Population Health

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Outline of Talk

- Introduction & Definitions
- The Vendor View
  - Camden Coalition
  - Atlantic City Special Care Center

Outline of Talk

- Projects
  - WSB
  - Kaiser Farmers Markets
  - Cambridge Health Alliance
  - Healthy SF
  - North Karelia, Finland
  - Lithuania/Norway
  - RWJ City Maps

Outline of Talk

- Patient Activation
- Behavioral Economics
- HIT
- Predictive Analytics Projects
- Conclusion
- References

Population Health Definitions

- “The health outcomes of a group of individuals, including the distribution of such outcomes within the group and the policies and interventions that link outcomes and patterns of health determinants”
- David Kindig & Greg Stoddart

Population Health Definitions

- “A conceptual framework for why some populations are healthier than others as well as the policy developments, research agenda, and resource allocation that flow from this framework.”
- T. K. Young

David Feinberg, MD

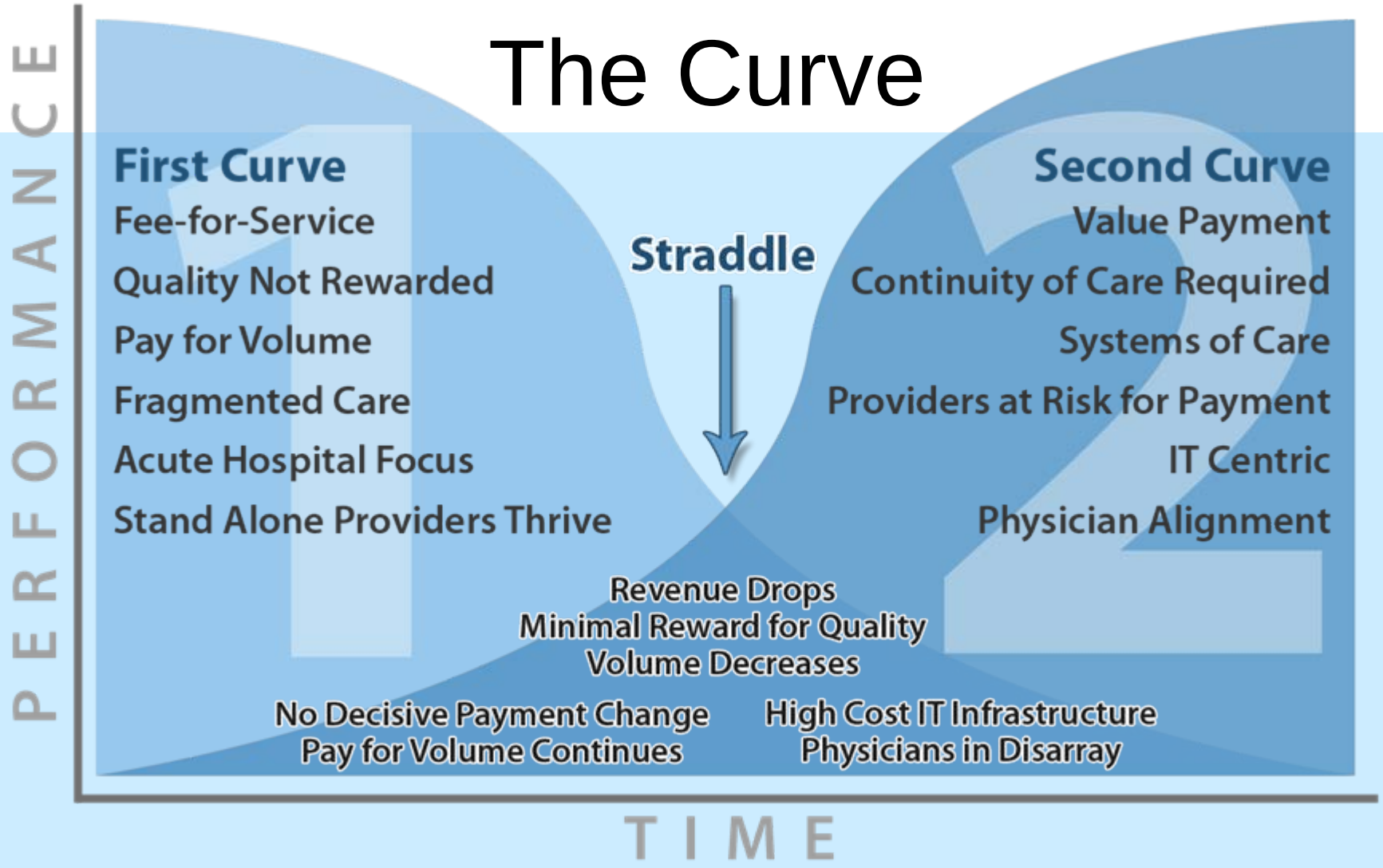
WSJ, September 27, 2015

"I think my job ultimately is to close every one of our hospitals. Because we should take care of you at home. We should take care of you at school. Nobody wants to go to the hospital. We really need to work to keep people healthy. Now, people will still get hit by cars, and there'll be complex surgeries that require hospitalizations. But I'm trying to put myself out of business."

ACA & Population Health

1. ACA requires tax-exempt hospitals to conduct community health needs assessments every three years and adopt implementation strategies that meet the identified needs, including identifying reasons why any such needs are not being addressed.
2. The law expands coverage for a wide range of prevention and wellness services, increasing incentives for employers that establish wellness programs and eliminating copayments for immunizations, screenings, and other clinical preventive services.
3. The elimination of payment for unnecessary readmissions and the development of delivery payment pilots increase the hospital's accountability for care outside its four walls.
4. Medical home demonstrations, coordination grants, and increased financial support for health centers encourage partnerships between hospitals and other community organizations.
5. ACA creates a fund to provide sustained national investment in preventive and public health programs, including those offered by hospitals to increase access to clinical preventive services and create healthier communities.

The Curve


PERFORMANCE
First Curve
Fee-for-Service
Quality Not Rewarded
Pay for Volume
Fragmented Care
Acute Hospital Focus
Stand Alone Providers Thrive
Straddle
Second Curve
Value Payment
Continuity of Care Required
Systems of Care
Providers at Risk for Payment
IT Centric
Physician Alignment
Revenue Drops
Minimal Reward for Quality
Volume Decreases
No Decisive Payment Change
Pay for Volume Continues
High Cost IT Infrastructure
Physicians in Disarray
TIME

Delivery System Reform

Reactive	Focused	Predictive
Visitor	Patient	Person
Symptomatic	Episode	Overall Health
Acute Needs	Most Common Conditions	Community Health Characteristics
Services & Supplies	Packaged Treatments	Manage Well Being
Unit Based	Efficiency Based	Outcome Based
No Financial Risk	Partial Financial Risk	Full Financial Risk

One View of Population Health

- Define population
  - Acquire, aggregate, normalize all relevant data
- Stratify risks
  - Id high, moderate, low risk individuals; Id care gaps
- Manage Care
  - Coordinate care, manage transitions of care, engage patients, change work flows
- Measure outcomes
  - Clinical outcomes, cost of care, patient satisfaction; Id shortfall/gaps; Improve care

Camden Coalition

- Jeffrey Brenner, MD
- Atul Gawande New Yorker article
- Data from hospitals
- Triage
- High risk (care management)
- Intermediate risk (care transitions)

How Camden Coalition Started

- Dr. Jeffrey Brenner
- Appointed to Police Reform Commission
- Broken windows theory of policing
- Police reluctant to generate computerized crime maps; police union resisted
- Brenner created block by block health care cost maps using 3 hospital billing data

How Camden Coalition Started

- Single building sent more people to hospital with serious falls (57 in 2 years) generating $3 million in hospital bills
- 2 most expensive blocks
  - Abigail House Nursing Home
  - Northgate II low income housing
  - 900 patients from these 2 blocks had 4000 hospital visits & $200 million in hospital bills

How Camden Coalition Started

- 1% of patients accounted for 30% of costs
- “Emergency room visits and hospital admissions should be considered failures of the health care system until proven otherwise” Dr. Jeffrey Brenner

How Camden Coalition Started

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How Camden Coalition Started

- “For all the stupid, expensive, predictive-modelling software that the big venders sell,” he says, “you just ask the doctors, ‘Who are your most difficult patients?,’ and they can identify them.”
- 560 pound 44 year old male with CHF, asthma, DM, hypothyroidism, gout, smoking, alcohol abuse, cocaine habit

How Camden Coalition Started

- Applied for disability insurance
- Moved from motel to stable home
- AA meetings
- Church attendance
- Cooking own meals
- Lost 220 pounds

Camden Coalition

- Goals of program
- Reduce readmissions and costs for complex patients
- No open referrals
- No duplicate services
- Facilitate clinical coordination

Camden Coalition

- Intermediate risk outreach team
  - RN
  - LPN
  - Health coaches
- High risk outreach team
  - RN
  - MA
  - Health coaches
  - Social worker

Camden Coalition High Risk

- Hospital utilization
- 2 or more chronic conditions
- Low socioeconomic status
- Homeless or unstable housing
- Lack of social support, HS diploma
- Behavioral health issues
- Generational poverty/urban violence

Camden Coalition

- The Transitional Care Model: Mary D. Naylor, PhD, University of Pennsylvania School of Nursing
- The Care Transitions Program: Eric Coleman, MD, Division of Health Care Policy and Research at the University of Colorado School of Medicine

Atlantic City Special Care Center

- AtlantiCare/Local 54 Casino Union
- Both self insured large employer
- Rushika Fernadopulle, MD
- Clinic for workers with exceptionally high medical expenses
- Flat monthly fee, no co-pay for patients
- Open access scheduling: same day appoint.

