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Summer Institute / HIT Series

Health IT for Disease Management: Population Health IT Implications

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Johns Hopkins University
- *School of Public Health*
- *School of Medicine*

1.5 hrs / ~55 slides

Overview

- Background
  - Chronic Diseases
  - Population Health Management
  - Promise of Health IT
- Consumer Health Informatics Solutions
  - Concept and Definitions
  - Categories and Sample Systems
  - Behavioral Change Models
- Resources
  - Books
  - Web

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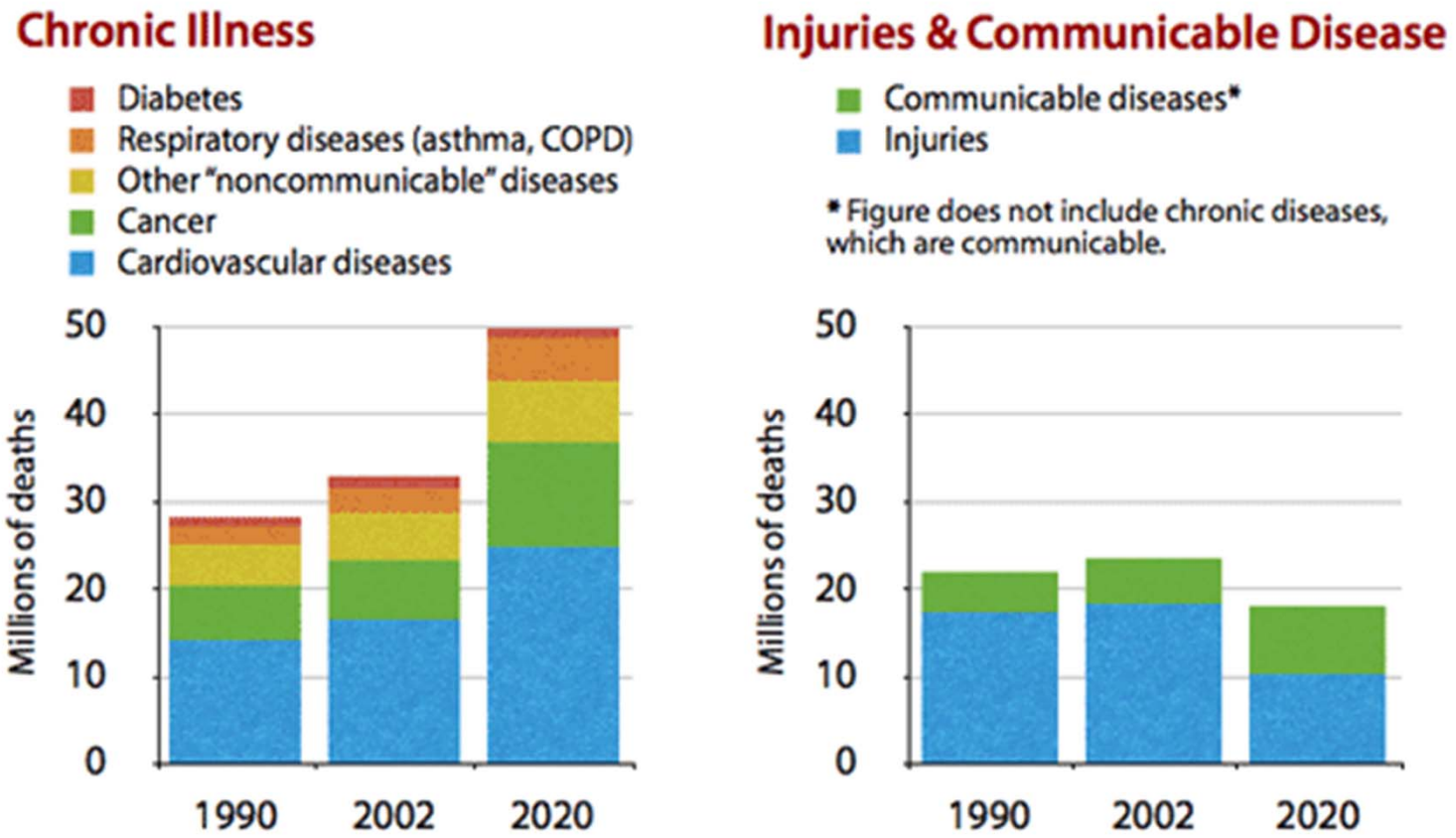
Background

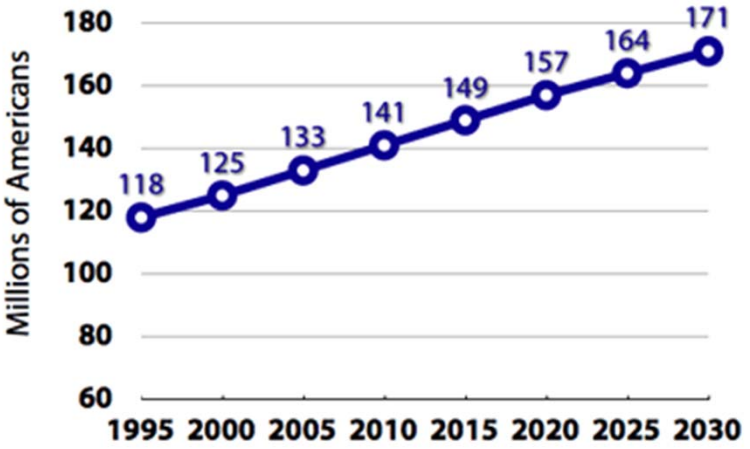
Background – Chronic Diseases → Global



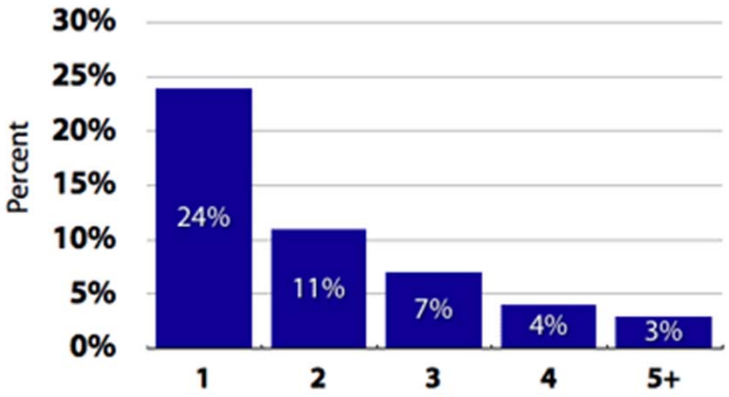
Annual Global Mortality by Category (Chronic vs non-Chronic)

Background – Chronic Diseases → US

- Almost one **out of every two U.S. adults** reported having at least one of six chronic illnesses of cardiovascular disease, cancer, chronic obstructive pulmonary disease, asthma, diabetes or arthritis in 2008.
- **Seven out of 10 deaths** among Americans each year are from chronic diseases. Heart disease, cancer and stroke account for more than 50% of all yearly deaths.
- In 2012, **9.3% of the US population**, had diabetes (8.3% in 2010). Diabetes is the leading cause of kidney failure, non-injury lower-limb amputations and blindness among 20 to 74 year-olds.
- **One in three** U.S. adults have hypertension or high blood pressure. Nearly 70% of first heart attacks and 77% of first strokes occur in people with hypertension.

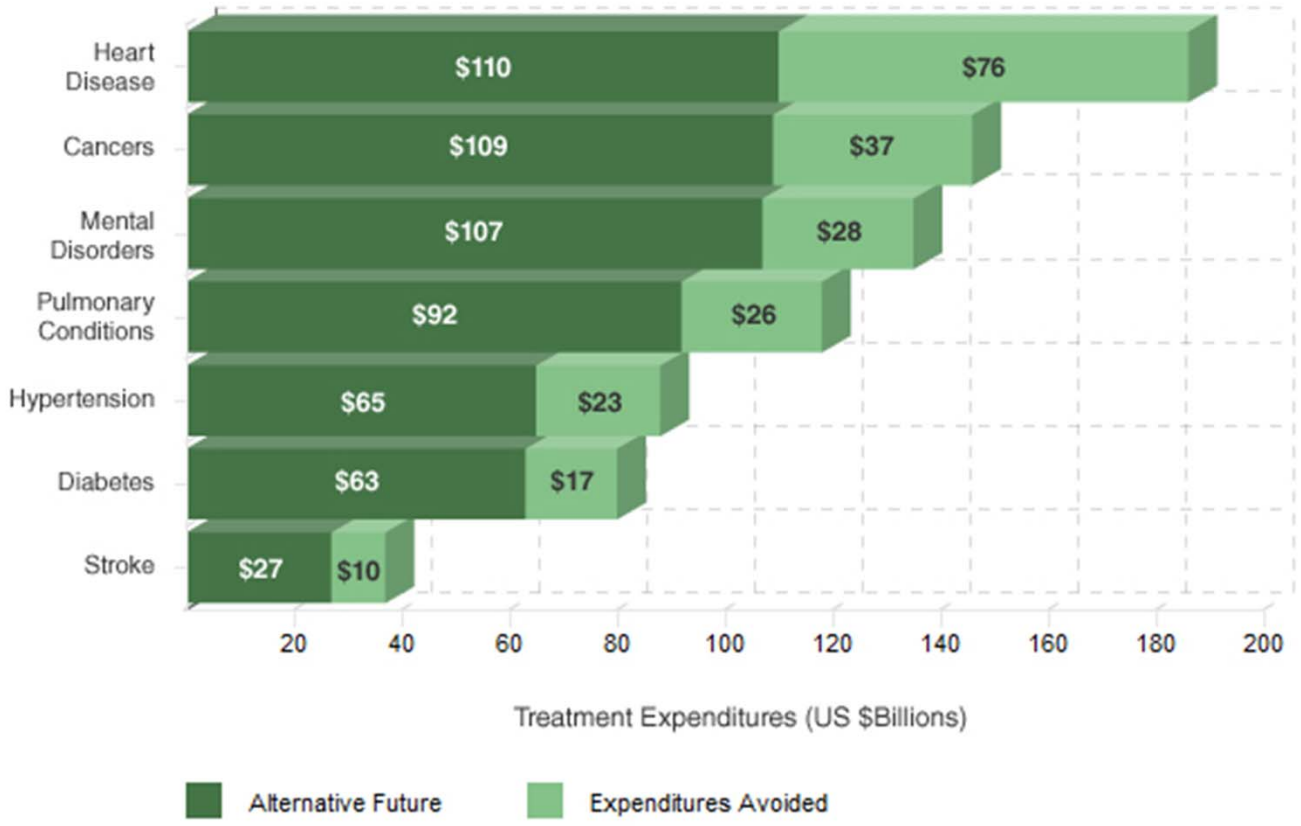


Prevalence of Chronic Diseases in the US



Number of Chronic Conditions Suffered by Americans

Background – Chronic Diseases in the US → Cost Breakdown

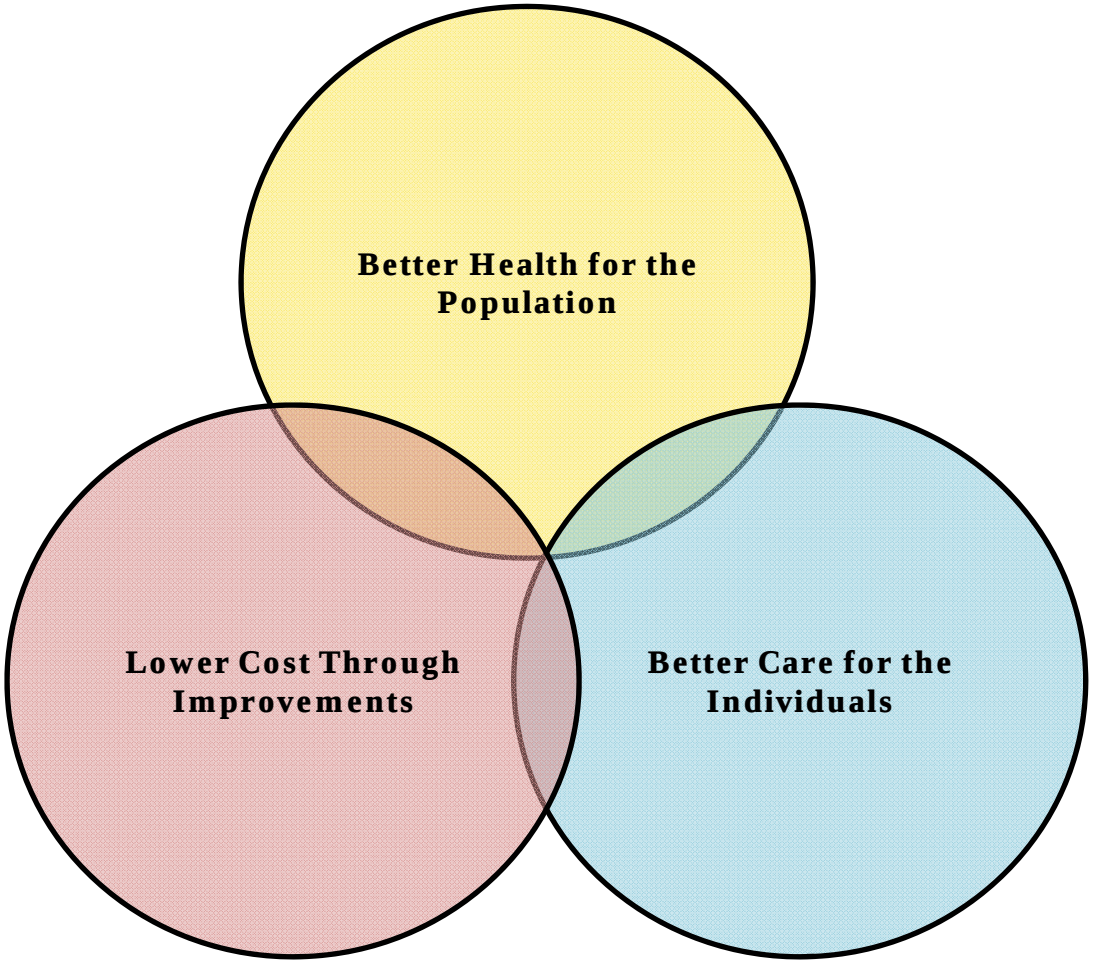


Avoidable treatment expenditure (2023 projections)

Background – Population Health Management → Definition

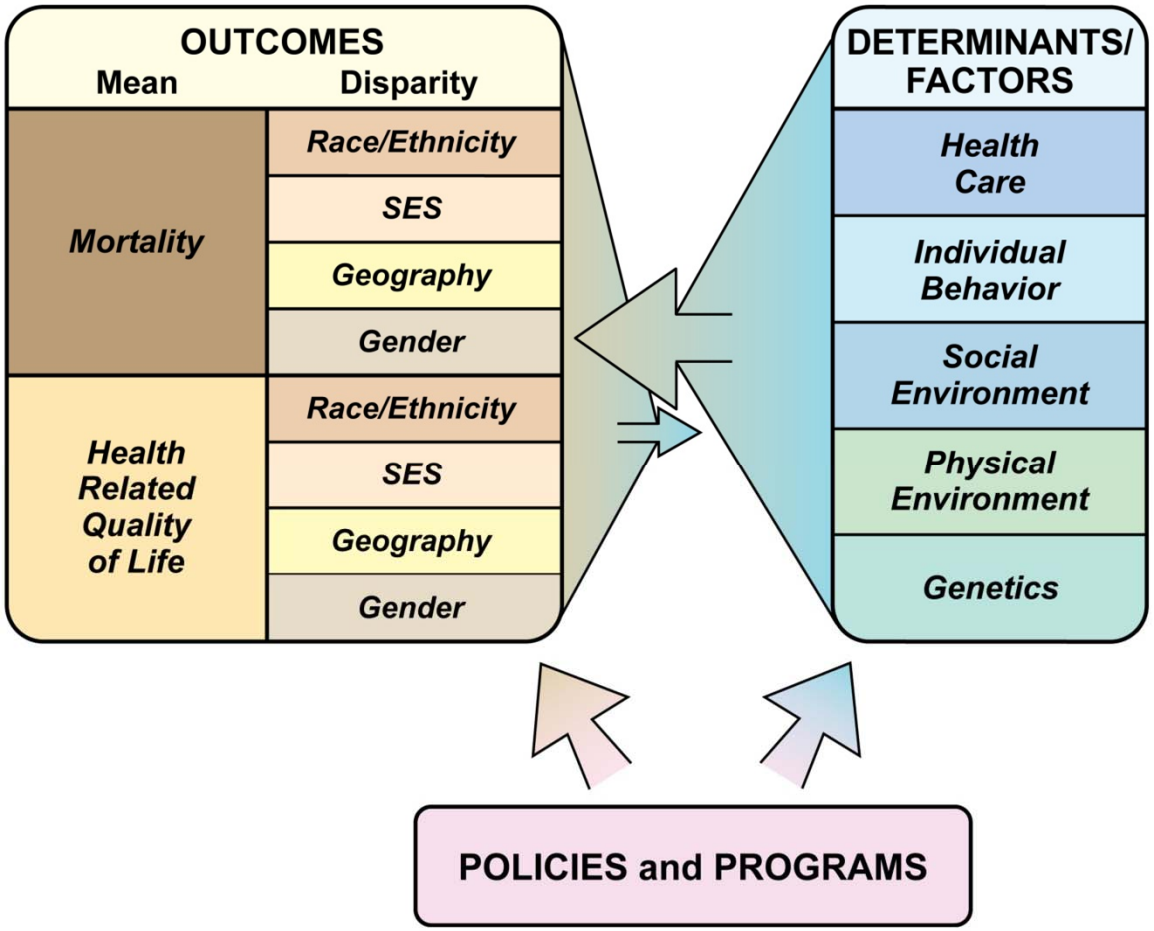
- Population health has been defined as "the **health outcomes of a group of individuals**, including the distribution of such outcomes within the group".
- The population health improvement model highlights three components: (1) the central care delivery and leadership roles of the **primary care physician**; (2) the critical importance of **patient activation**, involvement and personal responsibility; and (3) the patient focus and capacity expansion of **care coordination** provided through wellness, disease and chronic care management programs.
- To accomplish all of this, a provider organization must supply proactive preventive and chronic care to all of a provider's patients, both **during and between encounters** with the healthcare system. This requires providers to maintain regular contact with patients and support their efforts to manage their own health. At the same time, care managers must **manage high-risk patients** to prevent them from becoming unhealthier and developing complications.
- AHRQ → "**practice-based population health (PBPH)** is an approach to care that uses information on a group of patients within a primary care practice or group of practices to improve the care and clinical outcomes of **patients within that practice**."

