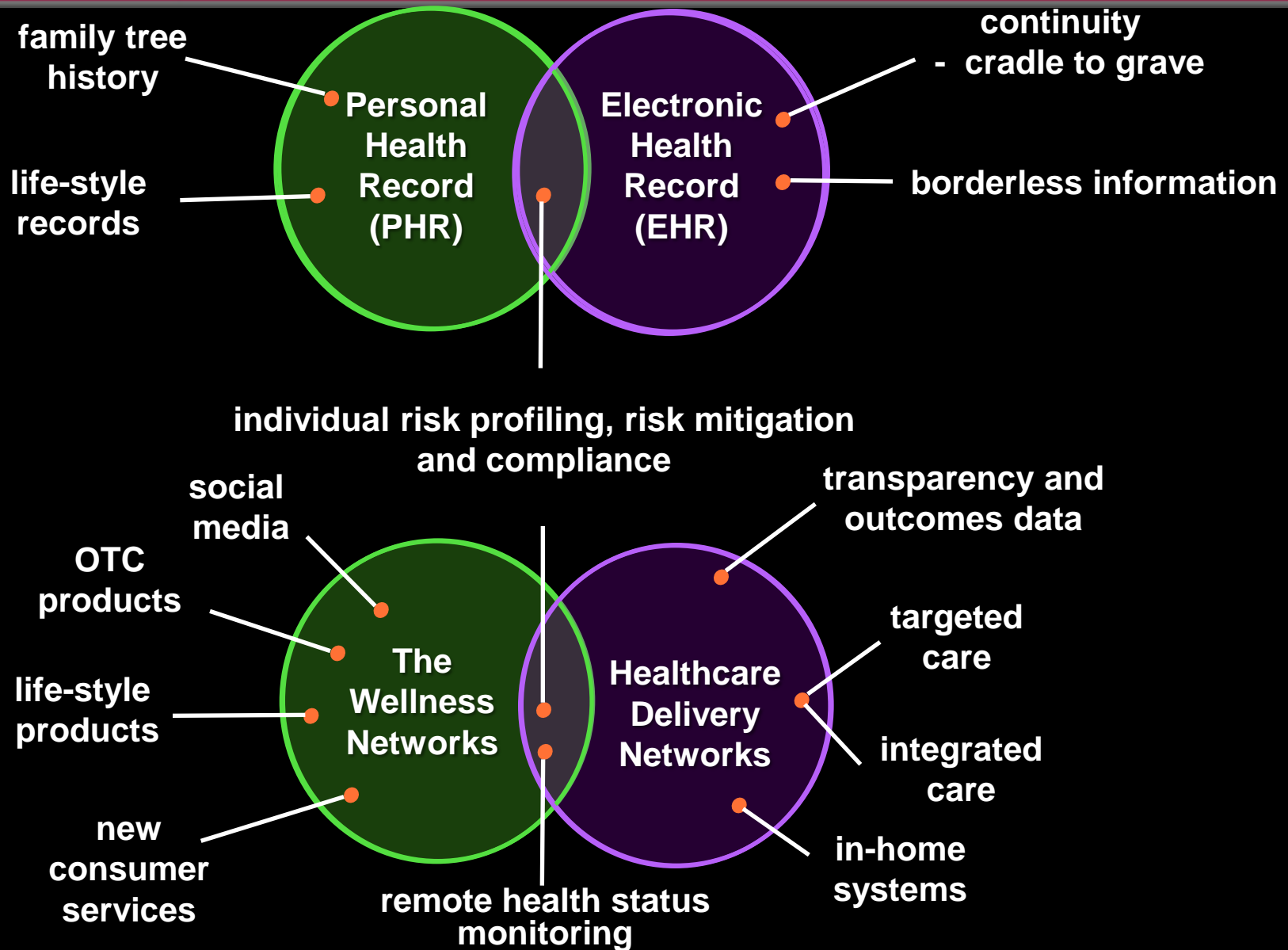
**Accelerating
Technology**

**Consumer
Choice
Point**

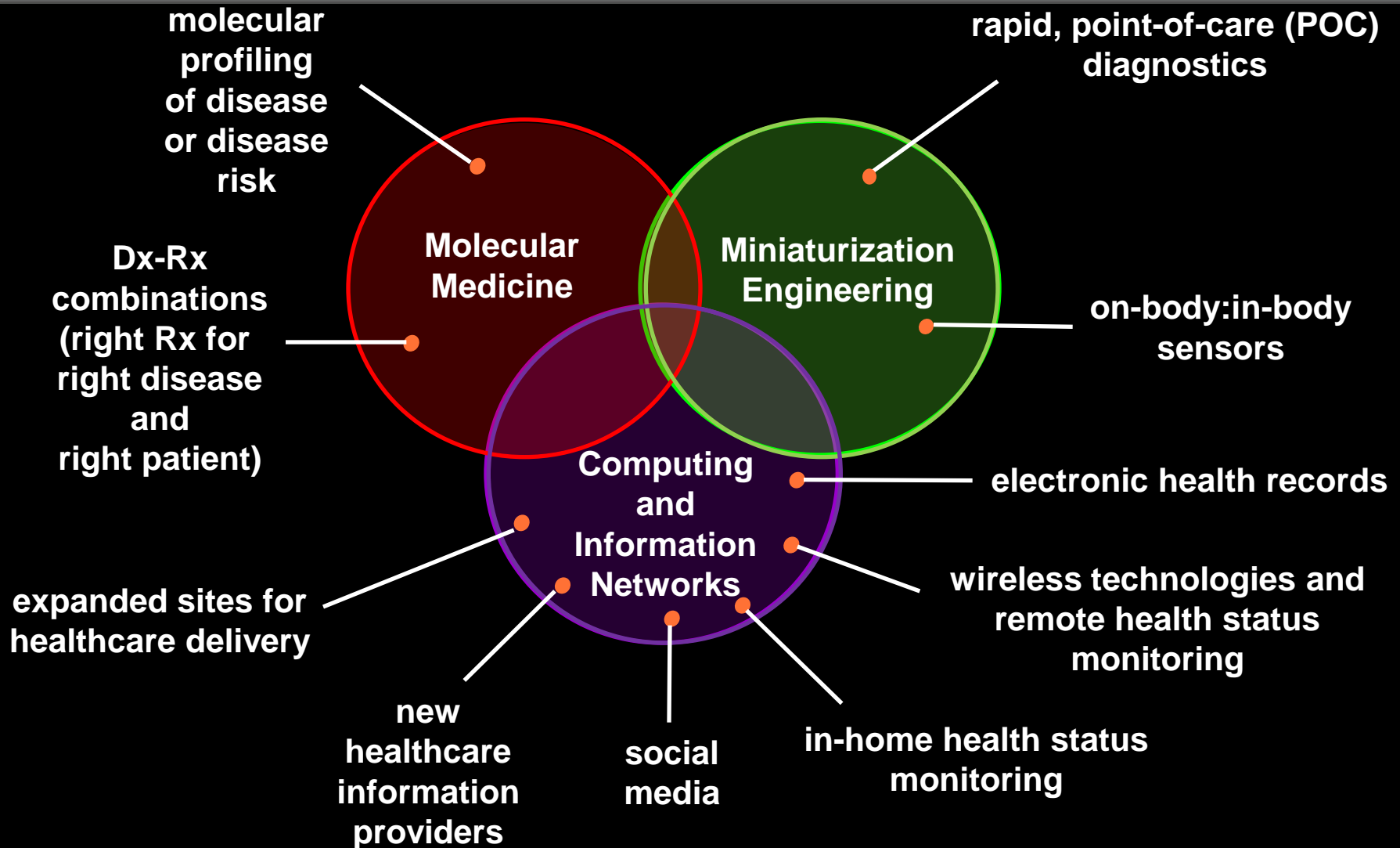
**Market
Discontinuity**

Digitizing Health Information

AORTA: Always On, Real-Time, Actionable



Technology Convergence and Personalized Medicine



Increased Consumer Responsibility for Personal Health (Wellness)

Regulation

- **increased scrutiny of “health claims” for OTC products**
 - validation, labeling
 - social media and e.promotion
- **global supply chains and authenticity/safety**
 - products and intermediates
 - validation of material(s) origin(s) and analytical methods
- **use of electronic systems to track product use and consumer concerns**

Technology Acceleration and Convergence: Healthcare Delivery and Consumer Health



The Coming Convergence in Healthcare Delivery and Consumer Health

Technologies

- **biotechnology, medicine, engineering, computing, telecommunications and social media**

Clinical Practice

- **molecular medicine and increasingly customized care**
- **diagnostic, drug and device combinations**
- **POC testing and remote monitoring**
- **earlier detection of disease and improved outcomes**
- **reduced error and improved compliance**

Realigned Incentives

- **integrated care for complex chronic diseases**
- **earlier disease detection and risk reduction**
- **wellness versus illness**
- **remote health status monitoring**