Atlantic City Special Care Center

- Physicians, RNs, social worker, receptionist, health coaches
- Fired half of initial hires
- “Recruit for attitude train for skill”

Health Coaches

- Modeled after promotora from Dominican Republic
- See patients at least once every 2 weeks
- Speak same language as patients
  - Gujarati
  - Hindi
  - Spanish
  - French Creole
  - Vietnamese
  - Cantonese
  - Portugese

Health Coaches

- Have chronic diseases themselves
- Have non-health care backgrounds
- “Because she talks to me like my mother”

Atlantic City Special Care Center

- “We get to connect with the patient; they socially bond with us as though to a family member. It is easy for them to talk to the health coach about anything, including depression and other issues.”
- -*Jayshree Patel, Health Coach*-

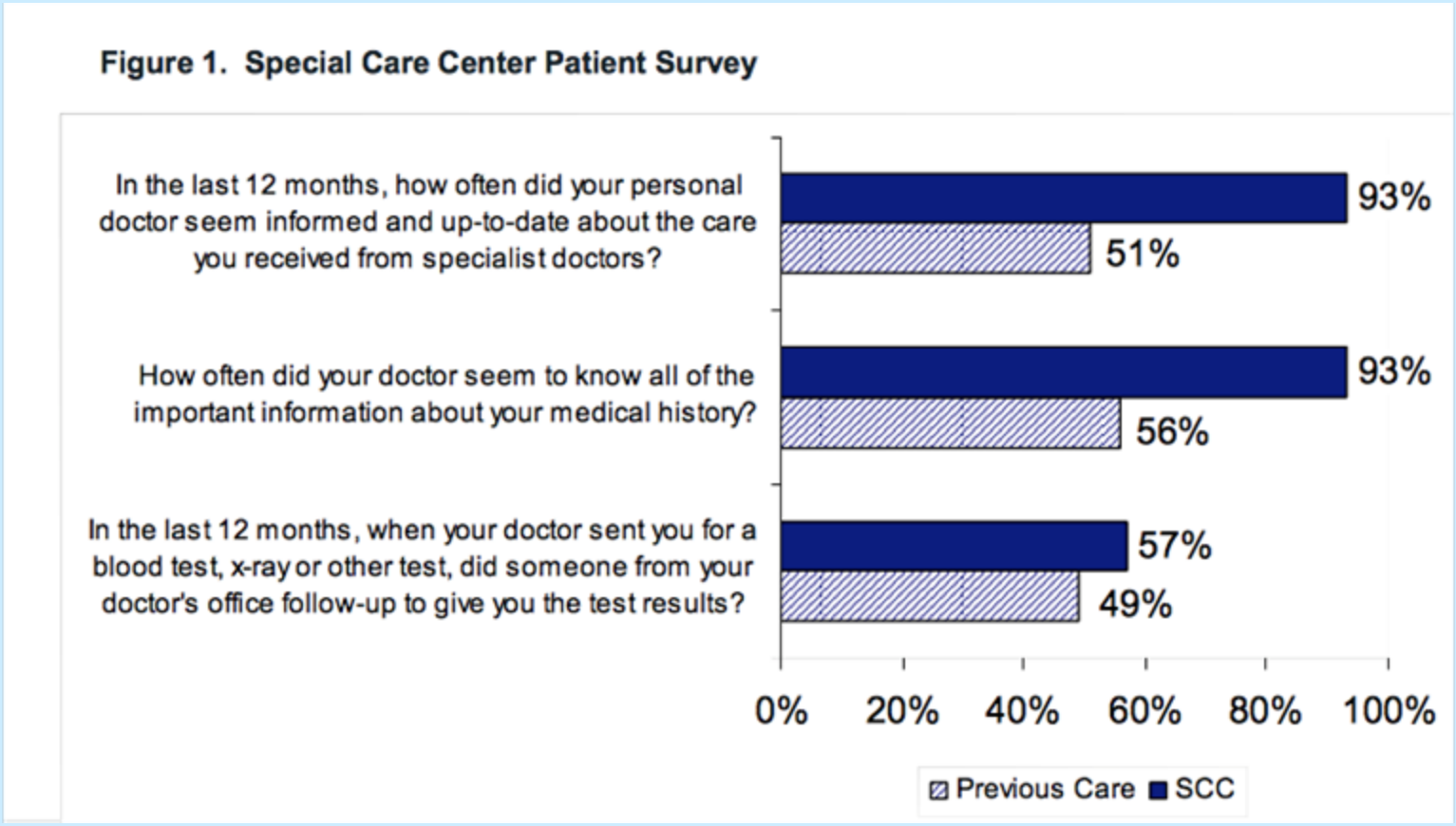
Atlantic City Special Care Clinic

- 25% decrease in surgery
- 41% decrease in ED visits
- 48% decrease in hospital admissions
- Independent economic analysis found 25% decrease in cost
- Similar programs in Seattle for Boeing and Las Vegas for casino workers

Atlantic City Special Care Clinic

- Conflict with local physicians
- Patients have good insurance coverage
- Cardiologist ordering cardiac ultrasound once a year and EKG every 3 months
- “Rogue physicians”

Atlantic City Special Care Clinic



Key Takeaways

- Transparency and support from top leaders of both union and hospital partners
- Reimbursement structure

  “We do not do fee-for-service; fee-for-service is toxic for primary care.”

  Rushika Fernandopulle, MD, MPP-

Key Takeaways

- Collaborative Team model requires buy-in by providers
- Access to data because they are self-insured
- Ambulatory Intensive Care Unit concept

Outside Health System Factors

- Food safety
- Neighborhood crime
- Open space
- Disease prevalence
- Income levels
- Unemployment rate
- Age/Sex/Race
- Care seeking behavior
- Food availability
- Housing conditions
- Parks
- Genetic inheritance
- Poverty rate
- Geographic location
- Pharmacy
- Transportation

Population Health Strategies

- Fitness and exercise promotion
- Obesity management and weight reduction
- Diet and nutrition
- Stress management
- Reductions in smoking and substance abuse
- Protected sex and family planning
- Physical activity and moderate amounts of exercise
- Auto safety; drunk driving
- Chronic disease management
- Food safety
- Clean water, sewers
- Promoting healthy communities
- Economic incentives for healthy behaviors
- Universal coverage to encourage preventive care

Walking School Bus Program

- Groups of children walk to and from school under adult supervision
- PedNet Coalition
- Columbia, MO
  - 8 schools
  - 20 routes
  - 450-500 kids
  - 200 volunteers

Walking School Bus Program

- Over the last decade the number of kids walking to school has declined from 48% to 13%
- 1969: 127 kids per school
- 2009: 521 kids per school

Walking School Bus Program

James L. Oberstar Safe Routes to School Award

- US Congressman & Chair of House Transportation & Infrastructure Committee
- Federal Safe Routes to School Program
- Awards
  - Michigan Dept of Transportation
  - Bear Creek Elementary School in CO 70% participation rate
  - Alpine Elementary School in UT participation rate went from 35% to 50%

Walking School Bus Program

- Training modules: http://apps.saferoutesinfo.org/training/walking_school_bus/
- Why We Need WSB, Anyway
- Preparation: What It Takes to Establish Sustainable WSB Program
- First Steps: How to Build Momentum to Launch Your WSB Program
- Community Partnership: Who Can Help Get WSB Rolling
- How To Identify & Secure Program Funding
- Key Training Takeaways

Walking School Bus Program: Key Takeaways

- Teamwork is essential; requires broad base of support
- WSB Coordinator is crucial
  - Springfield MO program
  - Police Dept got State grant, but needed help
  - Mother became coordinator
  - 100 kids participating at end of 1 year

Walking School Bus Program: Key Takeaways

- There is no one right way
  - Phoenix charter school
  - Most kids lived far away from school
  - Creative solution created staging post drop off site 0.5 miles from school
  - 40 kids participate with 10 adult volunteers

Walking School Bus Program: Key Takeaways

- Success brings success
  - Birmingham, AL YMCA
  - $400,000 RWJ Foundation Grant
  - Pilot program
  - After 1 semester 150 kids at 3 schools
  - RWJ Grant ran out
  - $150,000 Alabama State Funding

Walking School Bus Program: Key Takeaways

- Importance of planning
- Be persistent
  - After a few years drop-off is natural
  - Get more volunteers involved
  - Revisit steps that made initial pilot successful

Kaiser Friday Fresh Farmers Markets

- Dr. Preston Maring
- Oakland Kaiser May 2003
- Program has grown to where locally grown fruits and vegetables now used in 50 Kaiser hospitals
- Kaiser/Sustainable Economic Enterprises of LA sponsor Watts Healthy Farmers Market

Kaiser Friday Fresh Farmers Markets

- "The goal of the Kaiser Permanente farmers' markets is to address the obesity epidemic and to improve the health of our employees, members, and community residents by making fresh fruits and vegetables convenient and readily available."