Background – Population Health Management → Triple Aims



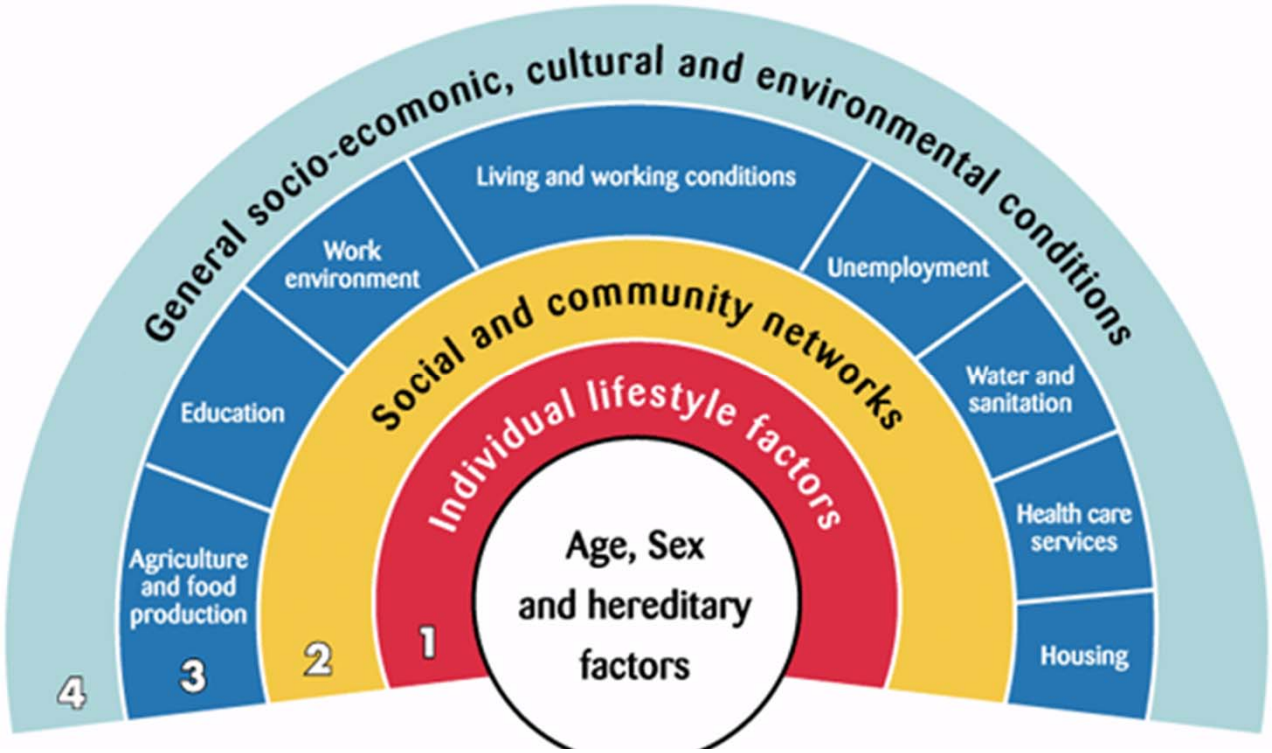
Triple Aims developed by the Institute for Healthcare Improvement (IHI)

Background – PHM → Conceptual Framework



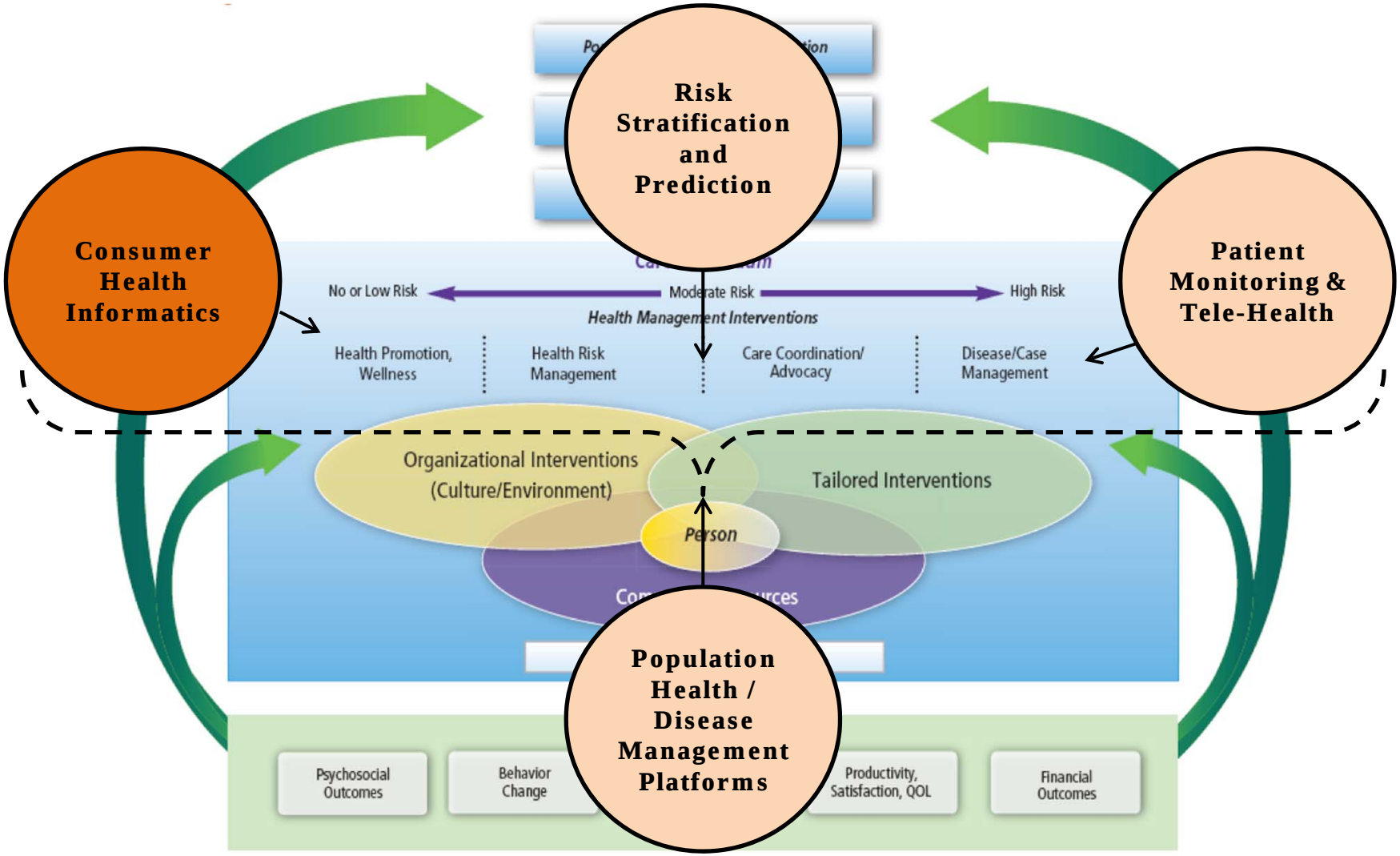
Conceptual Population Health Framework

Background – PHM → Conceptual Framework



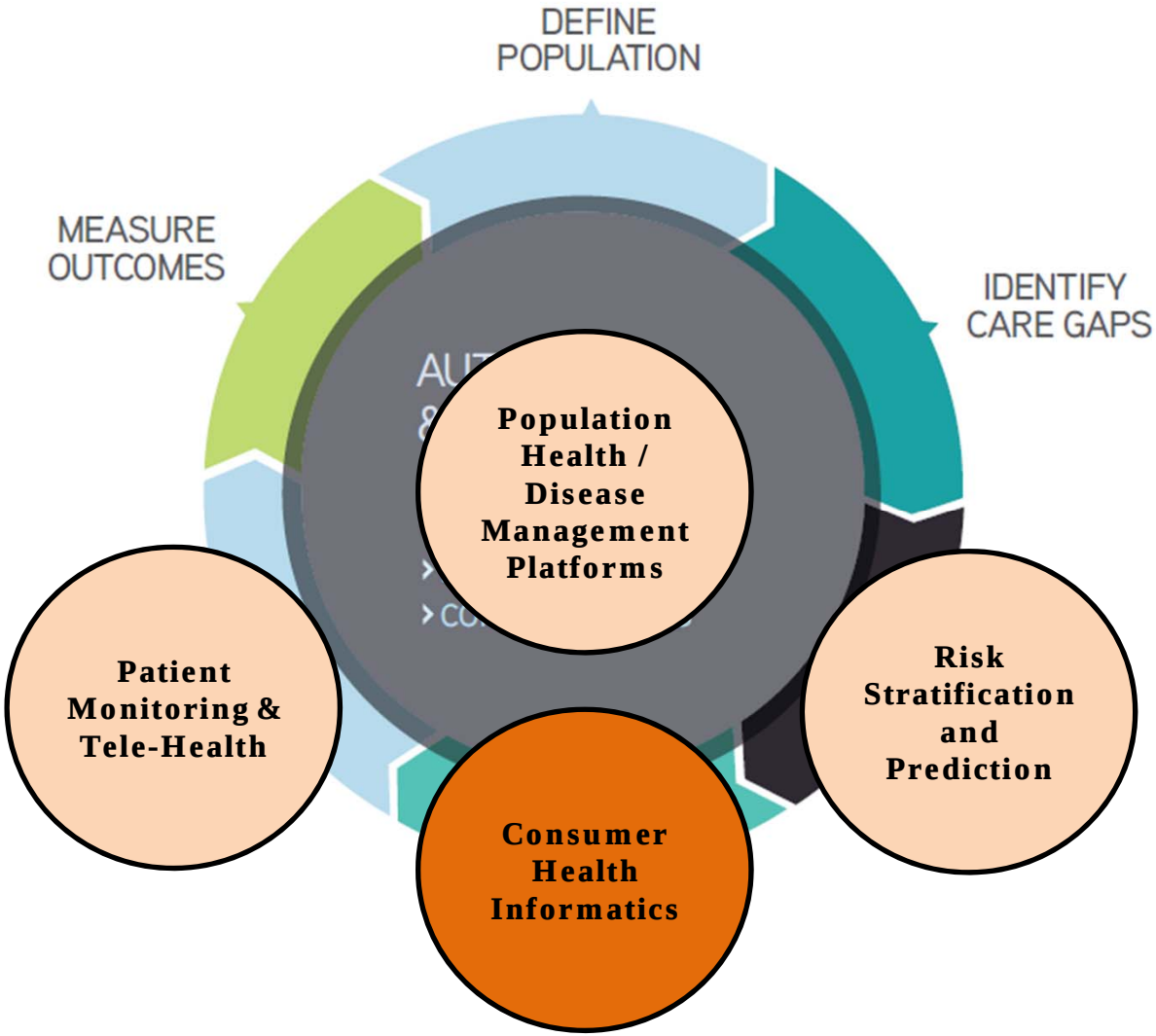
Conceptual Population Health Framework

Background – PHM → Management Framework



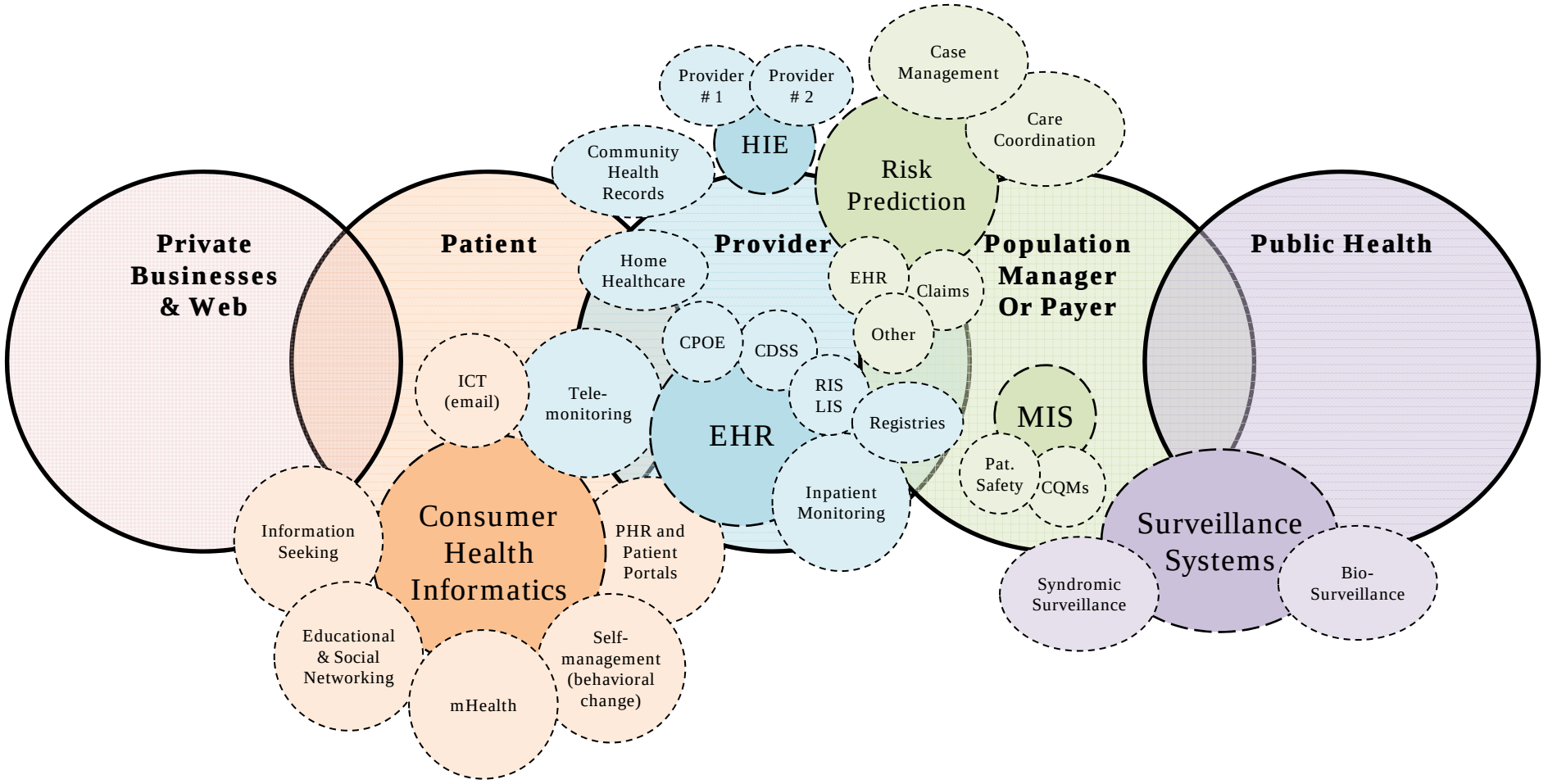
Conceptual Population Health Management Framework