The Coming Convergence in Healthcare Delivery and Consumer Health

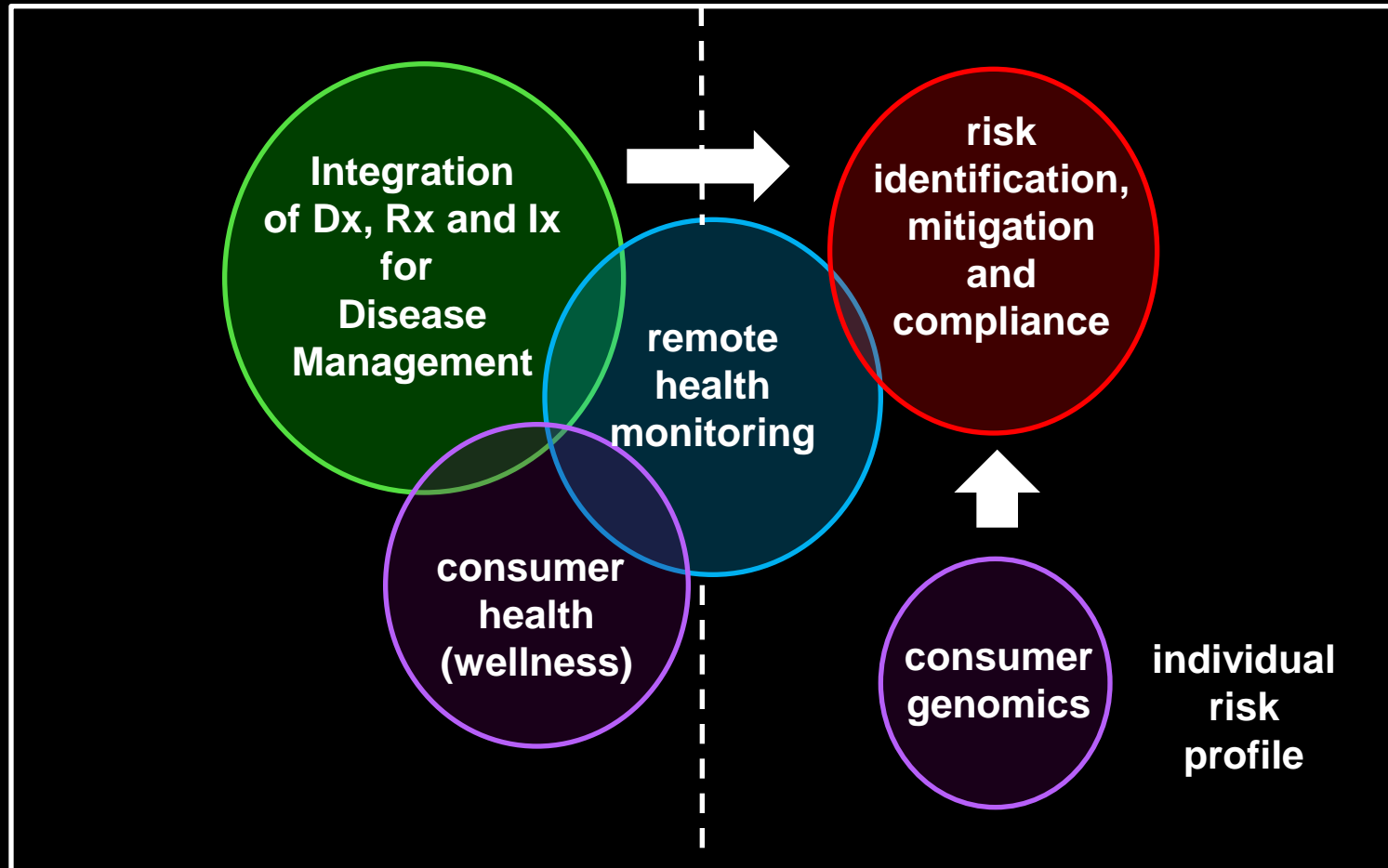
wellness

- **technology and economic drivers to limit unsustainable increases in healthcare costs**
- **cost-shifting to consumers**
- **incentives/penalties for non-compliance to reduce risk/cost of illness**
- **major opportunities for OTC product classes for wellness/lifestyle**