Kaiser Farmers Market

KAISER PERMANENTE®

Medical center and…grocery store?

It's not as crazy as it sounds.
Eating more fruits and vegetables is part of good health. That's why we've opened farmers' markets outside our medical centers and clinics.

Parsley, pears, poblano chiles...
No matter what you find at the farmers' market, chances are we've got a recipe for you. Visit our Food for Health blog for delicious, healthful recipes from our own physicians and dietitions.

Explore bite-sized ways to eat better with our tools and resources for healthy eating.

Back to kaiserpermanente.org

Find a farmers' market near you.

Northern California
Southern California
Colorado - Denver/Boulder
Colorado - Southern
Georgia
Hawaii
Maryland/Virginia/
Washington DC
Oregon/Washington

Now you can pick up your prescription and your green beans in the same trip.

Kaiser Farmers Market

- 190 tons a year of sustainably produced fruits and vegetables used by KP hospitals
- 50% of all fruits and vegetables served to patients
- Grown within 250 miles of facility
- The Weight of the Nation campaign with HBO, IOM, NIH, CDC, Dell Foundation

Journal of Agriculture, Food Systems, and Community Development

- Volume 2, Issue 2, Winter 2011/2012
- 74% of patrons at KP farmers markets consumed more fruits and vegetables
- 71% of patrons at KP farmers markets ate a greater variety of fruits and vegetables

Cambridge Health Alliance

Source: HRET, 2012.

	Process Questions	Results
Outcomes	What health statistics are inadequate for our catchment area and what population does this affect?	• Asthma is the leading chronic disease among children. • Cambridge Health Alliance was seeing a high number of pediatric inpatient admission for asthma.
Factors	What is causing the outcome that we are seeing?	• Low adherence to medication regimen. • Lack of knowledge about asthma attack triggers in children.
Interventions	What initiatives can we implement to modify and improve on the factors listed above?	• Web-based registrey used by physicians and school nurses to assess correct prescription and medication adherence. • Home visits by providers to help parent decrease or remove asthma triggers.
Impact	What are the results of the intervention?	• Increased adherence to asthma medication regimens. • Astha-related hospital admissions dropped by 45% from 2002-2009. • Asthma-related ED visits dropped by 50% over the same time period.

Healthy San Francisco

- Uninsured using ED at high rates
- SFDPH & 30 Hospitals/Clinics
- PCMH model
- Enrollment in subsidized health care system

Healthy San Francisco

- 100,000 enrolled in program
- Hospital Readmission Rate
  - 9% vs. 18% national average
- ED rate
  - 9% vs. 18% California state average

North Karelia in Finland

- Focus on nutrition, tobacco use, exercise
- Decreased heart attack deaths by 70%
- Decreased lung cancer deaths by 70%
- Male life expectancy increased 65-73 yrs.
- Mayo Clinic CardioVision 2020

WSJ, January 14, 2003

North Karelia in Finland

- “Stubborn persuasion.” No power.
- “What we’ve done better than the US is we’ve managed to get the whole community involved.”
- Dr. Pekka Puska leafleted markets
- Dr. Pekka Puska on local TV
- Yellow cards to record BP

North Karelia in Finland

- Alter local diet (from dairy and sausage to greens “food for animals”).
- Per capita vegetable consumption per year from 44 pounds to 110 pounds.
- Per capita berry consumption tripled to 143 pounds per year.
- Dairy industry negative ads in newspaper.
- Half number of cows compared to 1970.

Whiplash Pain and Culture

- Lithuania: no car insurance, no intractable neck pain and lingering headaches
- Norway: car insurance, 70,000 person organization for neck pain, headaches
- Cultural forces at work in reinforcing pain & dysfunction include insurance, self-help groups, class-action lawsuits, powerful patient organizations.

Population Health Statistics

- Your zip code is more important than your genetic code for health and wellness
- College grads live 5 years longer than those without a high school diploma
- Detroit with 139 square mile area and 900,000 people has only 5 grocery stores

RWJ City Maps

http://www.rwjf.org/en/library/collections/commission/search-city-maps.html

- Minneapolis
  - Life expectancy for babies varies by 13 years
- San Joaquin Valley
  - Life expectancy for babies varies by 9 years
- Kansas City
  - Life expectancy for babies varies by 14 years
- New Orleans
  - Life expectancy for babies varies by 25 years

New Orleans


RWJF Commission
to Build a Healthier America
Robert Wood Johnson Foundation
N
80
YEARS*
LAKEWOOD
NAVERRE
FAIRGROUNDS
SEVENTH
WARD
NEW ORLEANS,
LOUISIANA
MID CITY
66
YEARS*
MARIGNY
GERT TOWN
TULANE
GRAVIER
55
YEARS*
FRENCH
QUARTER
NEW ORLEANS
71
YEARS*
B.W.
COOPER
BROADMOOR
75
YEARS*
CENTRAL
CITY
1MI
*Life expectancy at birth by zip code
© 2013 Robert Wood Johnson Foundation

Kansas City


83
YEARS*
SHOAL
CREEK
LIBERTY
THE COVES
82
YEARS*
LINDEN
PARK
GLADSTONE
BIRMINGHAM
KANSAS CITY,
MISSOURI
KANSAS CITY
71
YEARS*
WASHINGTON
WHEATLEY
CUNNINGHAM
RIDGE
BLUE
HILLS
69
YEARS*
83
YEARS*
ARMOUR
HILLS
3MI

Twin Cities


RWJF Commission to Build a Healthier America
Robert Wood Johnson Foundation
3 miles could equal up to a 13-year life span difference
75–79 YEARS
HENNEPIN COUNTY
5 MILES
MINNEAPOLIS AND SAINT PAUL, MINNESOTA
MINNEAPOLIS
83+ YEARS
75–79 YEARS
SAINT PAUL
3 MILES
70–75 YEARS
83+ YEARS
1.5 MILES
2 MILES
2 MILES
70–75 YEARS
RAMSEY COUNTY
1MI

San Joaquin Valley, California

What Patient-Centered Should Mean

Donald M. Berwick, Health Affairs, 28, no. 4 (2009)

- “They give me exactly the help I need and want exactly when and how I need and want it.”
- “I eschew compromise words like partnership”
- “We should behave not as hosts in the care system, but as guests in their lives.”

What Patient-Centered Should Mean

Donald M. Berwick, Health Affairs, 28, no. 4 (2009)

- Patient centeredness improves health status outcomes
- Golomb statin drug takers initiate discussions of symptoms related to drug
- O'Connor on shared decision making found a 23% reduction in surgical interventions
- Patient education can increase compliance

What Patient-Centered Should Mean

Donald M. Berwick, Health Affairs, 28, no. 4 (2009)

- The experience (to the extent the informed, individual patient desires it) of transparency, individualization, recognition, respect, dignity, and choice in all matters, without exception, related to one's person, circumstances, and relationships in health care.

What Patient-Centered Should Mean

Donald M. Berwick, Health Affairs, 28, no. 4 (2009)

- Hospitals should have no restrictions on visiting
- Patients would choose food and clothes
- Patients should participate in rounds
- Patients would participate in design of health care processes and services
- Medical records belong to the patient
- Shared decision-making used universally

What Patient-Centered Should Mean

Donald M. Berwick, Health Affairs, 28, no. 4 (2009)

- Should patient-centeredness trump EBM?
- Is physician steward of social resources?
- What about clinicians' needs and wants?

From Patient Centered to People Powered

(BMJ 2015: 350, Feb 10, 2015)

- AMA, Belgian government “don’t google”
- IOM, Mayo, WHO regard patient as genuine value contributor partner in medicince
- Society for Participatory Medicine
- Social movement
- “Useful knowledge plus clinical experience plus what the patient wants leads to best care.”