Background – PHM → Management Framework



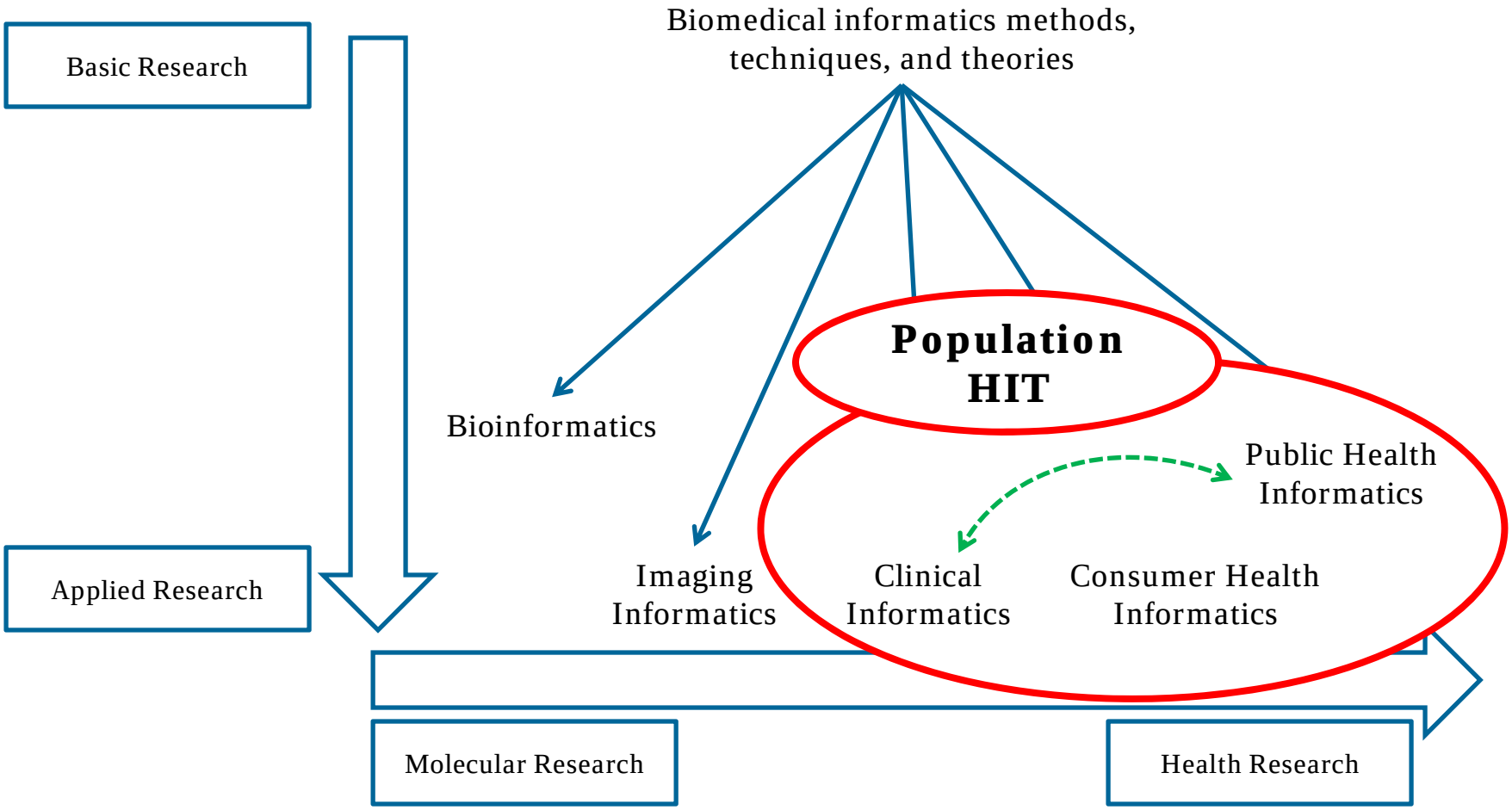
Conceptual Population Health Management Framework

Background – PHM → Promise of Health IT



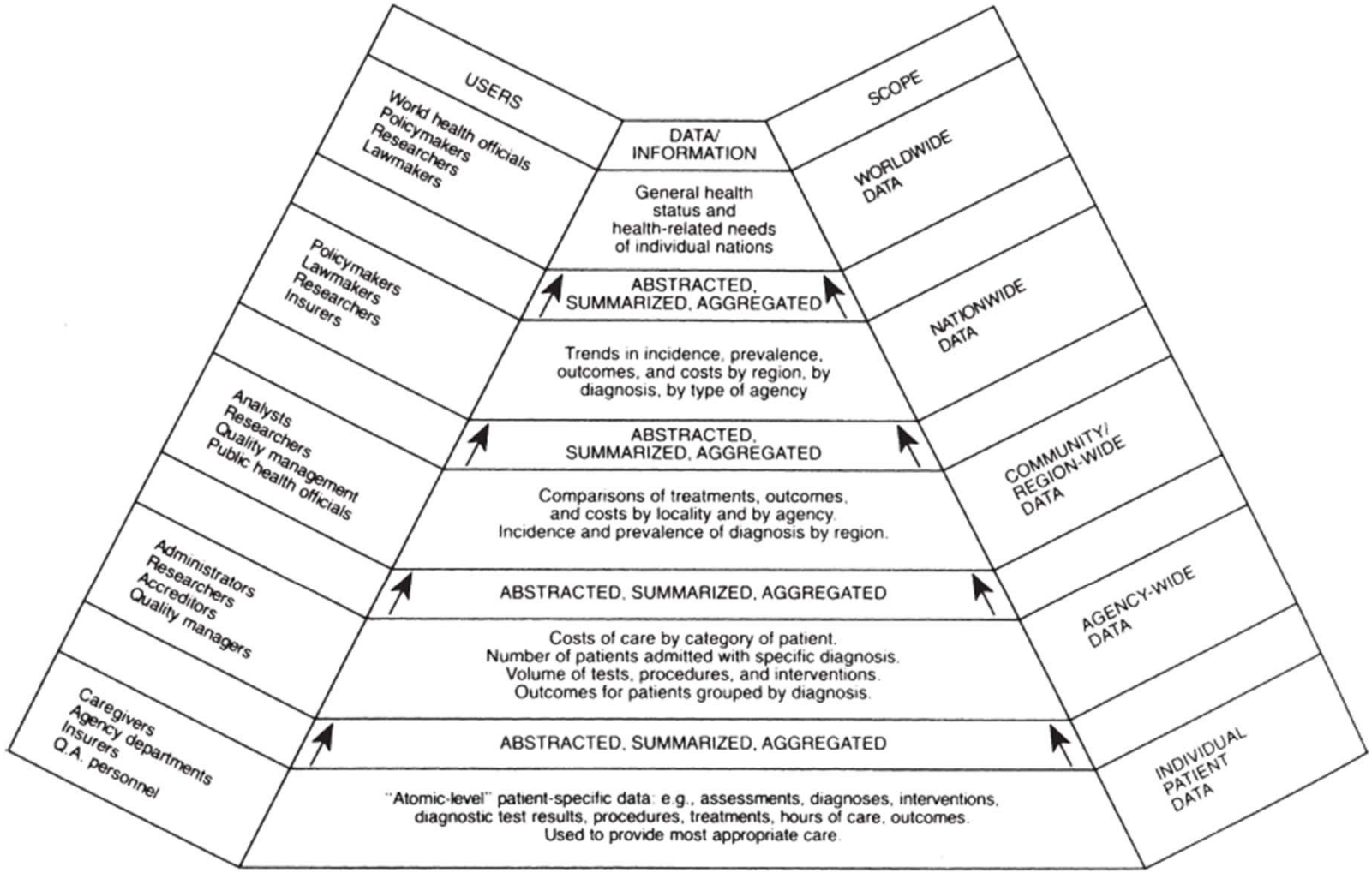
Population health stakeholders and health IT platforms/tools

Background – PHM → Role of Consumer Health Informatics



Population Health Informatics as an emerging domain

Background – PHM → Atomic Patient Level Data to Public Health



Examples of uses for atomic-level patient data collected once but used many times.

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Consumer Health Informatics

(Concepts and Use Cases)

Consumer Health Information (CHI) – Concept & Definition

- **Concept** of Consumer Health Informatics (CHI): CHI is the intersection of Health Information (HI) and Health Education (HE)
- **Health information consumer** is "a person who seeks information about health promotion, disease prevention, treatment of specific conditions, and management of various health conditions and chronic illnesses" (AMIA CHI WG).
- CHI **definitions**:
  - "CHI is the study of development and implementation of computer and telecommunication applications and interfaces designed to be used by health consumers" (US GAO).
  - "CHI is the use of modern computers and telecommunications to support consumers in obtaining information, analyzing their unique health care needs and helping them make decisions about their own health" (Academic)
- CHI **focuses** on: (1) consumer needs and preference → customization of information; (2) consumer behavior → integration of behavior change models; (3) target wellness in addition to chronic diseases / modifiable risks → healthy users (exercise, diet, travel, outbreaks and others).

CHI – Systems → Information Seeking

webmd.com & medlineplus.com

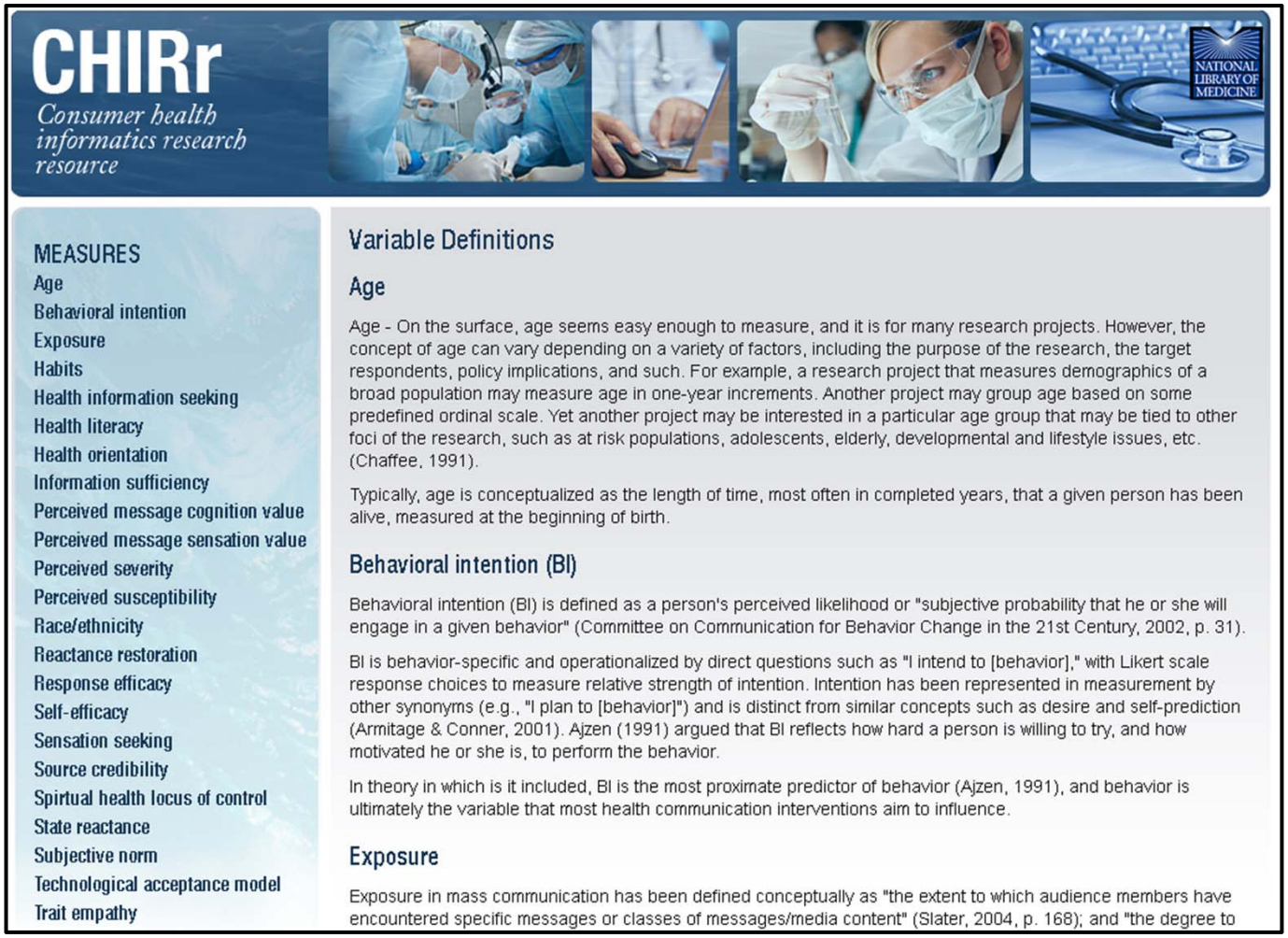
Consumer Health Information Seeking Behavior (>80% of population) → Health Promotion Strategies

CHI – Systems → Information Seeking (cont.)

hon.ch

Validation of Healthcare Information on the Web

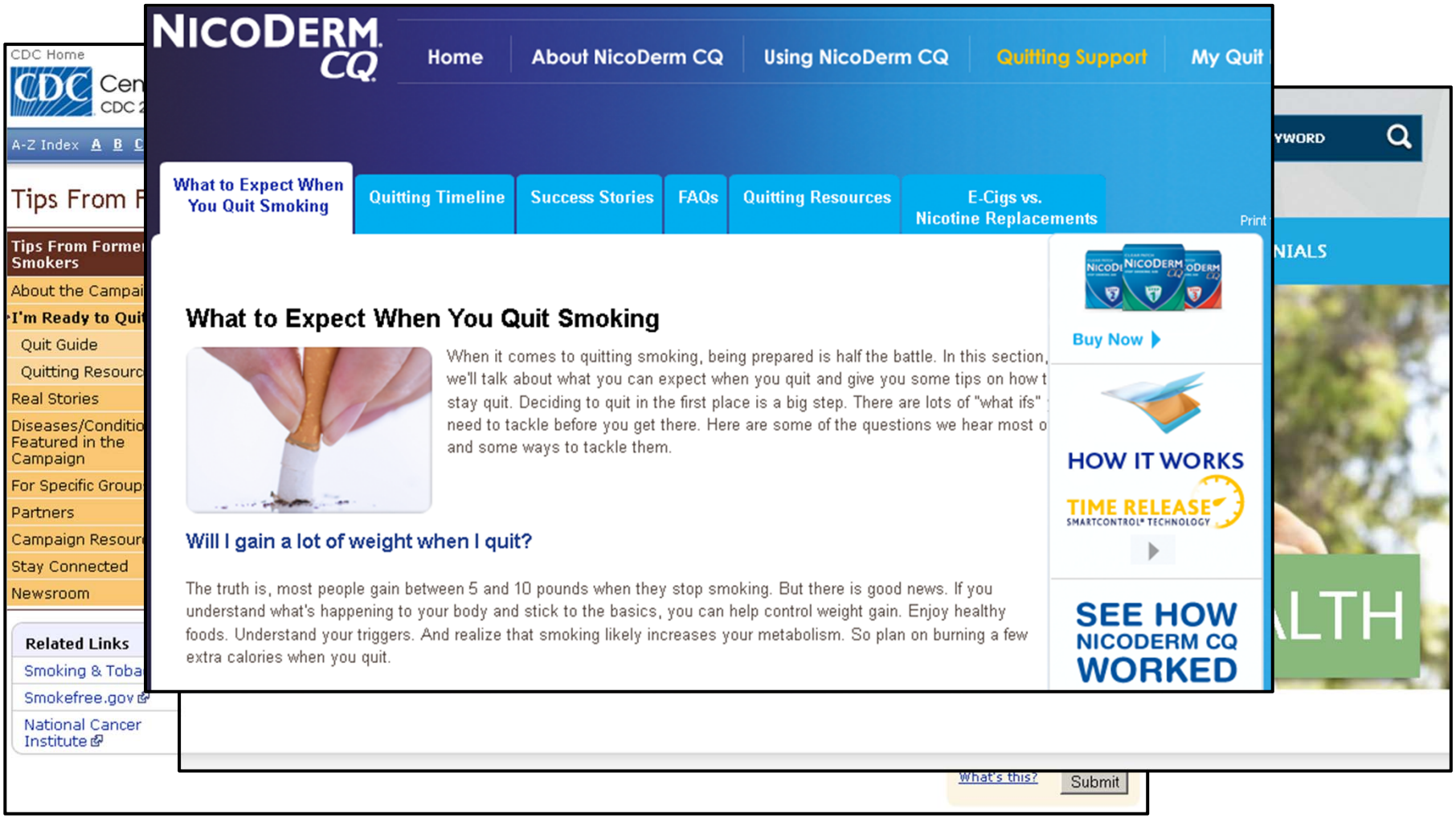
CHI – Systems → Information Seeking (cont.) → Definitions and Measures



http://chirr.nlm.nih.gov/definition.php

Consumer Health Information Seeking Definitions and Measures

CHI – Systems → Education



Various educational sites for smoking cessation (federal, state and commercial)

CHI – Systems → Education (cont.)