but

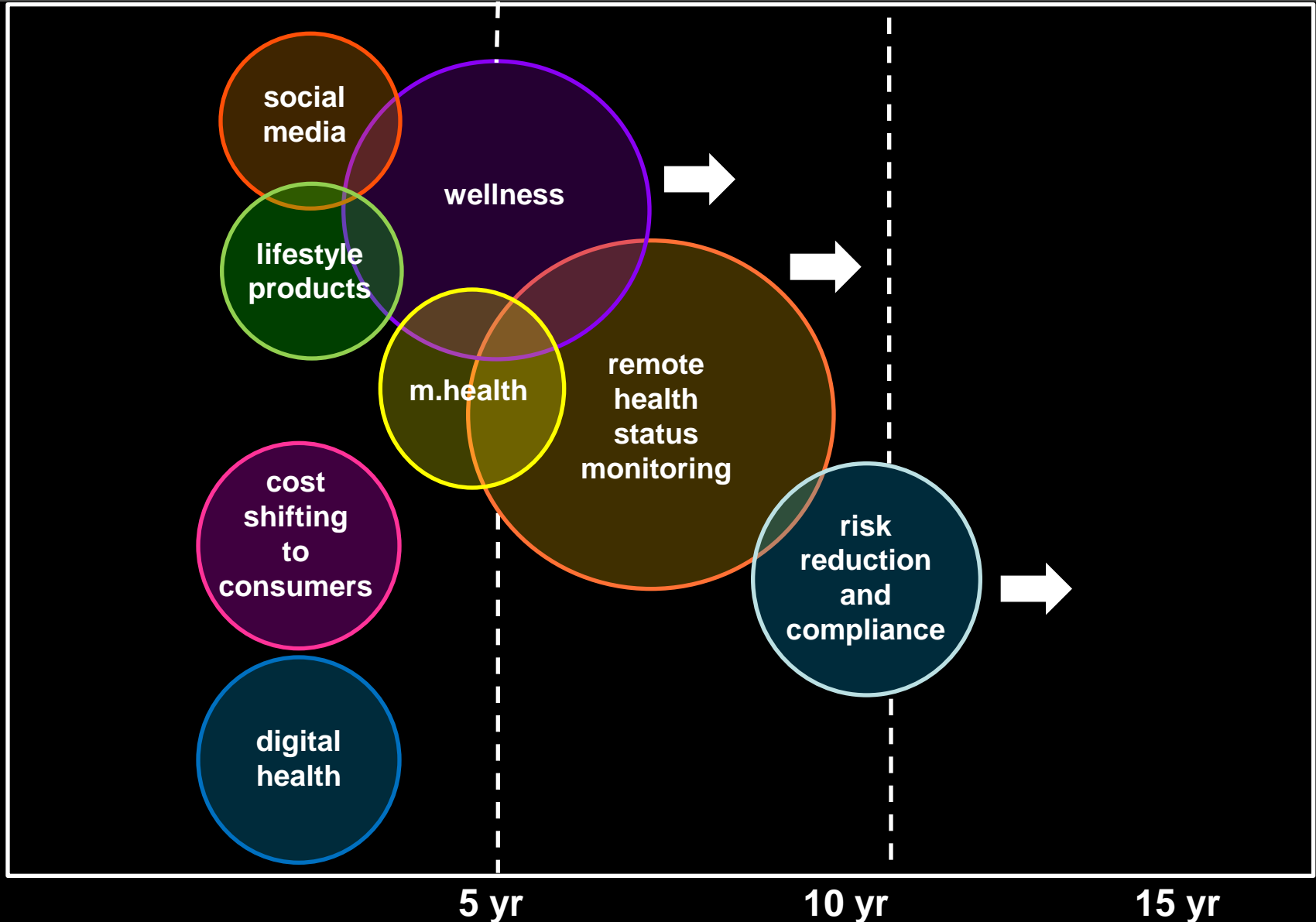
- **increased regulatory scrutiny of OTC sector**
 - **health claims, product quality and authenticity**
- **increased consumer activism and networking with greater impact on product adoption/rejection**

The Trajectory for Personalized Medicine Will be Different in the Clinical and Consumer Domains



10 yr

Potential Timelines for Disruptive Changes in Consumer Healthcare Arising from Technology Convergence



The Coming Convergence in Healthcare Delivery and Consumer Health

New Delivery Pathways

- **new organizational/business models**
- **rapid expansion of e.health/m.health**
- **social media and promotion/adoption of OTC/wellness/lifestyle products/services**
- **integration of consumer health product categories with remote health monitoring services**
- **new 'infomediaries' will change balance of power between healthcare professionals and consumer**
 - **transparency, positive outcomes and performance**
 - **consumer choice**

The Coming Convergence in Healthcare Delivery and Consumer Health

New Delivery Pathways

- **new organizational/business models**
- **rapid expansion of e.health/m.health**
- **social media and promotion/adoption of OTC/wellness/lifestyle products/services**
- **integration of consumer health product categories with remote health monitoring services**
- **new 'infomediaries' will change balance of power between healthcare professionals and consumer**
 - **transparency, positive outcomes and performance**
 - **consumer choice**

VALUE