Patient engagement

- Judith Hibbard's Patient Activation Measure 4 level scale
- Self management
- Collaboration with provider
- Maintaining function/preventing declines
- Access to appropriate care

Patient engagement

- Jessie Gruman's Center for Advancing Health 43 engagement behaviors organized in 10 categories

Patient engagement 10 Categories

- Find safe care
- Talk to providers
- Organize health care
- Pay for health care
- Make decisions
- Participate in care
- Promote health
- Get preventive care
- Plan end of life
- Seek knowledge

Jessie Gruman on Patients

- As a savvy and confident patient who is flummoxed by so much of what takes place in health care, I am regularly surprised by how little *you know about how little we patients know…*

Jessie Gruman on Patients

- *. You are immersed in the health culture. But we don't live in your world. So we have no idea what you are talking about much of the time. One way to help us feel competent in such unfamiliar environments is to give us some guidance about what this place is and how it works. What are the rules?*

Ashya King case could lead to families rejecting NHS advice

Guardian Nov 12, 2014

- Ashya King, 5 years old, with medulloblastoma
- Parents took him to Spain wanting proton beam
- Parents jailed in Spain after UK arrest warrant
- Public outcry; UK pays for proton beam therapy in Prague
- Delays in therapy may have not been best care
- Parents reject chemotherapy

Health Gadgets Test Privacy Law Limits

WSJ November 28, 2012

- Defibrillator implants beam data to device co.
- Hugo Campos wants same access to data as his cardiologist
- Wants to track heart data just like he uses Fitbit
- HIPAA, trail of data exhaust, legal implications

Commonwealth Health App Study

- Identified health apps
- Alcohol, arthritis, asthma, bipolar, cancer, cirrhosis, cognitive impairment, COPD, coronary artery disease, dementia, liver, lung, obesity, pain, smoking, stroke, depression, diabetes, drug abuse, elderly, heart disease, heart failure, high blood pressure, kidney disease

Commonwealth Health App Study Criteria for Usefulness

- Description of engagement
- Relevance to target population
- Consumer ratings and reviews
- Recent app updates

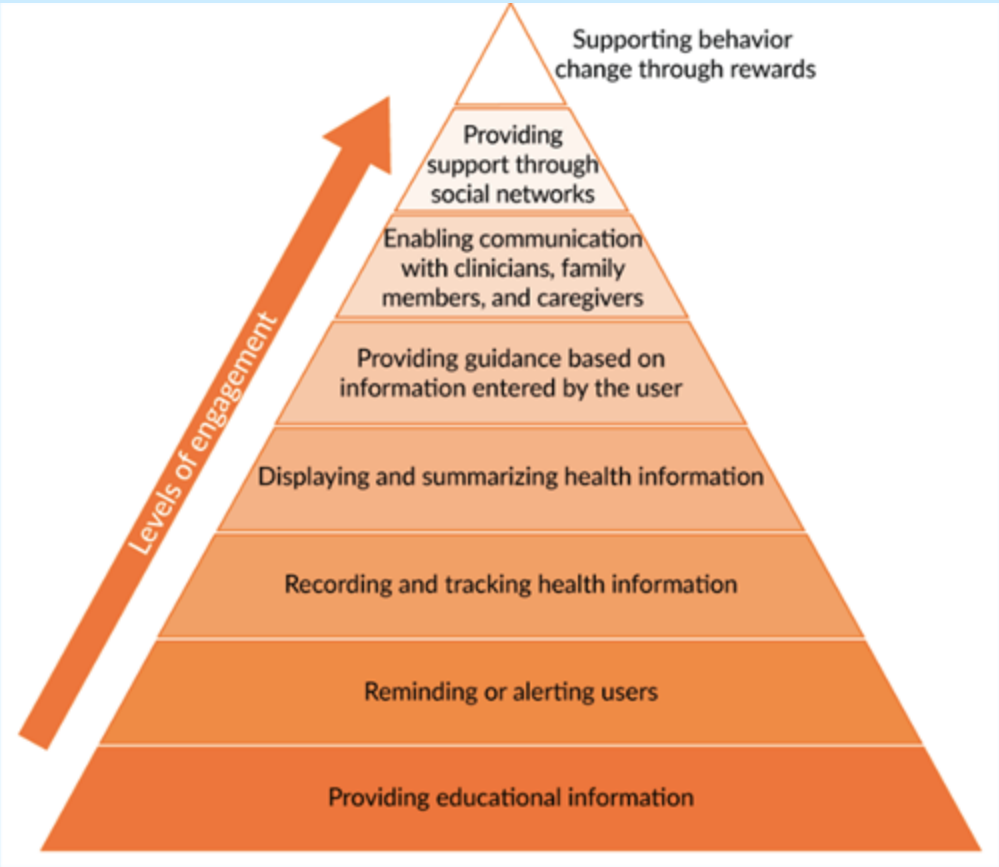
Commonwealth Health App Study Criteria Results

- 43% of iOS apps were judged useful
- 27% of Android apps were judged useful
- High need, high cost patients
- Patient facing apps for patients with chronic disease

Commonwealth Health App Study Reasons Apps Fail

- Minimal functionality beyond books, videos
- Not relevant to disease population
- Poorly rated by users
- Not intended for broad use
- Data breach concerns

Activating Patients with Mobile Apps

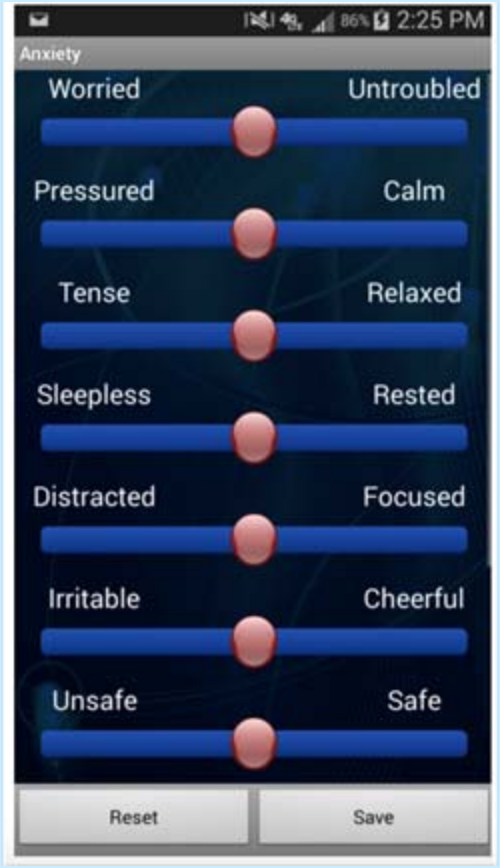


Mango Health

Mango Health

- Medication management app with medication reminders, refill alert, drug interaction warnings, track side effects
- Points system with weekly raffle for prizes
- Inability to share with MD
- Doesn’t connect with peer group
- Data breach concerns

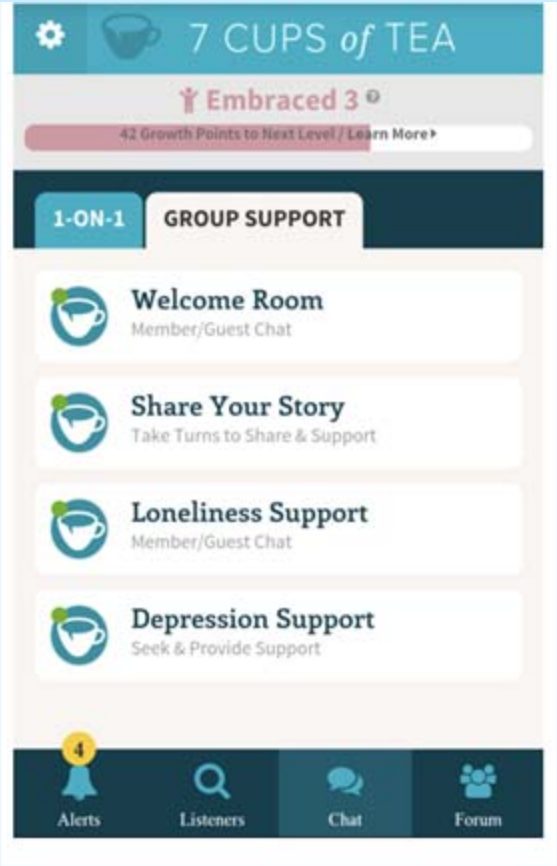
T2 Mood Tracker



T2 Mood Tracker

- 1st place in general wellness category of Apps4Army Competition
- Does not provide feedback
- Low, moderate, high engagement levels
- Can graph results over time
- Emergency support telephone number
- Missed opportunities for timely intervention

7 Cups of Tea


7 CUPS of TEA
Embraced 3
42 Growth Points to Next Level / Learn More
1-ON-1
GROUP SUPPORT
Welcome Room
Member/Guest Chat
Share Your Story
Take Turns to Share & Support
Loneliness Support
Member/Guest Chat
Depression Support
Seek & Provide Support
4
Alerts
Listeners
Chat
Forum