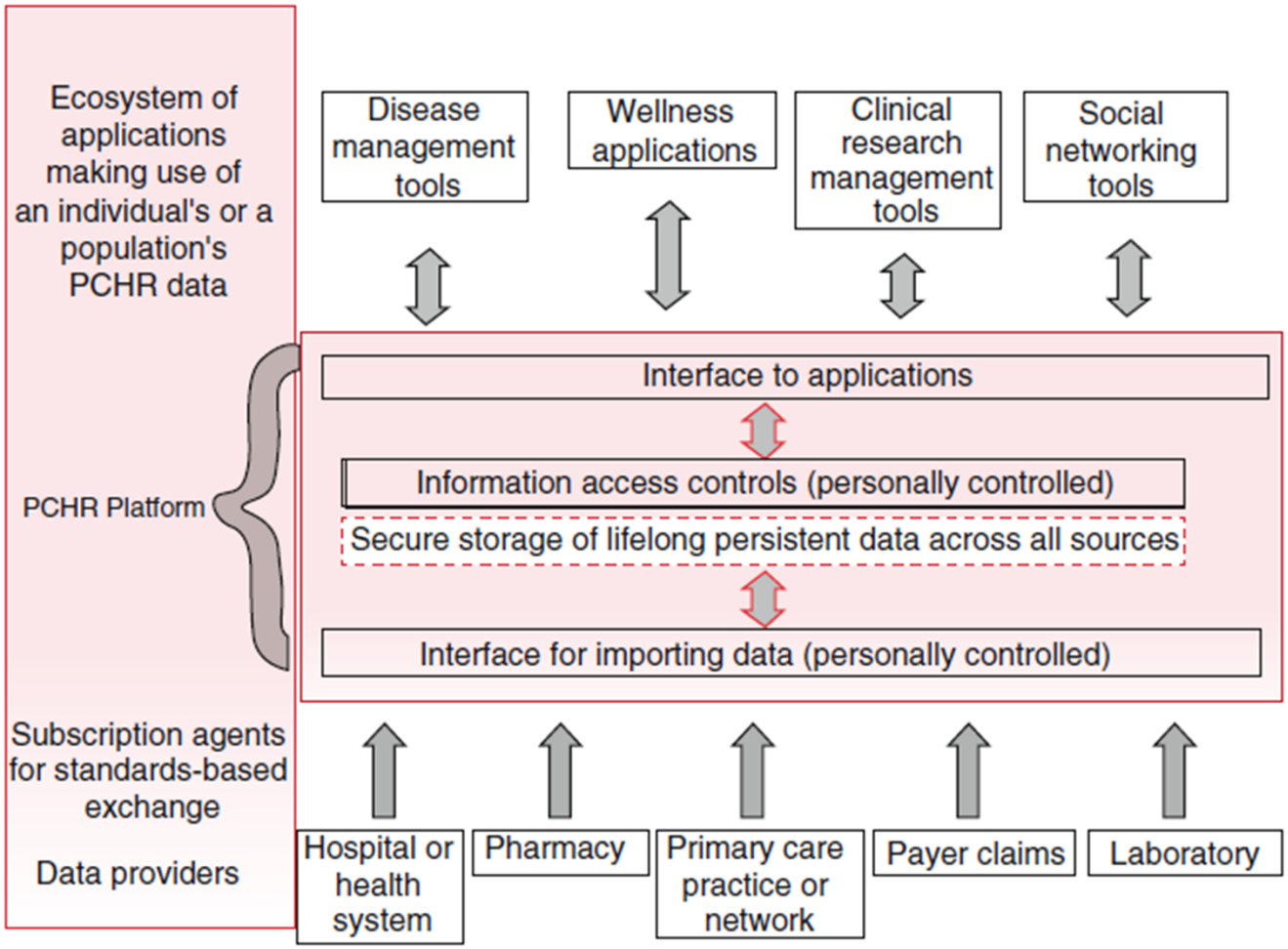
http://jdrf.org/hello-jdrf-kids-online-community/

Customization of health data based on age and other demographic data (human computer interaction issues)

CHI – Systems → Personal Health Records (PHRs) → Definition

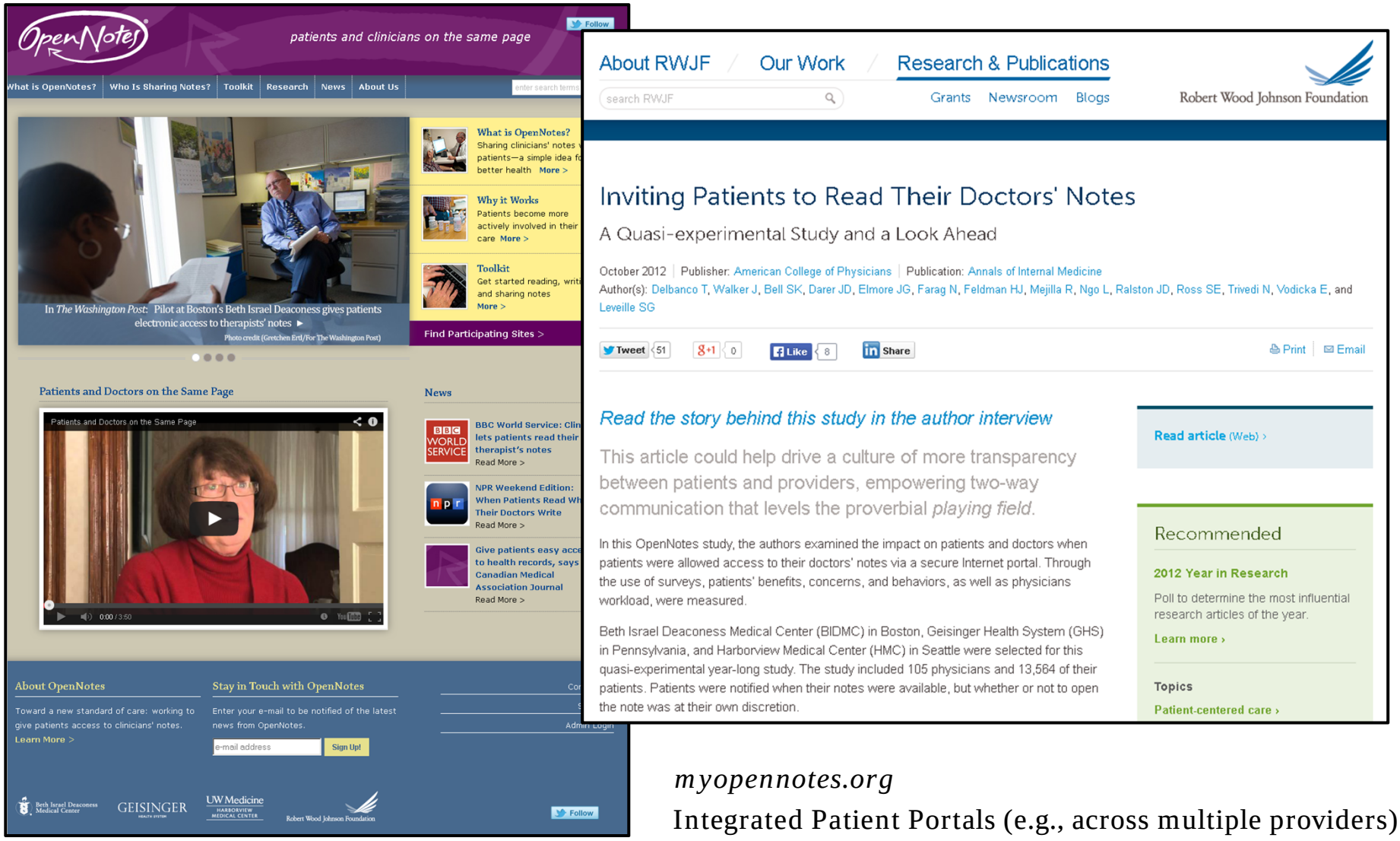
- Definition: "A personal health record, or PHR, is a health record where health data and information related to the care of a patient is **maintained by the patient**."
- Main questions:
  - *Who owns the data? Who controls the data?*
  - *How confidentiality and security will be handled in a PHR system?*
  - *Who will pay for the record? What is the business model? Federal funding/incentives or Health Record Banking?*
  - *Should we have a national PHR system?*
  - *Who can access the PHR data?*
  - *How to resolve conflict of patient-entered data with provider-entered data?*

CHI – Systems → PHRs → Architecture / Data Connections



An architecture for a personally controlled health record system (PCHR). The PCHR has a secure repository of data with subsequent accesses controlled by the patient or her proxy.

CHI – Systems → PHR → Integrated Patient Portals



myopennotes.org

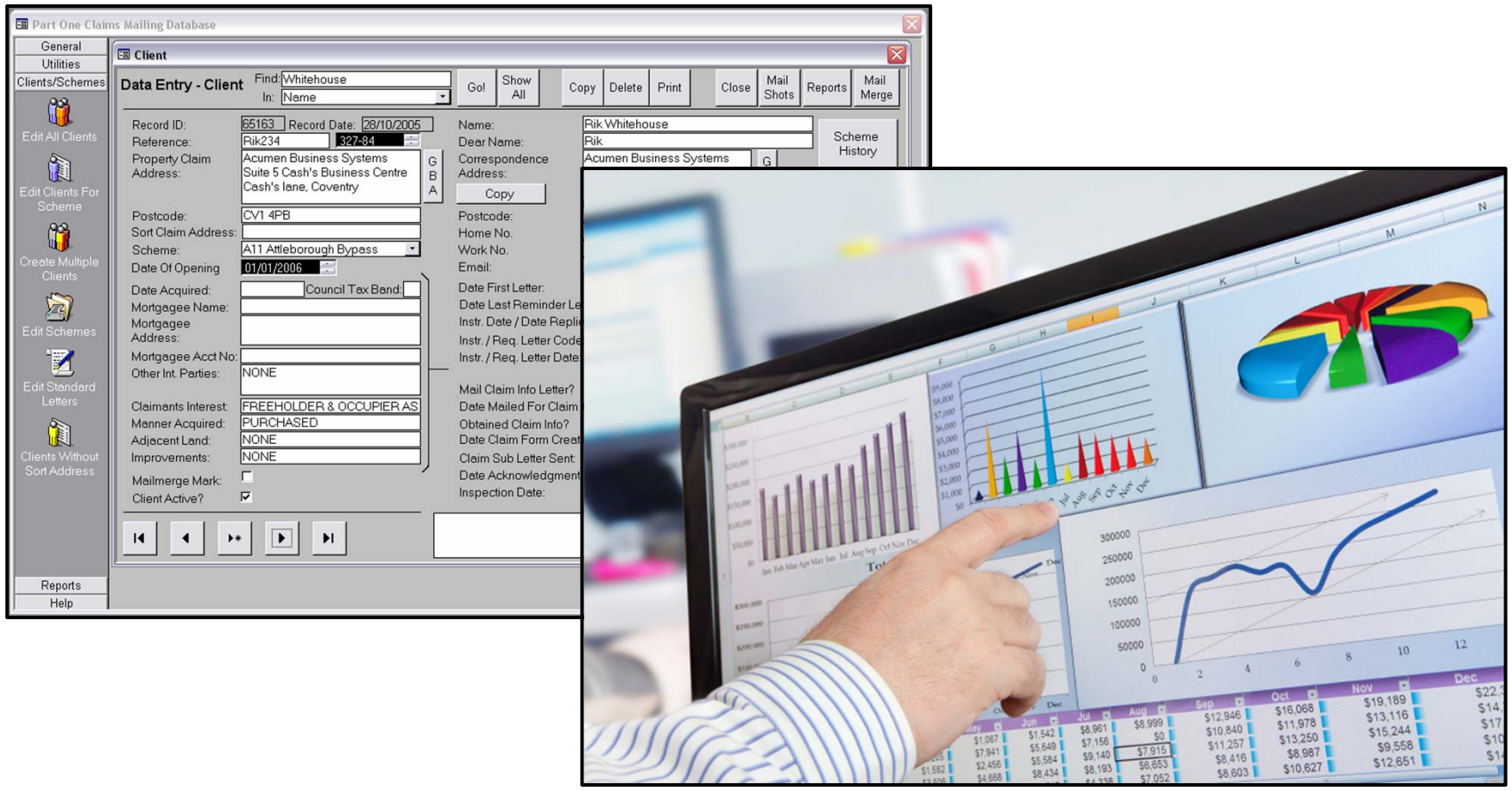
Integrated Patient Portals (e.g., across multiple providers)

CHI – Systems → PHR → Advanced PHRs

myphr.com

Sample Personal Health Records (PHRs)

CHI – Systems → PHR → Patient Decision Support Systems



PHR-based DSS

CHI – Systems → PHR → mobile PHRs

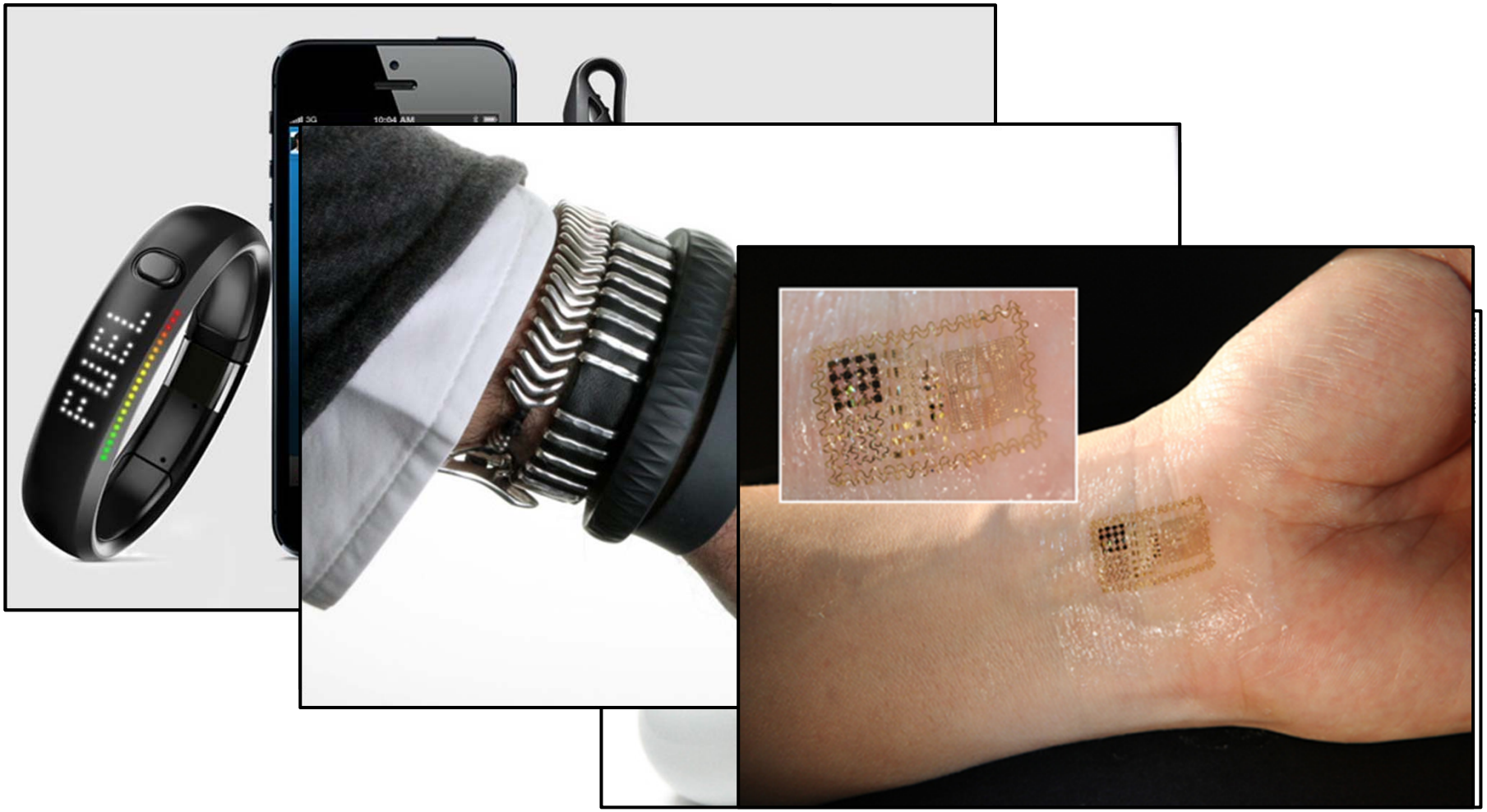
Table 7 – Mobile PHR features.

mPHR name	Features			
	Import/export	Images	ICE feature	Password
Capzule PHR	X	X		X
Cloud PHR	X			X
Polka Health			X	
ExpressWell	X	X		X
Health n Family	e	X		X
HealthNotes	e			
HealthRecord			X	
motionPHR(iOS)	X		X	X
Emergency – I.C.E.			X	
Emergency Info			X	X
Emergency Inform.				
My Family	E		X	X
My Medical Pro	E		X	X
Health Care Manag.				
MedRecordsToGo				
motionPHR(Android)	X		X	X
Stabilix PHR Lite				X
Stabilix PHR Pro			X	X
ZipHealth		X	X	X
Average mPHRs covering a specific feature	42.11%	15.79%	52.63%	63.16%

e – email only; E – export only.