7 Cups of Tea

- Anonymously connects user with trained active listeners for social support
- 2 reviewers disagreed whether app appropriately handled dangerous situation
- Supports high engagement level patients
- Does not support low or moderate engagement level patients

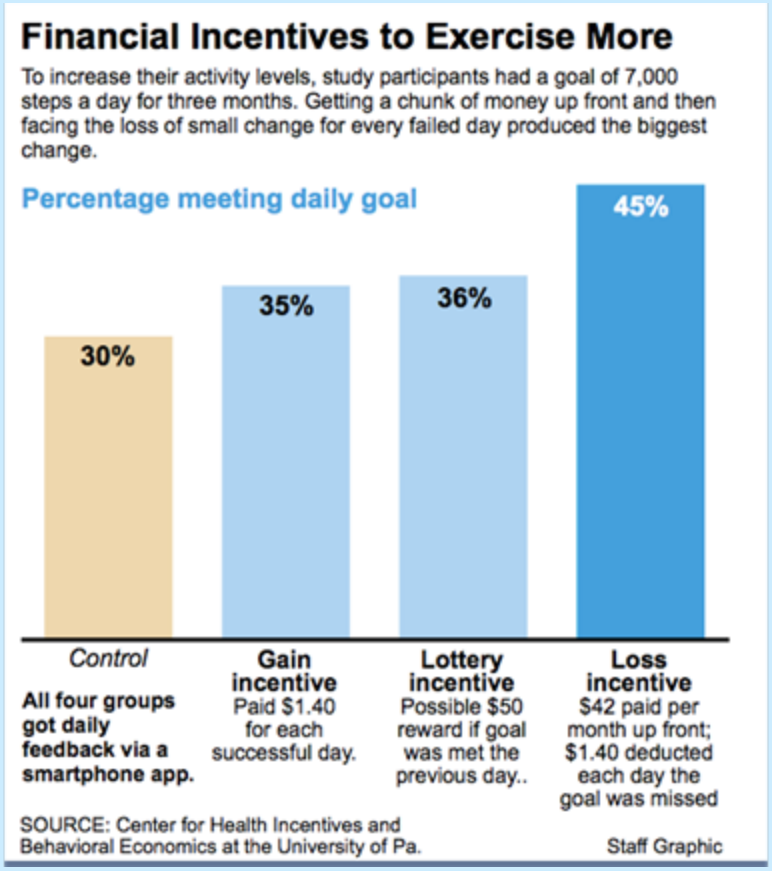
Behavioral Economics & Population Health

- Patients and physicians are predictably irrational in decision-making because they succumb to human foibles
- Humans depend on heuristics
- People have trouble making healthy choices because of uncertainty, emotions, complex trade offs between current and future costs and benefits

Behavioral Economics & Population Health

- Loss aversion
- We feel the pain of loss more acutely than we feel the pleasure of gain. In other words, we may like to win, but we *hate to lose*.
- Psychologically losses are twice as powerful as gains

How to Lose Weight



Loss Aversion & Wellness Programs

- Difficult to demonstrate behavior changes and cost savings for employers
- Change in design may lead to more results
- Daily lottery entered if patient reaches daily goal
- Deposit contracts where patient puts own money or reputation at risk

Adherence to Treatment

- University of Pennsylvania Center for Health Incentives and Behavioral Economics (CHIBE) study of post MI pts
- Smart pill bottle tracks and wirelessly transmits data about medication use
- Daily contact by e-mail, text, voice mail telling them if they won lottery prize or if they would have won if they had taken pill

Adherence to Treatment

- Family members receive automated message to provide peer pressure
- Clinical social workers dispatched if patient misses 4 consecutive doses
- Automated hovering
- Combination of telemedicine and behavioral nudges

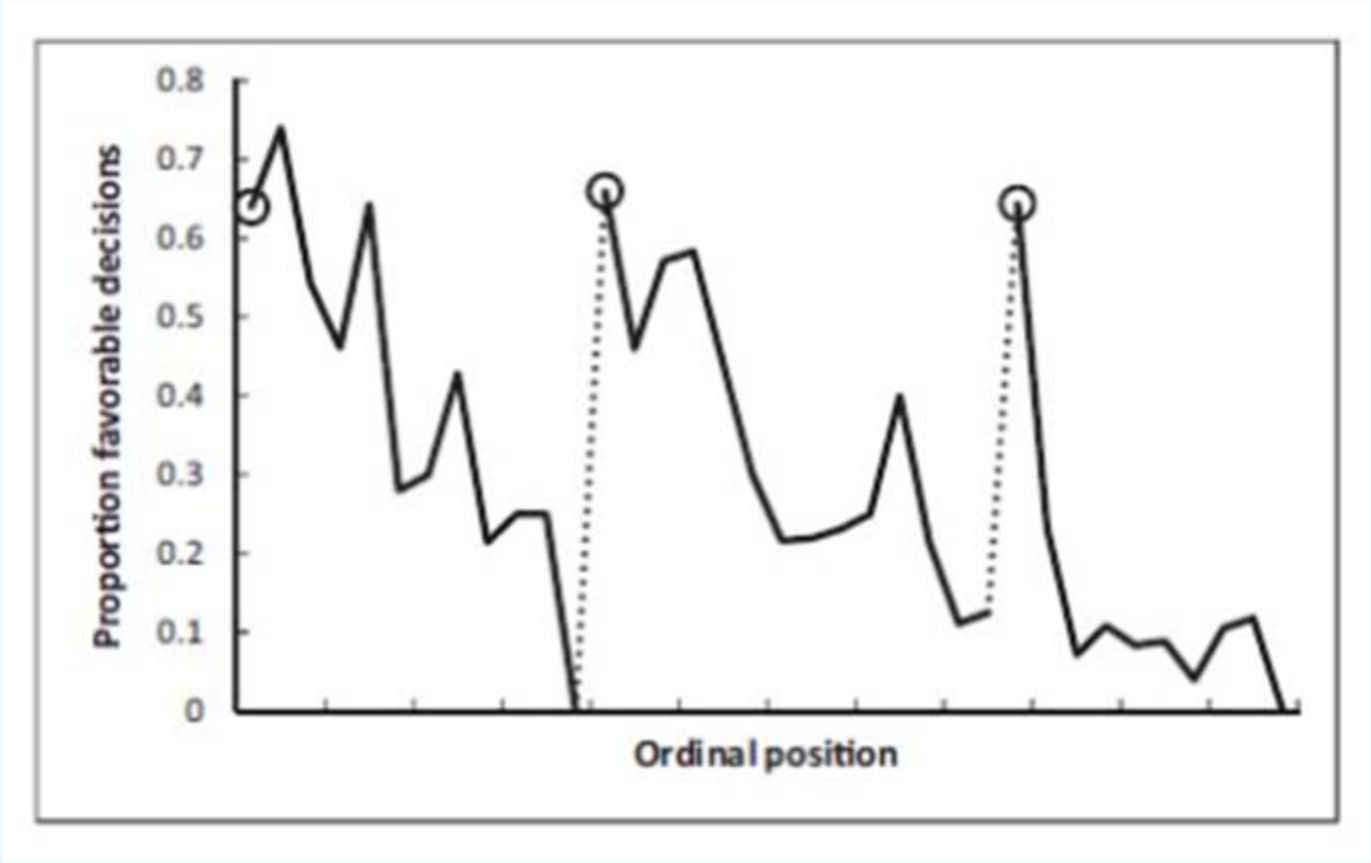
Decision Fatigue

- Heuristics are used as a shortcut to the answer
- Fostering Improvement in End of Life Decision Science at CHIBE
- ICU MD makes 11critical decision per patient per day or 1,500 in 2 week rotation
- Group decision making, EBM protocols

Decision Fatigue

- http://www.pnas.org/content/108/17/6889.abstract
- Experienced parole judges in Israel granted parole 65% of the time with first prisoner after each food and rest break
- At end of the sessions rate of parole near zero

Decision Fatigue



Framing & Patient Decisions

- Many people fail to complete advance directives
- Aggressive treatment is medicine's default decision
- Patients say they want comfort, good quality of life until death

Framing & Patient Decisions

- CHIBE Study
- Advance directive with comfort oriented goal as default option even with shorter life
- Advance directive with life-extending goal even if it meant more pain & suffering
- Directive without embedded default
- Twice as many chose comfort goal when provided with nudge to do so

Scott Halpern, MD, PhD CHIBE

- The central tension…boils down to this: as a society we wish to support people's authority to make medical decision… At the same time, we also want patients to make choices that promote their own interests. But in most cases patients can't achieve that on their own – they procrastinate, get tripped up by well documented foibles of

Scott Halpern, MD, PhD CHIBE

- human decision making. So do we let patients make decisions that divert them from their own goals, or do we intervene? Our group's standpoint is that as long as the nudges are true nudges, where a decision maker is free to choose otherwise, then we are likely to achieve a great deal more good by helping…people make decisions that are likely to be consistent with their goals."

Social Networks & Medicine

Gina Kolata, NY Times, August 5, 2007, WK 1

- NEJM study of social network of 12,067 people followed for 32 years
- Obesity can spread from friend to friend like a virus
- Networks amplify whatever effect they are propagating
- Smoking, depression, suicide

Role of HIT in PHM

- Identify and track cohorts of patients
  - By risk level
  - By adherence to care plans
  - By medication use
  - By achievement of therapeutic targets

Role of HIT in PHM

- Profiling the population
- Point of Care
- Patient engagement and managment

Role of HIT in PHM

- Profiling the population
  - Patient registries
  - Advanced population predictive analytics
  - Risk stratification

Role of HIT in PHM

- Point of care
  - EHR
  - Health information exchange
  - Referral tracking

Role of HIT in PHM

- Patient activation and management
  - Automated outreach
  - Patient portals
  - Telehealth
  - Remote patient monitoring

HIT Information (Automate & Control)

- What % of AODM had recent Hba1c test?
- How many AODM patients in zip code?
- Which physicians have best performance?
- Which patients have gaps in care?

HIT Knowledge – Intelligence (Explore & Innovate)

- Who in the population is at highest risk?
- What will diabetic care cost next year?
- What impact from outreach?
- What options provide maximal value right now for this patient?

Population Health & Hospital

- Sharing data across all points of care is only way to provide coordinated care
- Data access becomes critical for patients, families, doctors, staff
- Mobile applications become more important and essential

Target

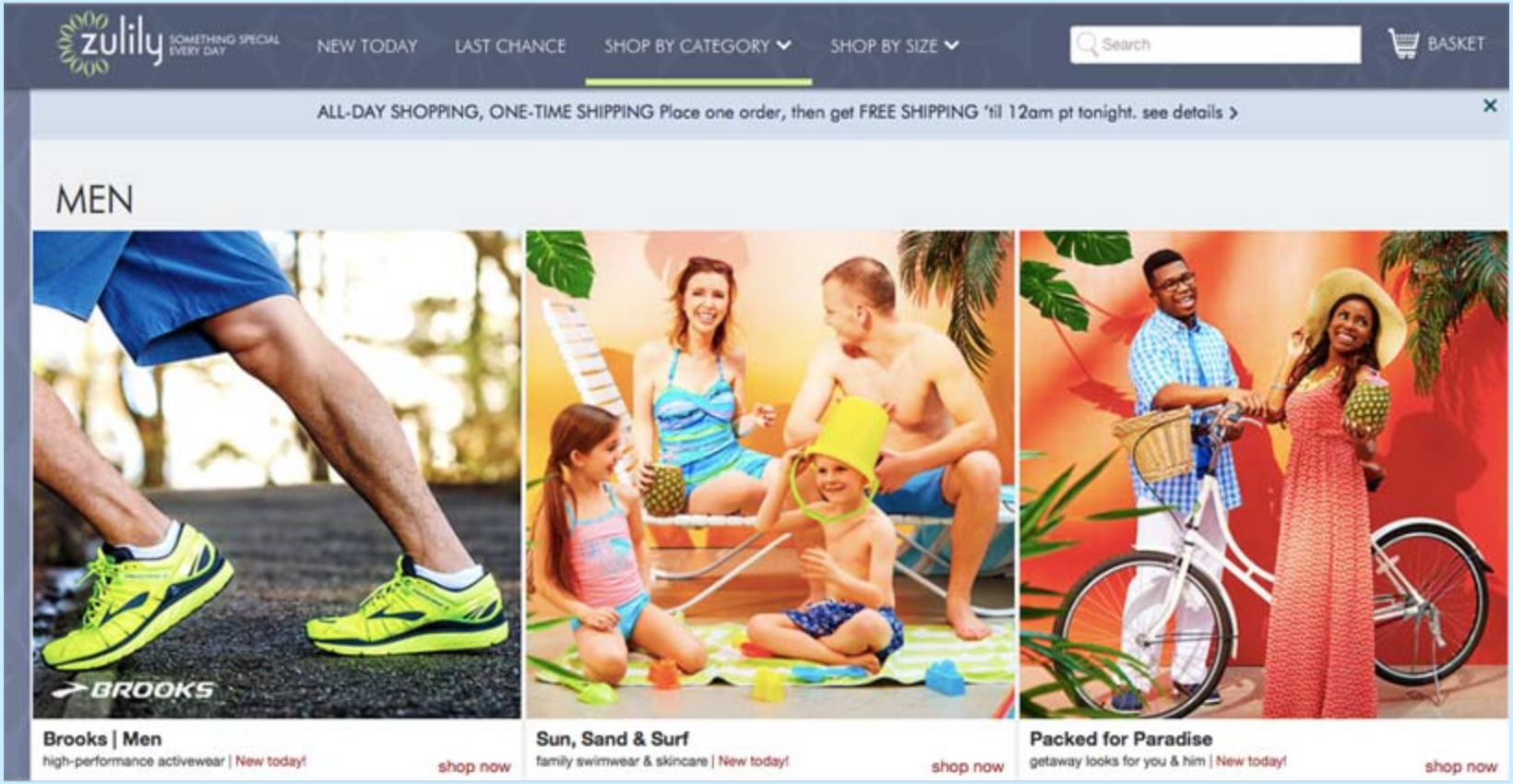

NATE SILVER ON WHAT OBAMA SHOULD DO NEXT, P. 44
DON'T MOCK THE ARTISANAL PICKLE MAKERS, P. 18
A NANNY'S VIEW OF THE WORLD, P. 47
MANAGEMENT TIPS FROM 'DOWNTON ABBEY,' P. 52
GREECE CONFRONTS ITS SPARTAN FUTURE, P. 38
The New York Times Magazine
HEY! YOU'RE HAVING A BABY!
How your shopping habits reveal even the most personal information. By Charles Duhigg

Target

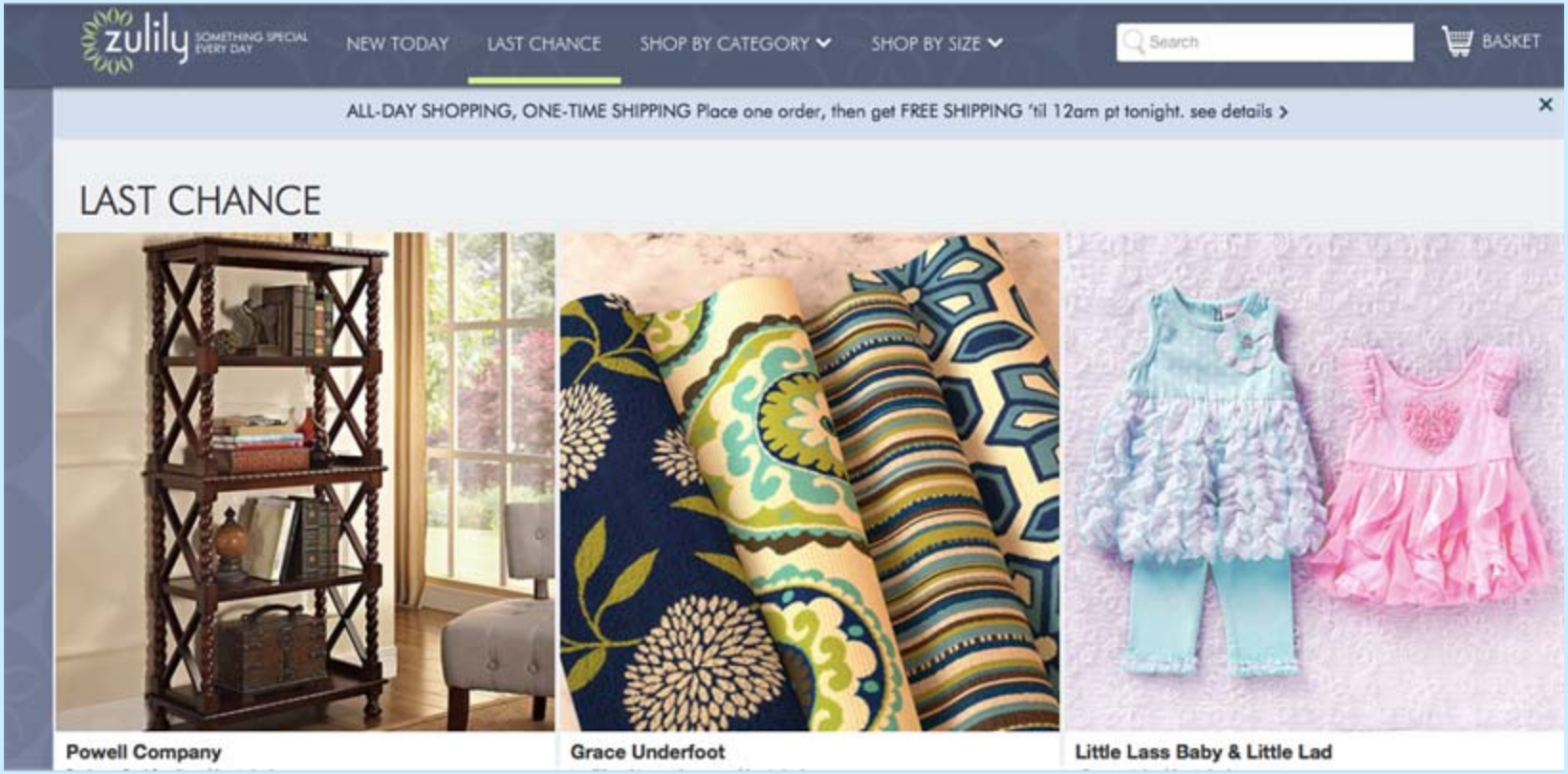
- New York Times Magazine, February 2012
- Marketing analytics
- Consumer data
- Pregnancy likelihood score
- Target identified a teen who was pregnant and sent her coupons
- Mother opened the mail….