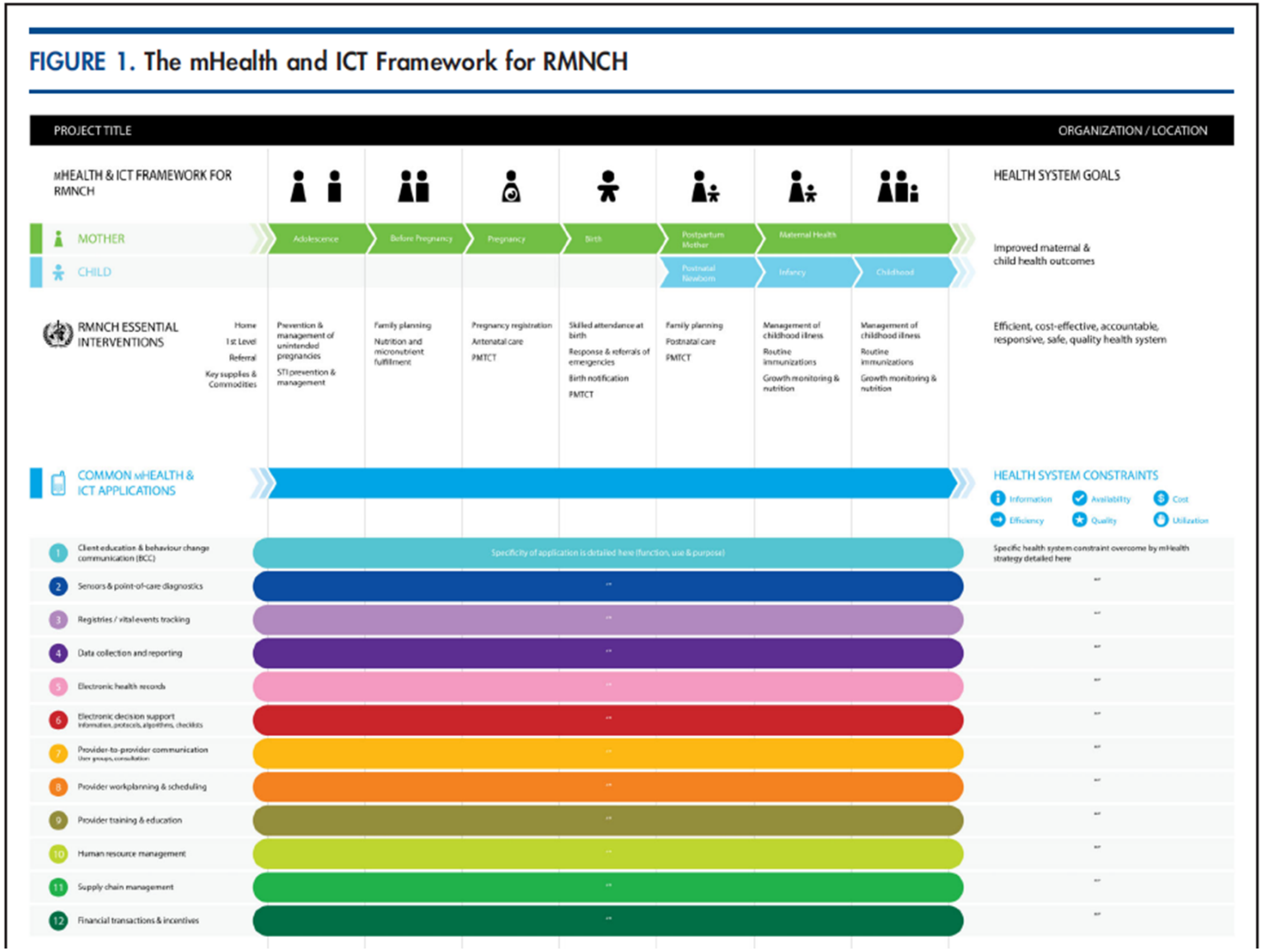
Features of mobile PHRs

CHI – Systems → mHealth → Wearables



mHealth (mobile health)

CHI – Systems → mHealth → Conceptual Models for Specific Domains



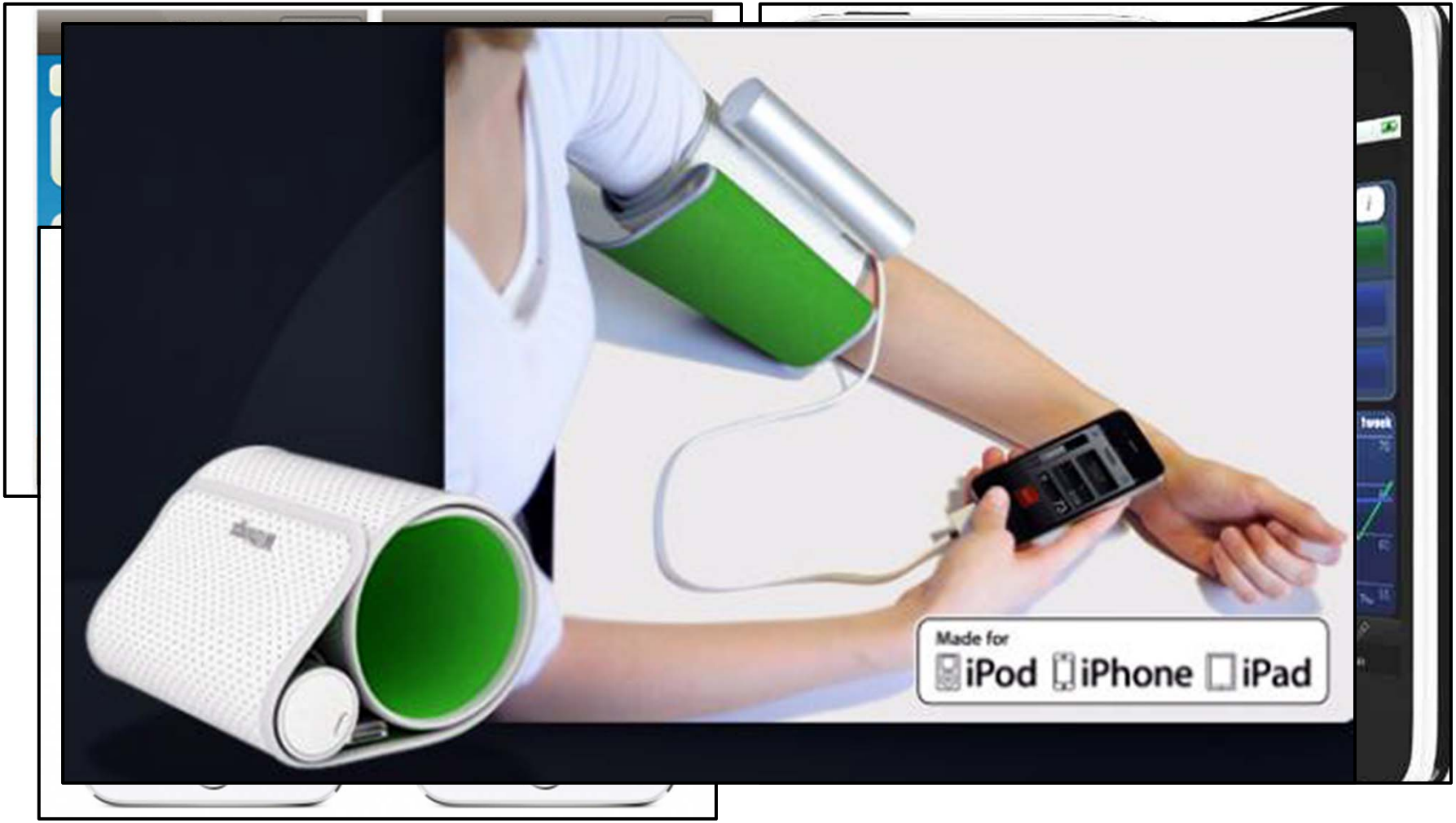
The mHealth and ICT Framework for reproductive, maternal, newborn, and child health

CHI – Systems → mHealth → Developing Countries

jhumhealth.org

mHealth application in developing countries

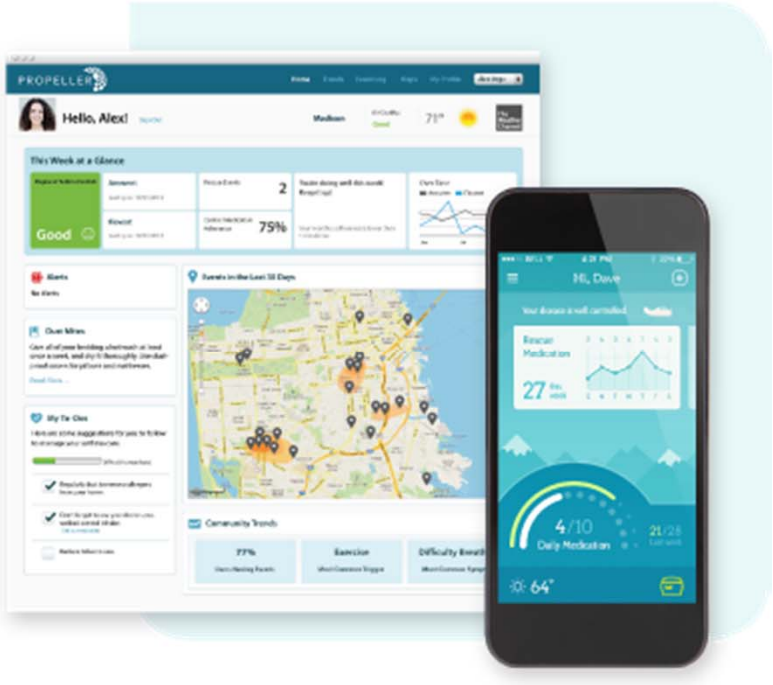
CHI – Systems → mHealth → Developed Countries



mHealth application in developed countries (wellness and remote monitoring)

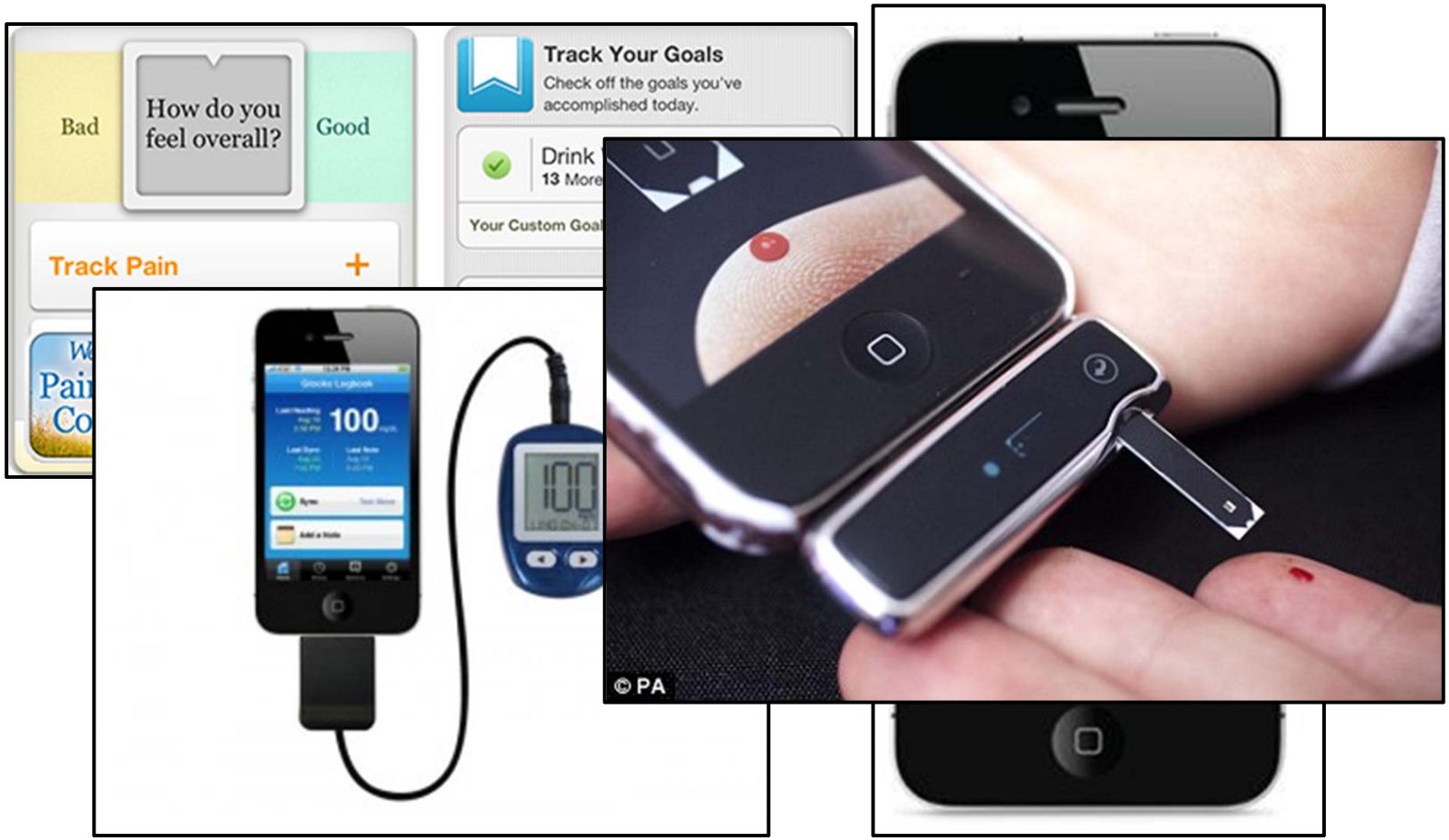
CHI – Systems → mHealth → Disease Management and Public Health

Track your asthma attacks



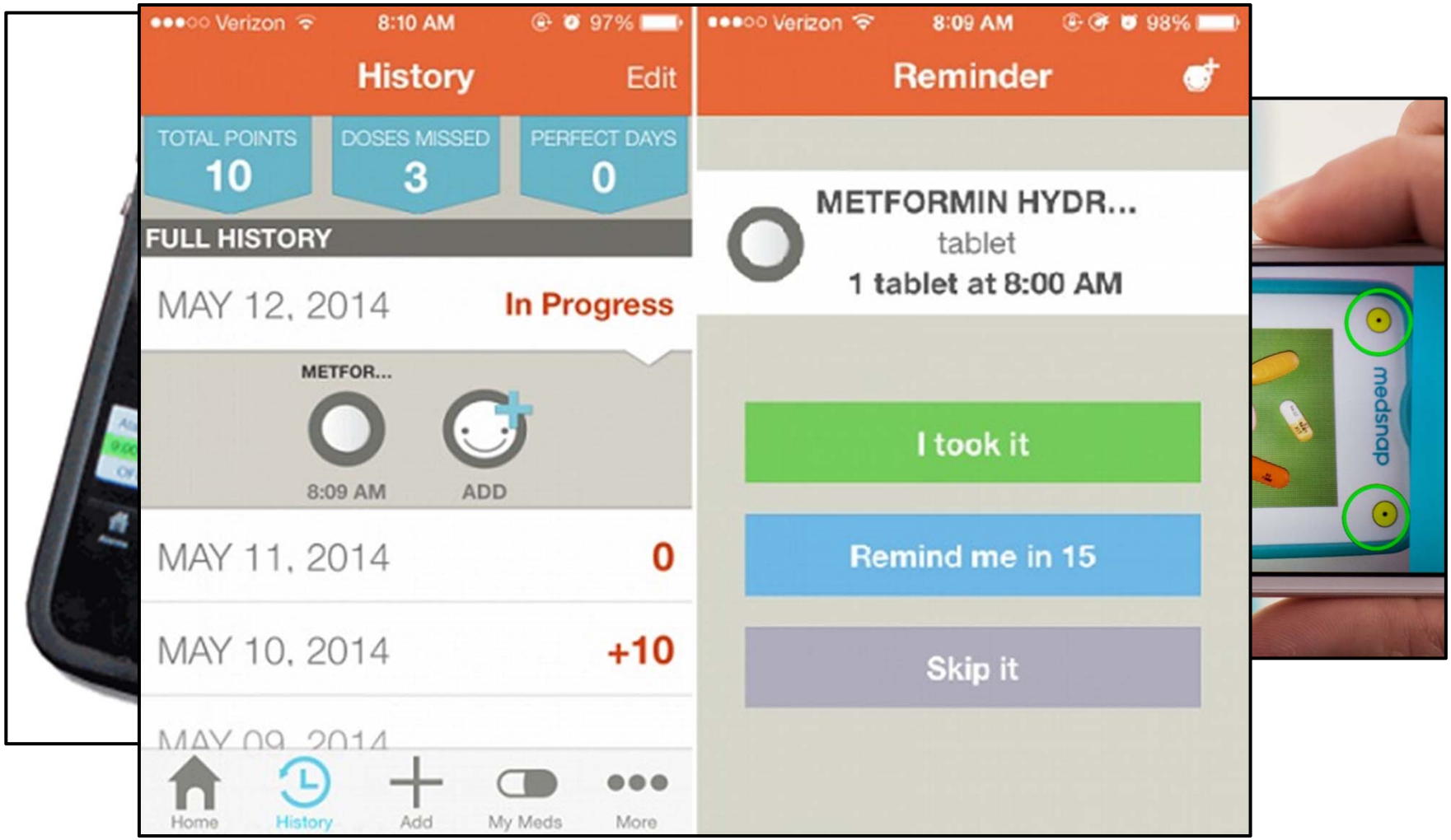
And then shared it with your community

CHI – Systems → mHealth → Disease Management and Chronic Diseases



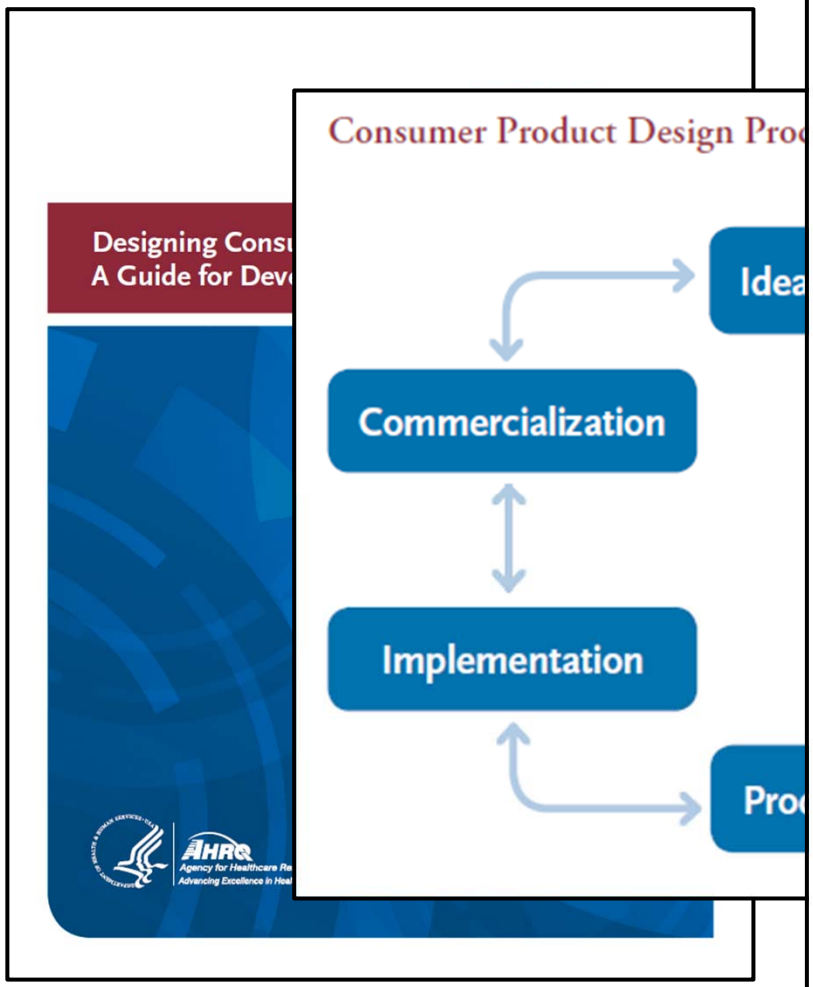
Disease Self-Management (e.g., pain and diabetes)

CHI – Systems → mHealth → Disease Management and Medication Adherence



Medication Adherence

CHI → mHealth → Guidelines

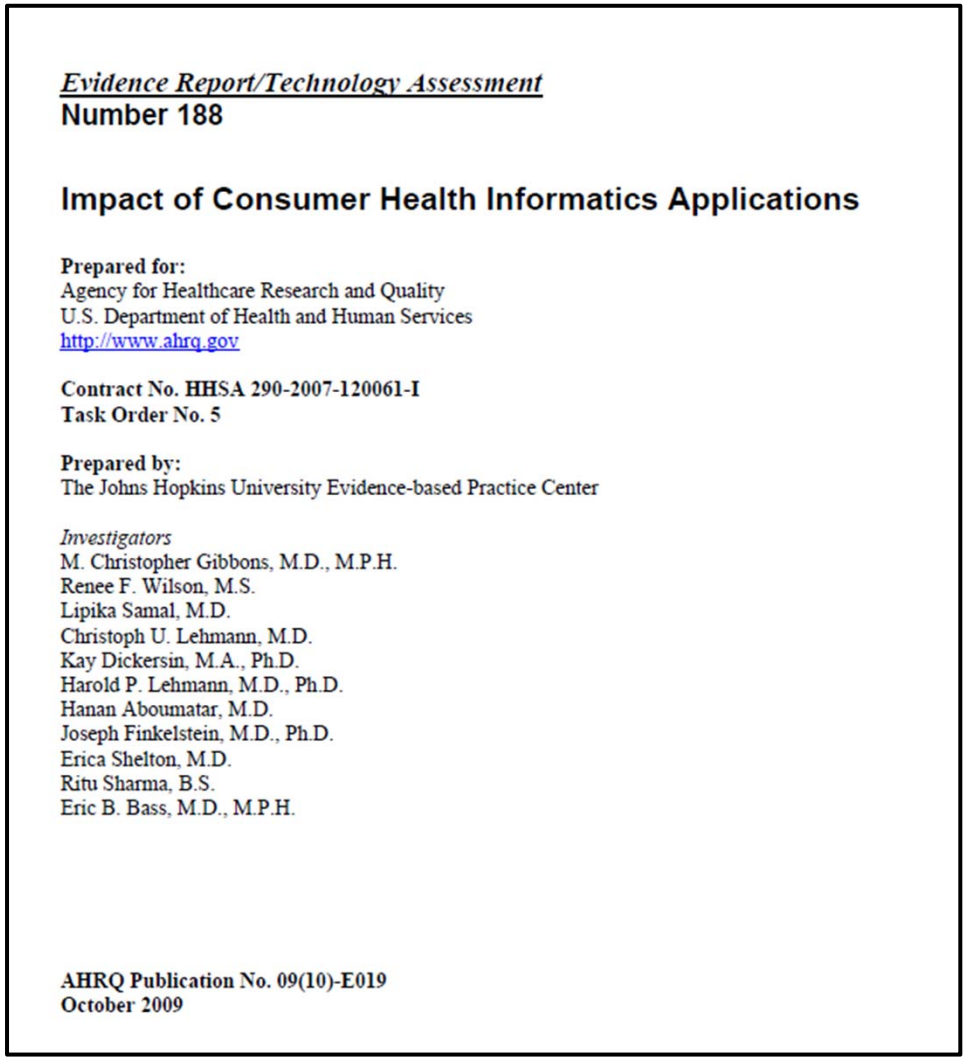


AHRQ Design and Development Guidelines

Recommendations Mapped by Development Phases

	Recommendations	Idea Generation	Customer Identification	Concept Development	Product Testing	Implementation	Commercialization
1	Assemble and prepare a design team consisting of members with appropriate knowledge and skills for all product development phases.	✓	✓	✓	✓	✓	✓
2	Strive to understand customer needs within the environments that the product will be used throughout all product development phases.	✓	✓	✓	✓	✓	✓
3	Include a diverse set of customers when generating ideas for new products and when evaluating early product iterations.	✓	✓	✓	✓	✓	
4	Select and apply well-developed and established design methods in combination with intuition- or innovation-driven design approaches.	✓	✓	✓	✓	✓	✓
5	Use multiple approaches early to learn about customers and the market to inform the product's design.	✓	✓	✓			
6	Drive design decisions and modifications based on learning from prototyping and pilot testing activities.		✓	✓	✓		
7	Define and tailor success metrics based on the needs and contexts of unique customer segments.		✓	✓	✓	✓	✓
8	Balance customer needs with product safety and privacy concerns specific to health IT products.		✓	✓	✓	✓	✓
9	Build products based on established health data and transmission standards.			✓	✓	✓	
10	Incorporate successful marketing strategies to promote the product and be responsive to customers once the product is promoted and adopted.					✓	✓

CHI – Systems → mHealth → Impact



Evidence Report/Technology Assessment
Number 188

Impact of Consumer Health Informatics Applications

Prepared for:
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http://www.ahrq.gov

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Prepared by:
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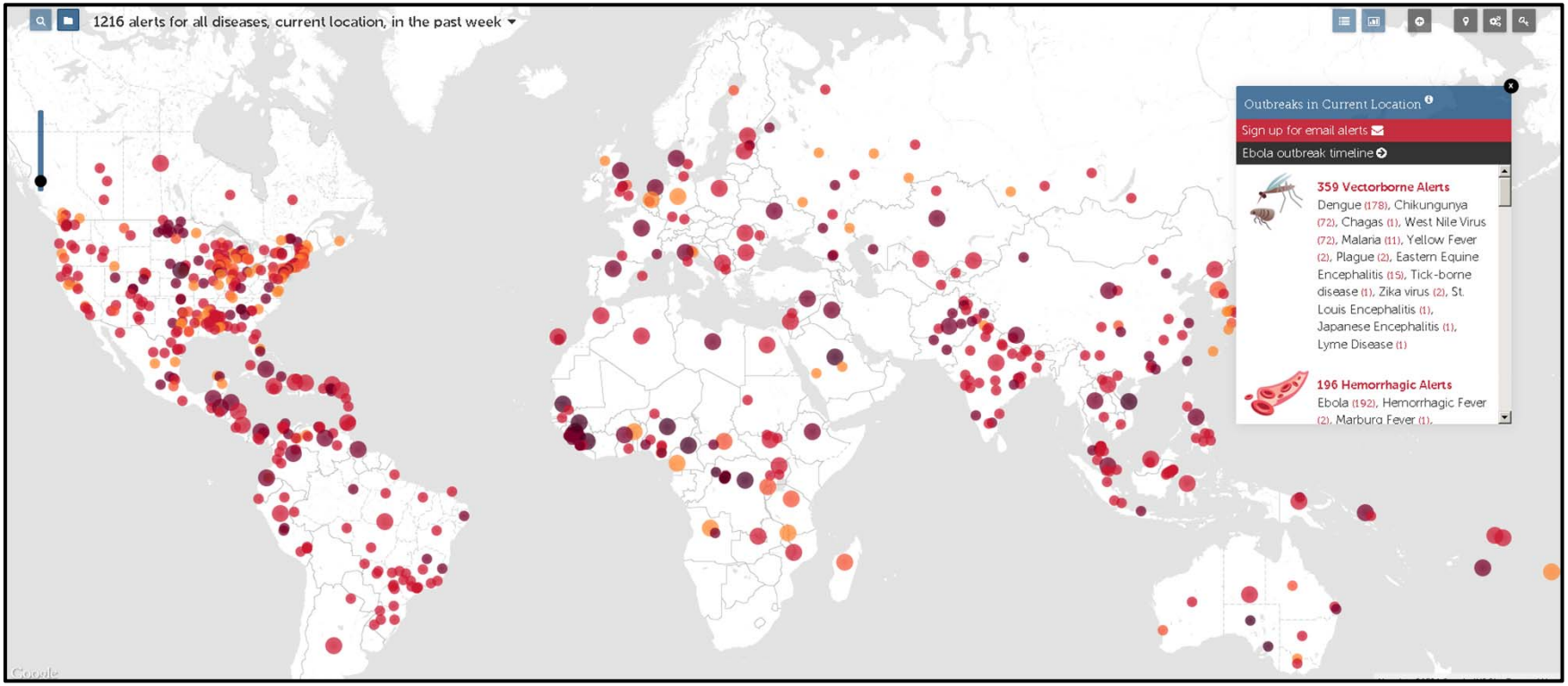
October 2009

AHRQ – Evidence of Consumer Health Informatics Applications

CHI – Systems → mHealth → Tele-health

Tele-Health / Tele-medicine

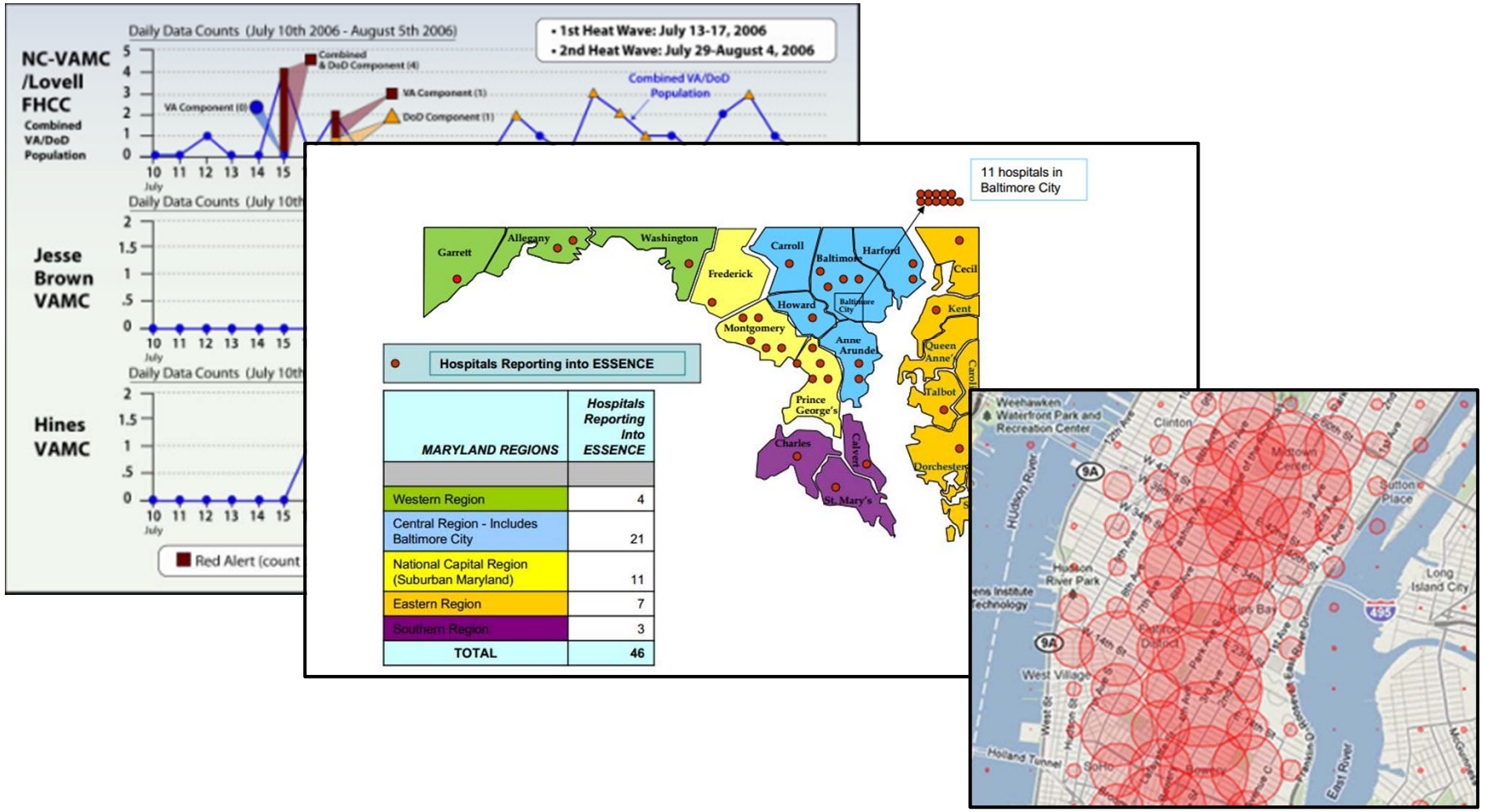
CHI – Systems → Public Health → Consumer Health Maps



healthmaps.org

Consumer Surveillance Tools (e.g., Health Maps)

CHI – Systems → Public Health (cont.)