Zulily

Kent’s Zulily



Ann’s Zulily


zulily
SOMETHING SPECIAL EVERY DAY
NEW TODAY
LAST CHANCE
SHOP BY CATEGORY
SHOP BY SIZE
Search
BASKET
ALL-DAY SHOPPING, ONE-TIME SHIPPING Place one order, then get FREE SHIPPING 'til 12am pt tonight. see details ›
LAST CHANCE
Powell Company
Grace Underfoot
Little Lass Baby & Little Lad

Zulily

- Online retailer
- Daily Deal
- Page layout optimization
- Millions of layout possibilities
- Mass personalization

When a Health Plan Knows How You Shop (Natasha Singer, New York Times, June 28, 2014)

- UPMC prediction models using patient claims, prescriptions, census records, household incomes, education levels, marital status, race, number of children, number of cars
- Acxiom, a marketing analytics company
- Mail order shoppers and Internet users are more likely to use the ER

When a Health Plan Knows How You Shop (Natasha Singer, New York Times, June 28, 2014)

- “It brings me another layer of vision, or view, that helps me figure out better prediction models and allocate our clinical resources.” Dr. Pamela Peele
- Assigns care coordinators to patients flagged as high risk

When a Health Plan Knows How You Shop (Natasha Singer, New York Times, June 28, 2014)

- Predilytics taps into socioeconomic, demographic, and consumer purchasing data for health insurers
- Patients who could not get timely appointments with PCP and who lacked cars more likely to be hospitalized
- “What we are really doing is looking at multifactorial data and systemic issues that are getting in between individuals and their ability to maintain the highest health status”
  Chris Coloian

When a Health Plan Knows How You Shop (Natasha Singer, New York Times, June 28, 2014)

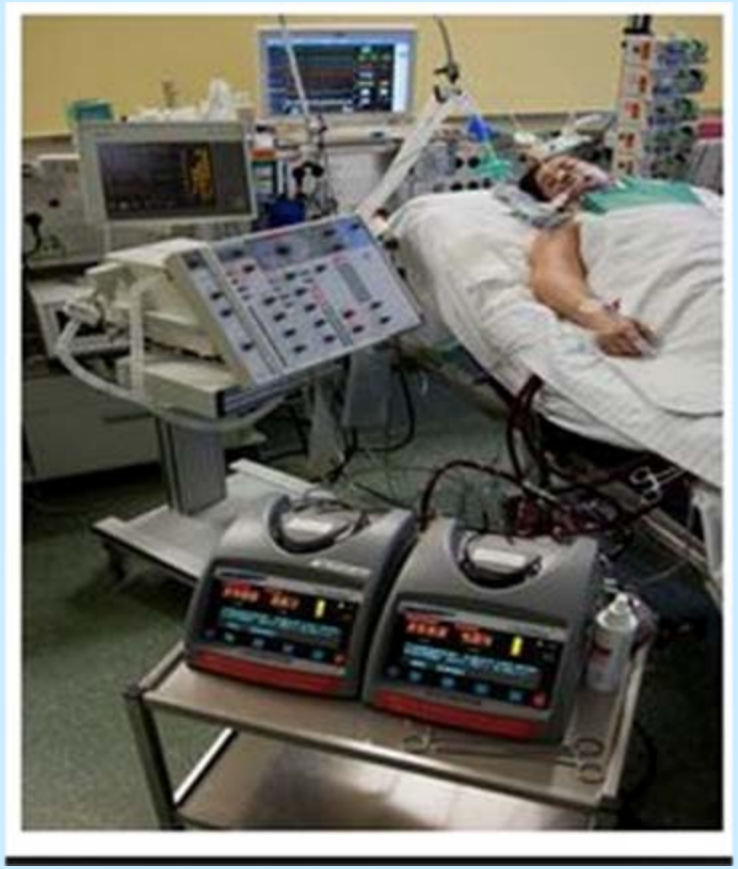
- MedSeek helps hospitals “virtually influence” behavior of patients
- Refine marketing pitches based on sex, age, race, income, risk assessment, culture, religious beliefs, family status
- Trinity Health System in Michigan used this company “to scientifically identify well insured prospects”

When a Health Plan Knows How You Shop (Natasha Singer, New York Times, June 28, 2014)

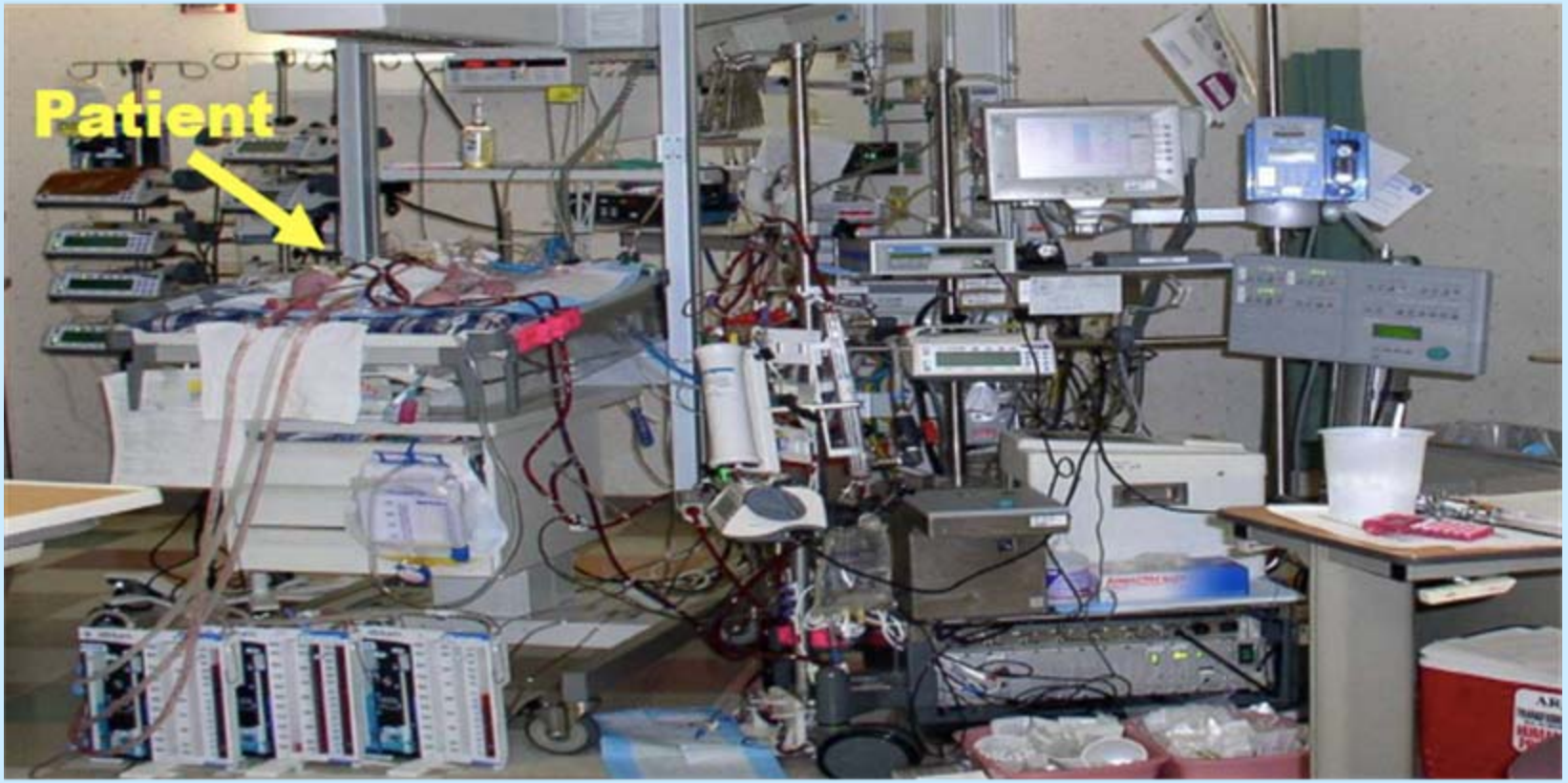
- Consumer data mining and marketing segmentation raises ethical issues
- “Is the larger mission to improve public health, or to make insurers and hospitals more profitable? I think we should be careful of running gung-ho into an area of health care analytics that may disadvantage deserving patients.” Anita Allen
- Acxiom admits details about consumers can be wrong