Consumer-oriented Biosurveillance Tools

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Consumer Health Informatics

(Health Games)

CHI – Systems → Health Games

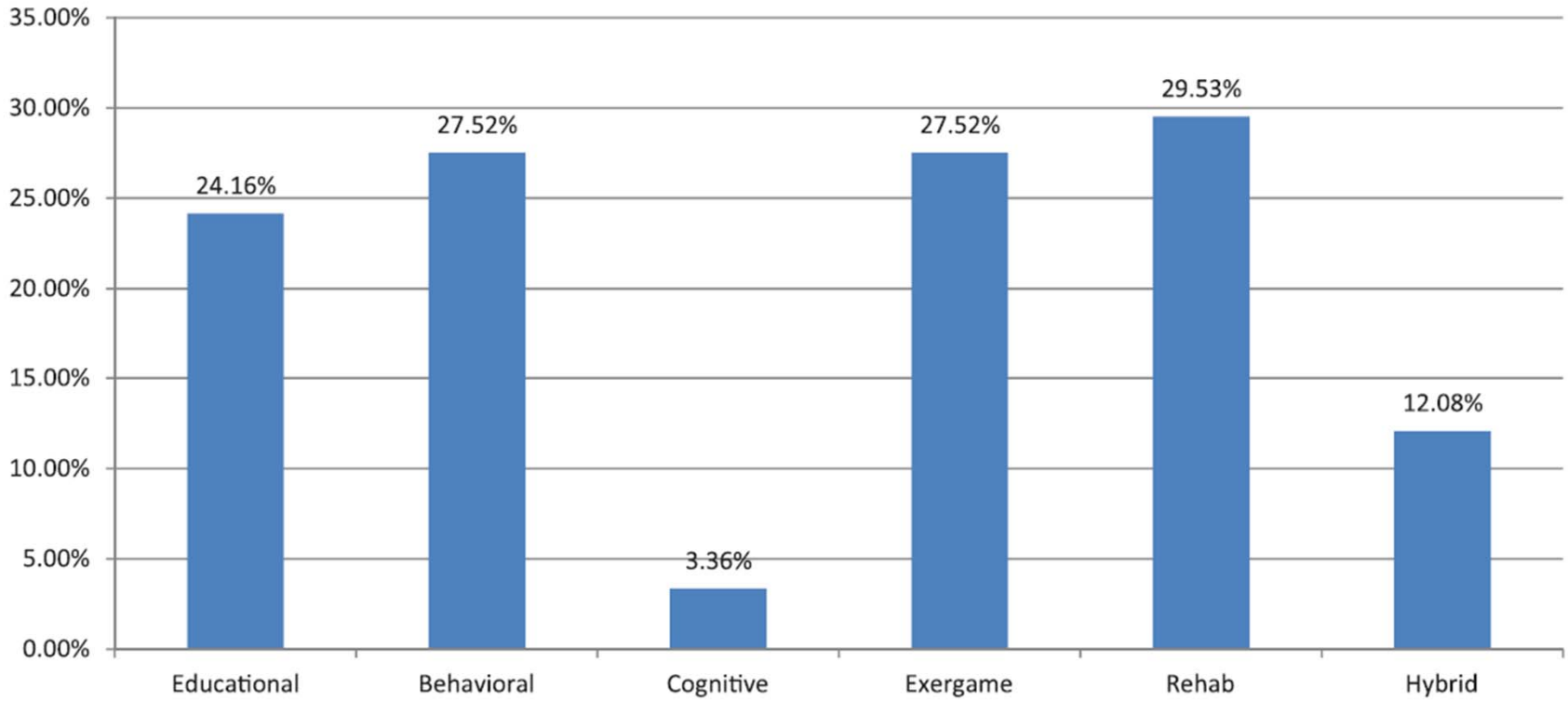
- Health games are interactive applications that can motivate users to actively engage about their healthcare.
- Health games can be specialized in one of the following domains:
  - medical training (virtual reality games)
  - health education (health edugames)
  - psychological therapy (behavioral change/self-care games/coach games)
  - physical rehabilitation (exergames)
  - cognitive rehabilitation (memory games)
  - stress relief (distraction games)

CHI – Systems → Health Games (cont.)

gamesforhealth.org / healthgamesresearch.org

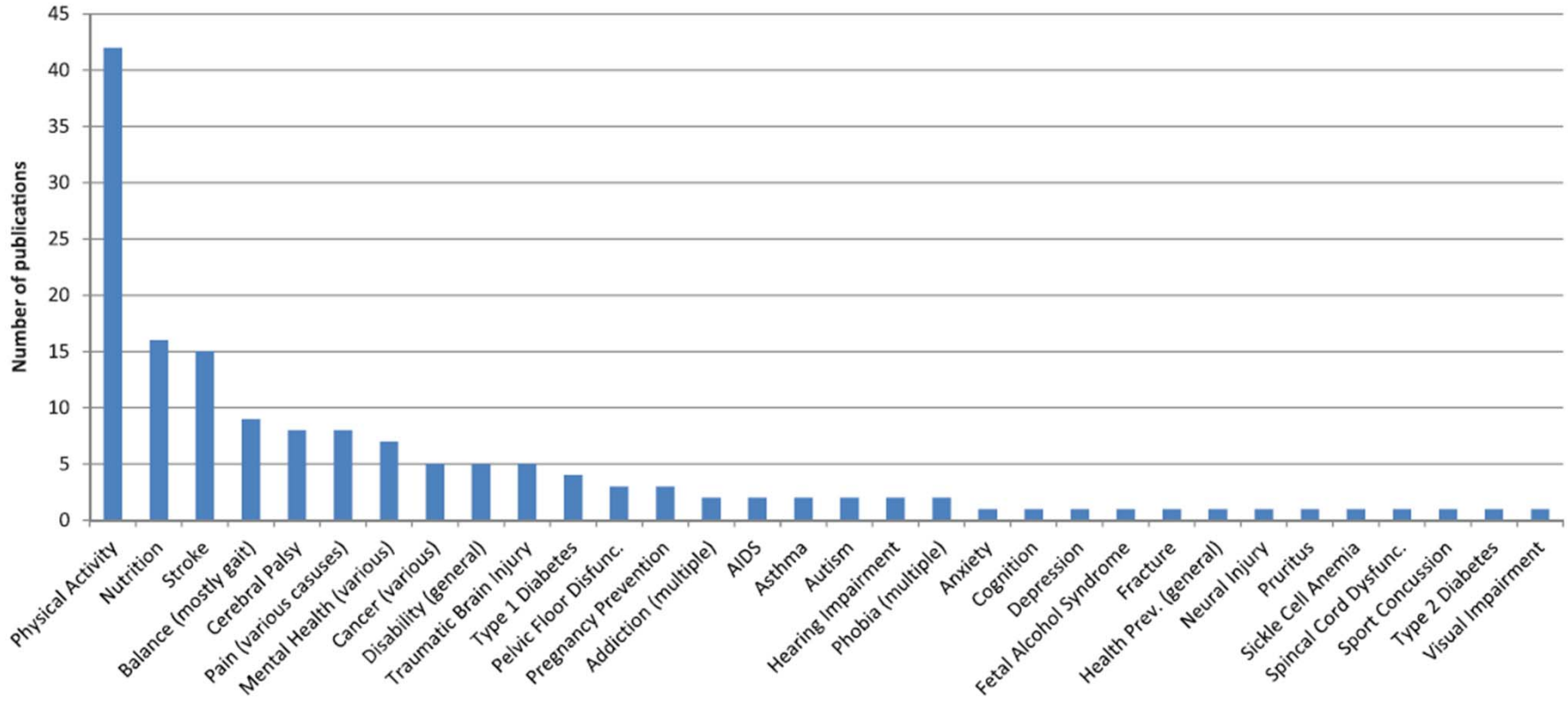
Sample Health Games

CHI – Systems → Health Games (cont.)



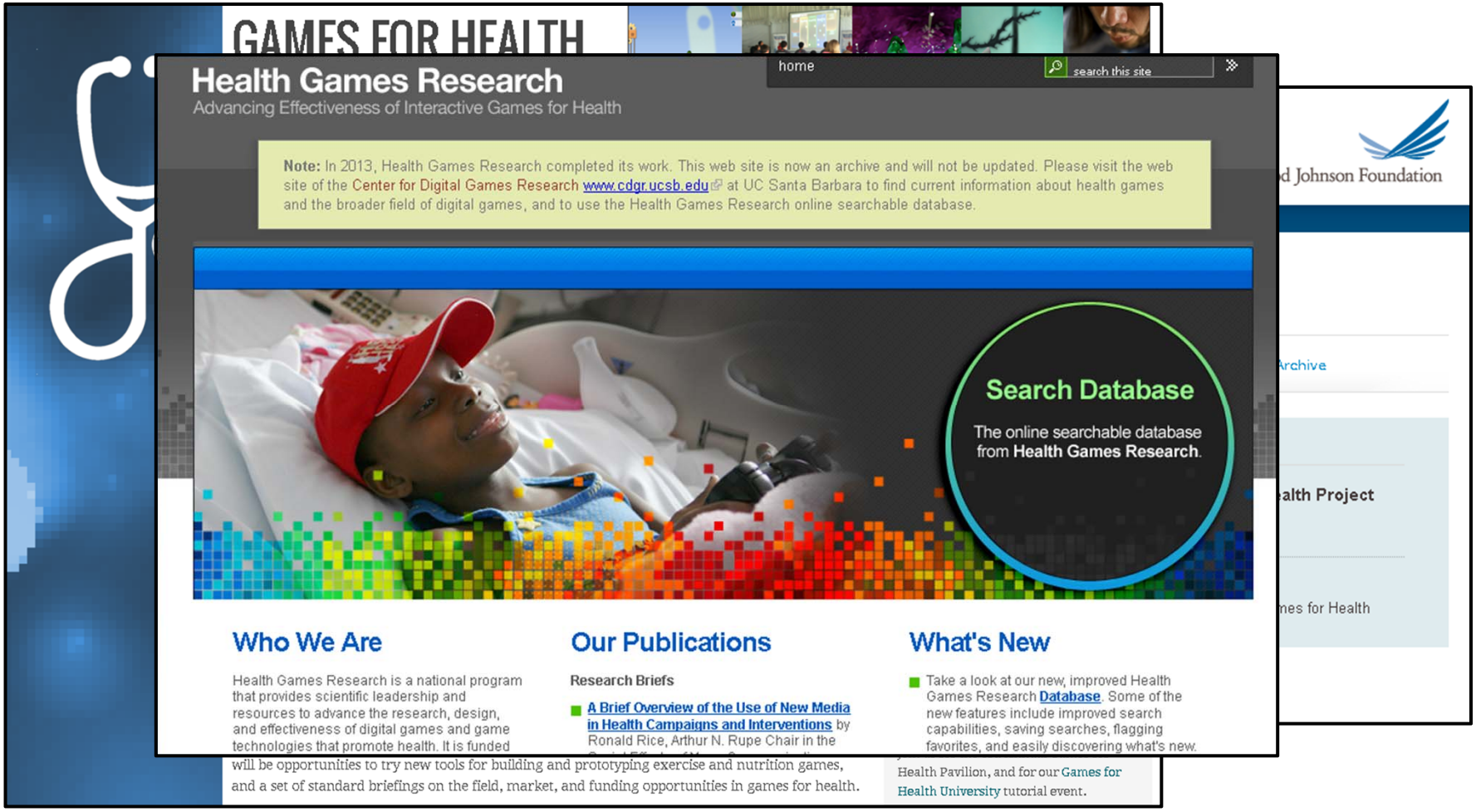
Scoping Review of Health Games - distribution of health game categories

CHI – Systems → Health Games (cont.)



Scoping Review of Health Games - number of publications per clinical context

CHI – Systems → Health Games (cont.)



gamesforhealth.org / healthgamesresearch.org

Health Games Resources

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Behavioral Change Models

CHI – Behavioral Change Models (BCM) → Levels

- Behavioral change models of psychology are categorized as: Individual (HBM, TPB, SCM), Interpersonal and Community.

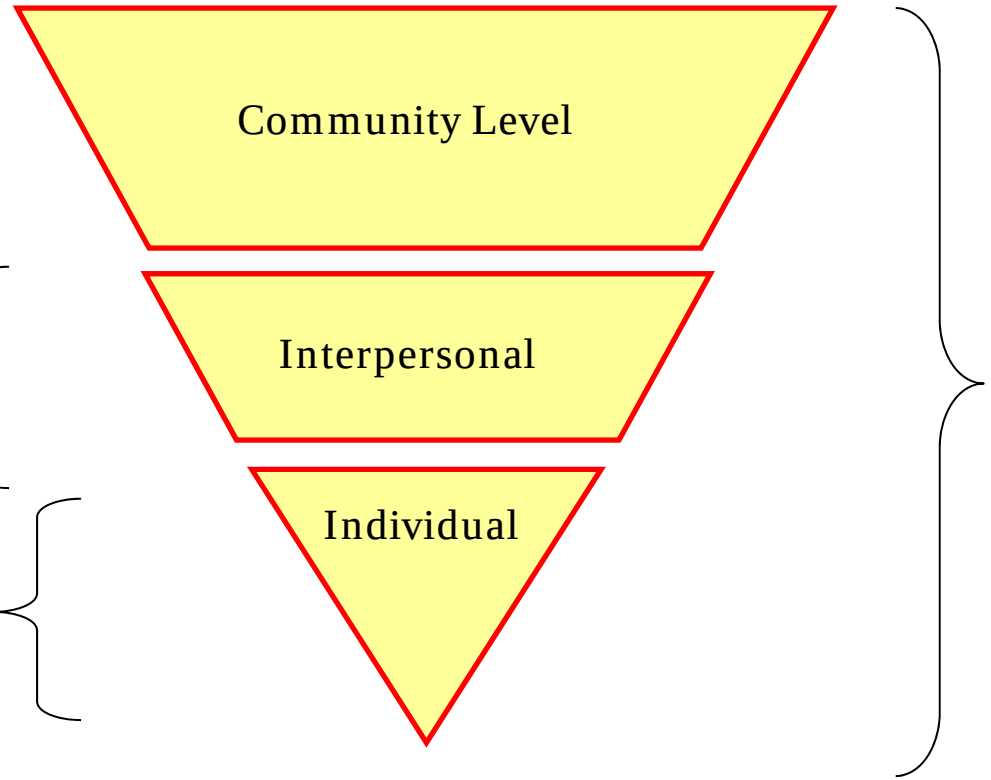
Concept	*Definition*
Intrapersonal Level	Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personality traits
Interpersonal Level	Interpersonal processes and primary groups, including family, friends, and peers that provide social identity, support, and role definition
Community Level	
Institutional Factors	Rules, regulations, policies, and informal structures, which may constrain or promote recommended behaviors
Community Factors	Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations
Public Policy	Local, state, and federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management

CHI – BCM → Levels (cont.)

- Diffusion of Innovations
- Organizational Change

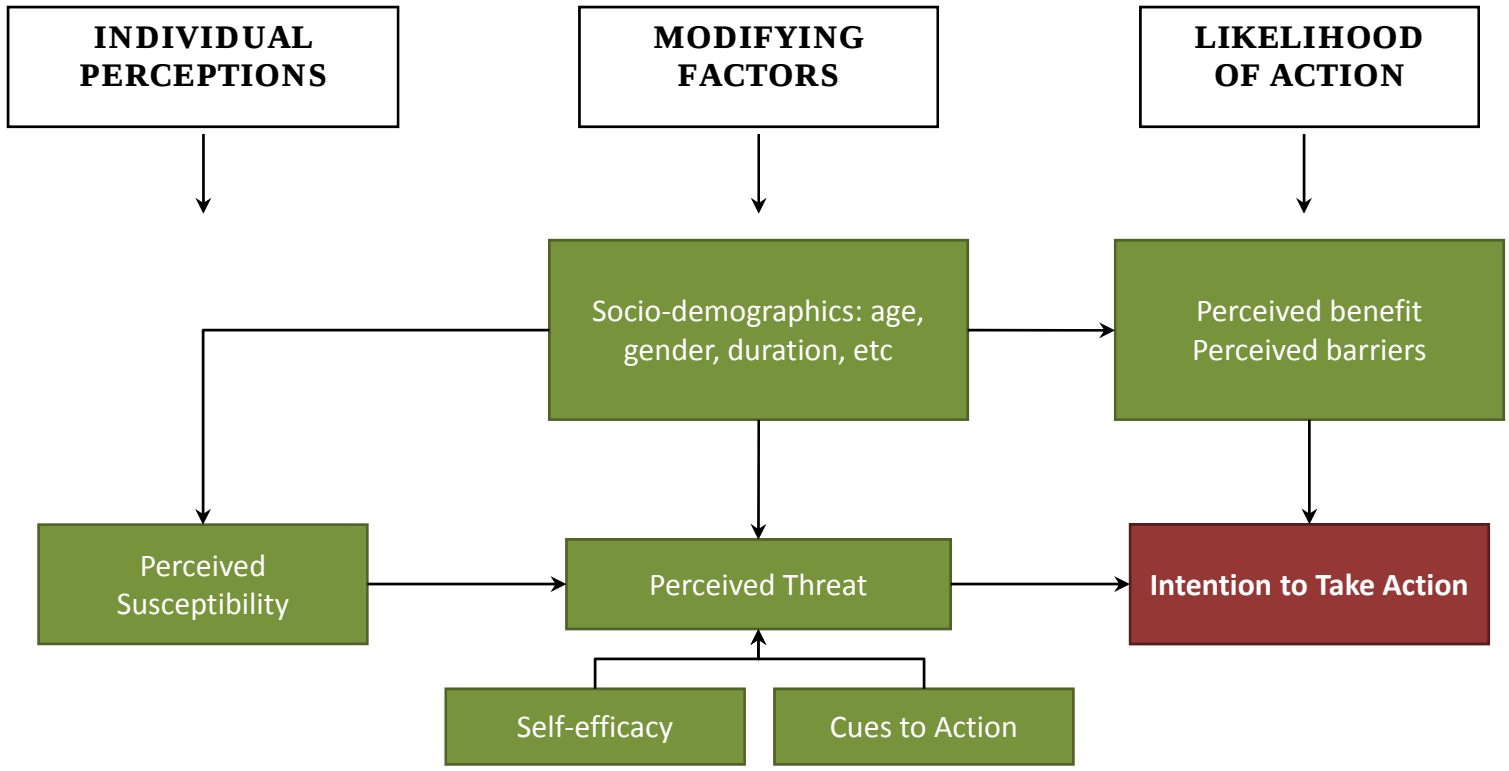
- Social Learning Theory

- Health Belief Model
- Stages of Changes Model
- Consumer Info-Processing
- Theory of Planned Behavior



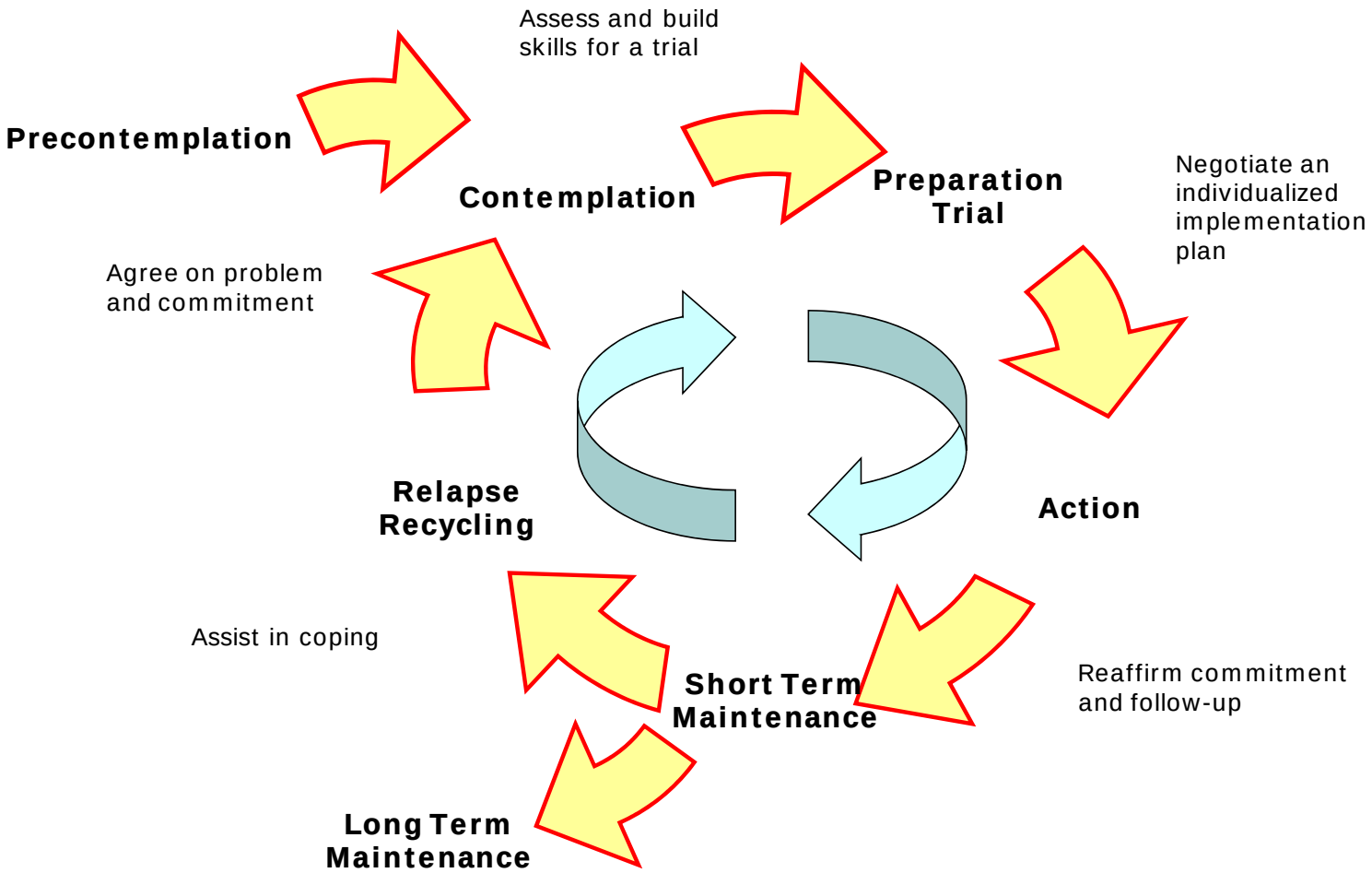
The Behavior Modification Inverse Pyramid

CHI – BCM → Health Belief Model



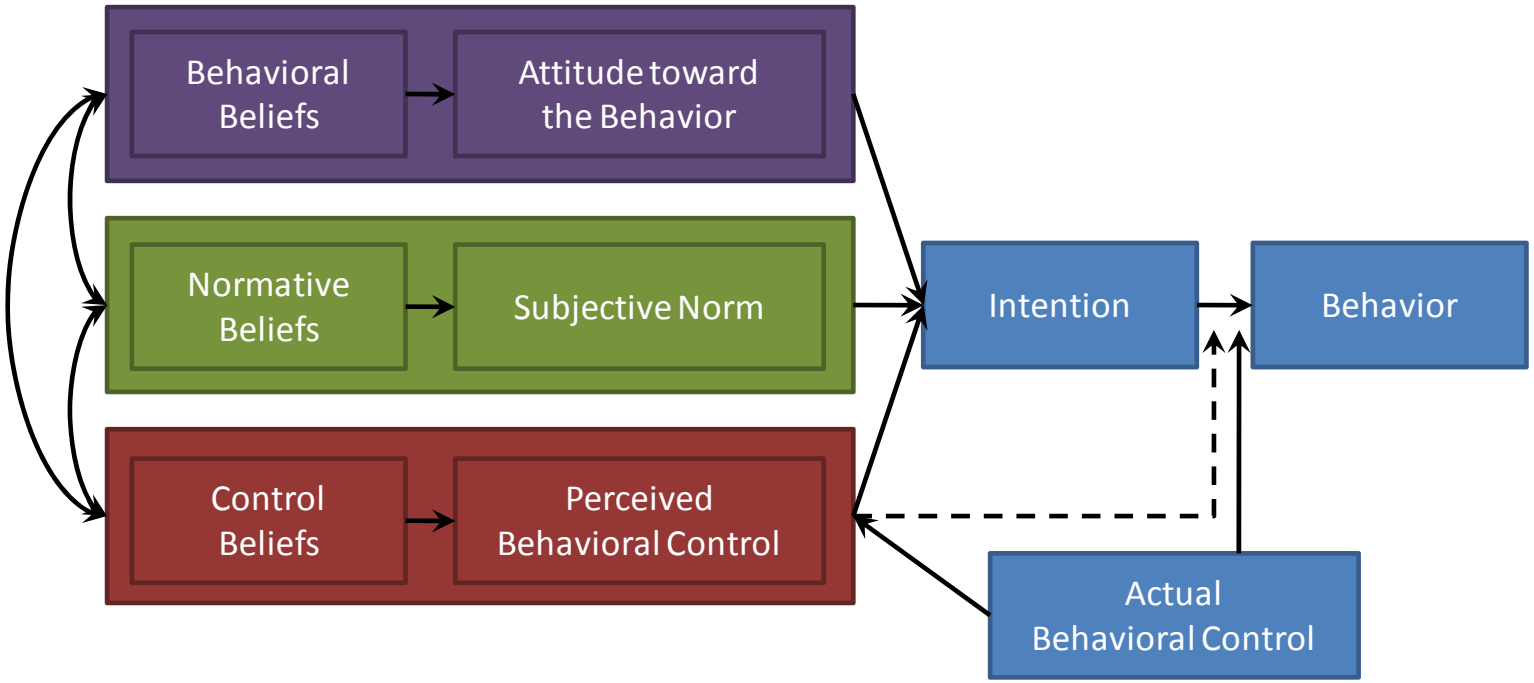
Health Belief Model

CHI – BCM → Stages of Changes Model



Stages of Changes Model

CHI – BCM → Theory of Planned Behavioral



Theory of Planned Behavioral

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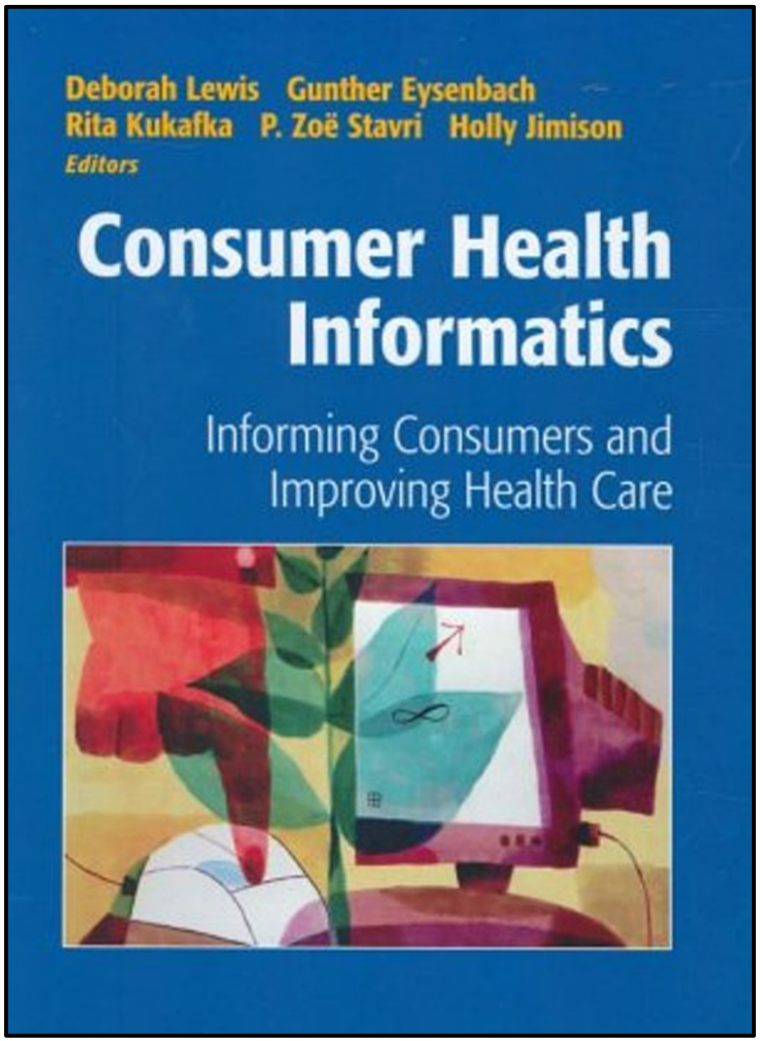
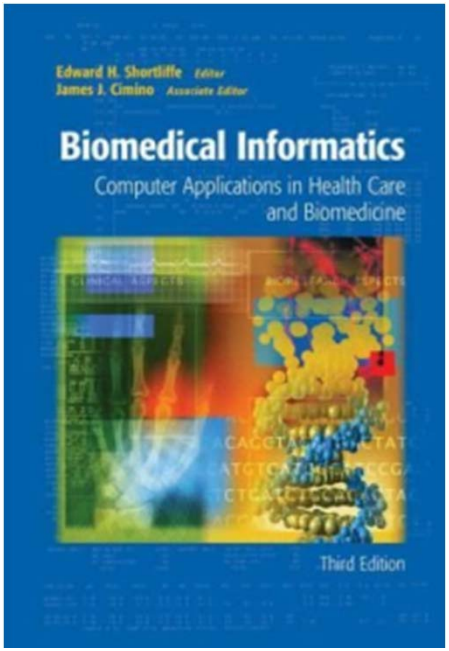
Additional Resources

Resources – Books



Title	Consumer Health Informatics
Authors	Debora Lewis
Year	2005
Hardcover	258 pages
Publisher	Springer
Language	English
ISBN	038723991X

Resources – Books (cont.)

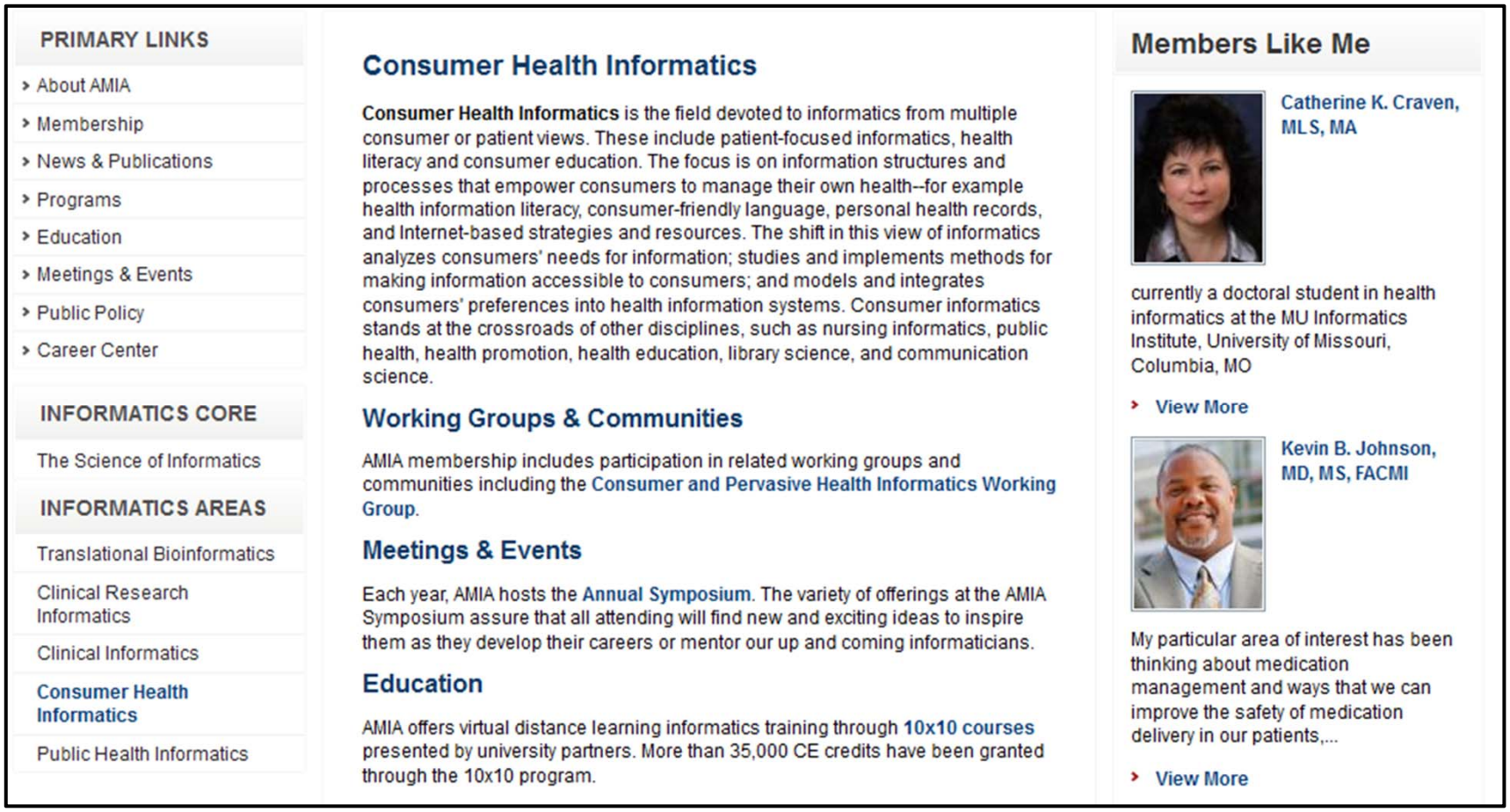


Title	Biomedical informatics: Computer Applications in HealthCare and Biomedicine.
Authors	Shortliffe, E.H. and Cimino, J.J (eds)
Year	2006
Hardcover	1024 pages
Publisher	Springer; 3rd edition (May 15, 2006)
Language	English
ISBN	0387289860

Resources – Web

- **Associations**:
  - AMIA (American Medical Information Association): www.amia.org
  - IMIA (International Medical Information Association): www.imia-medinfo.org
  - HIMSS (Healthcare Information and Management Systems Society): www.himss.org
  - Academy Health (HIT Interest Group): www.academyhealth.org
- **Government and Non-for-profit**:
  - ONC: www.healthit.gov
  - CMS MU: www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms
  - HL7: hl7.org
- **Journals**:
  - JAMIA (Journal of AMIA): jamia.bmj.com
  - JMIR (Journal of Medical Internet Research): www.jmir.org
  - IJMI (International Journal of Medical Informatics): www.ijmijournal.com
  - HIJ (Health Informatics Journal): jhi.sagepub.com
  - ACI (Applied Clinical Informatics): aci.schattauer.de

Resources – Web (cont.)



PRIMARY LINKS

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- Education
- Meetings & Events
- Public Policy
- Career Center

INFORMATICS CORE

The Science of Informatics

INFORMATICS AREAS

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Consumer Health Informatics

Public Health Informatics

Consumer Health Informatics

Consumer Health Informatics is the field devoted to informatics from multiple consumer or patient views. These include patient-focused informatics, health literacy and consumer education. The focus is on information structures and processes that empower consumers to manage their own health--for example health information literacy, consumer-friendly language, personal health records, and Internet-based strategies and resources. The shift in this view of informatics analyzes consumers' needs for information; studies and implements methods for making information accessible to consumers; and models and integrates consumers' preferences into health information systems. Consumer informatics stands at the crossroads of other disciplines, such as nursing informatics, public health, health promotion, health education, library science, and communication science.

Working Groups & Communities

AMIA membership includes participation in related working groups and communities including the **Consumer and Pervasive Health Informatics Working Group**.

Meetings & Events

Each year, AMIA hosts the **Annual Symposium**. The variety of offerings at the AMIA Symposium assure that all attending will find new and exciting ideas to inspire them as they develop their careers or mentor our up and coming informaticians.

Education

AMIA offers virtual distance learning informatics training through **10x10 courses** presented by university partners. More than 35,000 CE credits have been granted through the 10x10 program.

Members Like Me

Catherine K. Craven, MLS, MA

currently a doctoral student in health informatics at the MU Informatics Institute, University of Missouri, Columbia, MO

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Kevin B. Johnson, MD, MS, FACMI

My particular area of interest has been thinking about medication management and ways that we can improve the safety of medication delivery in our patients,...

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AMIA (American Medical Information Association): www.amia.org

Summary

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