ICU

ICU



Health Care



Health Care Has More Data

- Massive data sets
- Streaming at faster and faster rates
- From new sources
- Dark or unanalyzed data
- Requires Big Data Predictive Analytics

Big Data Predictive Analytics

WHAT WE DO

- **Developing data system architectures tailored for analytics** – Our CTO led the development of the Knowledge Discovery Infrastructure (KDI) for the Centers for Medicaid and Medicare Services (CMS) that was subsequently used as the base architecture, with high-speed data dissemination capacity, for the next generation of the CMS Integrated Data Center being built in Maryland.
- **Significant experience in analysis of Medicare and Medicaid claims** – Our staff has experience in a wide range of analytic applications performed against the complete collection of all Medicare claims for the years 2009, 2010, and 2011. Our staff led the development of a successful 10-state pilot project to perform analytics across the subset of dual-eligible claims in a demonstration project for CMS.
- **Predictive Analytics** – We specialize in the application of statistical, machine learning and natural language processing methods to explore, develop models and discover trends from the combinations of digital data and structured and unstructured text at any scale. Our niche area of expertise is in the discovery of predictor variables and the development of rigorous, multi-variate statistical models.

WHAT WE DO - continued

- **Text Analysis and Natural Language Processing** – Recognizing that the majority of the data in social, healthcare and legal settings is captured as 'unstructured' text, PYA Analytics has developed a world-class expertise in automated information extraction, data mining, and analysis of information stored in non-relational and textual resources such as case/diagnostic notes and legal documents.
- **Geo-temporal Analytics** – Our CEO and staff have a long history of extracting valuable insights from the geo-temporal and spatial aspects of data. Related to healthcare, applications include the impacts of changing population demographics, population exposures to environmental hazards, and estimates of geographic sources of localized health issues.
- **Management Consulting in Organizational Development, Leadership, and Management of Data Analytics Teams** – Our leadership team and senior staff have extensive experience in designing, organizing and leading data analytic teams for a wide spectrum of applications. The teams led by our leadership have consisted of experts in the application domain, computer scientists, mathematicians, statisticians, and healthcare/business analytics professionals. We have translated this experience into organizational development and leadership services that are available to our clients.

PYA ANALYTICS HEALTHCARE PROJECTS

Bundled Payments

- Through calculation of the cost of an episode of care within the health provider network based on existing historical data, we enabled the client to propose to CMS a capped cost that will be 2% less than CMS currently estimates for that population with additional savings retained by the provider network.

- This work required interpretation of CMS documents from which algorithms are developed for calculating the total cost of care in accordance with CMS guidelines.

Technologies Applied: Built algorithms from published requirements and performed analysis using the algorithms and clinical data.

PYA ANALYTICS HEALTHCARE PROJECTS

Hierarchal Condition Categories (HCC)

- Used CMS established algorithms to calculate the Hierarchal Condition Categories for qualifying patients within the health provider network.

Technologies Applied: Built algorithms from published requirements and performed analysis using the algorithms and clinical data.

PYA ANALYTICS HEALTHCARE PROJECTS

Tennessee Department of Child Services

- Determined the relative quality of worker case notes collected as unstructured text to identify staff needing additional training and to improve the training programs.
- Identified cases that indicated the person of interest may be at risk for undesirable outcomes.

Technologies Applied: Performed text analysis using natural language processing technologies against a training set. Developed the predictive analytics models. Tested the models against a validation set of case notes. Implemented the models into an appliance (hardware/software platform) that would perform continual automated analysis of the thousands of case notes that are collected each week.

PYA ANALYTICS HEALTHCARE PROJECTS

Large Medical Hospital

- Determined if nurses in a hospital setting were compensated properly over a period covering several years.

Technologies Applied: Developed algorithms that captured the pay structure and guidelines embedded in the contracts between the hospital and work force. Applied those algorithms across the workforce and identified overpayments and underpayments.

PYA ANALYTICS HEALTHCARE PROJECTS

Healthcare Specialist Company

- Integrated clinical records and non-clinical records to estimate disease progression in patients with indicators of diabetes.

Technologies Applied: Carried out predictive analytics for estimating key indicators of disease progression rates based upon fusing image content extraction data, clinical records, demographic data, economic data, and geo-temporal data for patients with positive eye examination screening for diabetes.

PYA ANALYTICS HEALTHCARE PROJECTS

Centers for Medicare and Medicaid Services

- Worked with a large team across the country, carried out the implementation, operation, maintenance and refinement of the CMS system for measuring quality of healthcare procedure to support the improvement of the quality of care for beneficiaries.

Technologies Applied: Applied natural language processing techniques, web analysis technologies, and ontology knowledge to perform a wide spectrum of analysis across very disparate literature sources to obtain insight into the quality measurements that are being most accepted and tested across the U.S. healthcare community.

PYA ANALYTICS HEALTHCARE PROJECTS

Large Hospital Organization

- Established a data quality framework which served as a foundation for data quality process improvement, data quality assessment, and assurance.

Technologies Applied: Applied total quality management (TQM) practices including establishing enterprise wide data governance policies, a dynamic and comprehensive enterprise ontology, and key performance indicators for master data elements which are evaluated relative to multiple data quality dimensions which are then combined into real-time data quality scorecards for comprehensive, continuous data quality monitoring .

PYA ANALYTICS HEALTHCARE PROJECTS

Medical Research Organization

- Designed and implemented a data architecture solution tailored for application of advanced analytics and visual solution presentation in an applied research and development setting.

Technologies Applied: Designed a data architecture which supports integration of data from multiple, diverse systems such as Electronic Medical Records, laboratory analysis, genomic profiling, radiation and chemotherapy treatment delivery and patient rehabilitation .

PYA ANALYTICS HEALTHCARE PROJECTS

Rural Health

- Worked with a large university and surrounding rural health networks to advise in the planning and execution of a CMMI research grant that establishes a rural clinically integrated network to improve heart health and post-stroke survival, reduce the total cost of care associated with heart disease and stoke, and implement a payment model to incentivize rural provider collaboration.

Technologies Applied: Used data architecture methods to create a cloud based Shared Analytics Infrastructure that integrates and aggregates real-time claims and clinical data with publically available data for use in health planning, business intelligence and reporting, and advanced predictive analytics for the beneficiary population cohort.

Population Health Functions

- Medical neighborhood coordinated care that includes PCP, specialists, hospitals, rehab and long term care facilities, home health, pharmacies, labs, imaging centers
- Patient engagement strategies where providers proactively seek out patients with gaps in care
- Technology solutions to achieve the above

Population Health & Hospital

- Hospital centric care model is changing to population health management care model based on care coordination across fragmented continuum of care
- We used to only interact with patients when they presented to office or hospital
- Now we must interact with patients who do not show up for care

Community- Major Site of Health Care

Green, et al., (2001) NEJM, 344:2021-25

- 1,000 adults living 1 month
- 800 report symptoms
- 327 consider seeking care
- 217 seek care (physician) (113 primary care)
- 65 visit complementary/alternative provider
- 21 visit hospital outpatient clinic
- 14 receive home care
- 8 hospitalized (1 in AHC)

Why is it so hard to activate a community to be healthy?

- Health poorly defined.
- Communities in disarray.
- Biomedical model does not provide language sufficient to address culture.
- Biocultural model & language may be required.
- Health promotion: complex not complicated.
- Getting started in uncertain environment.
- Leadership: no one's day job, nonprofit politics.
- But, we must begin…

Mature PHM

- Organized system of care
- Care teams
- Coordination across care settings
- Access to PCP
- Patient self management
- Linked EHRs and patient registries
- Focus on behavior and lifestyle changes

Mature PHM

- PCMH and the medical neighborhood
  - Prevention
  - Shift from acute to chronic care
  - Predictive and proactive
  - Continuous, not episodic
  - Whole person oriented, not case oriented
  - Care for people when they do not present to office or hospital

Medical Neighborhood

- PCP
- Specialists
- Hospitals
- Rehab and long term care
- Home health agencies
- Pharmacies
- Labs and imaging centers

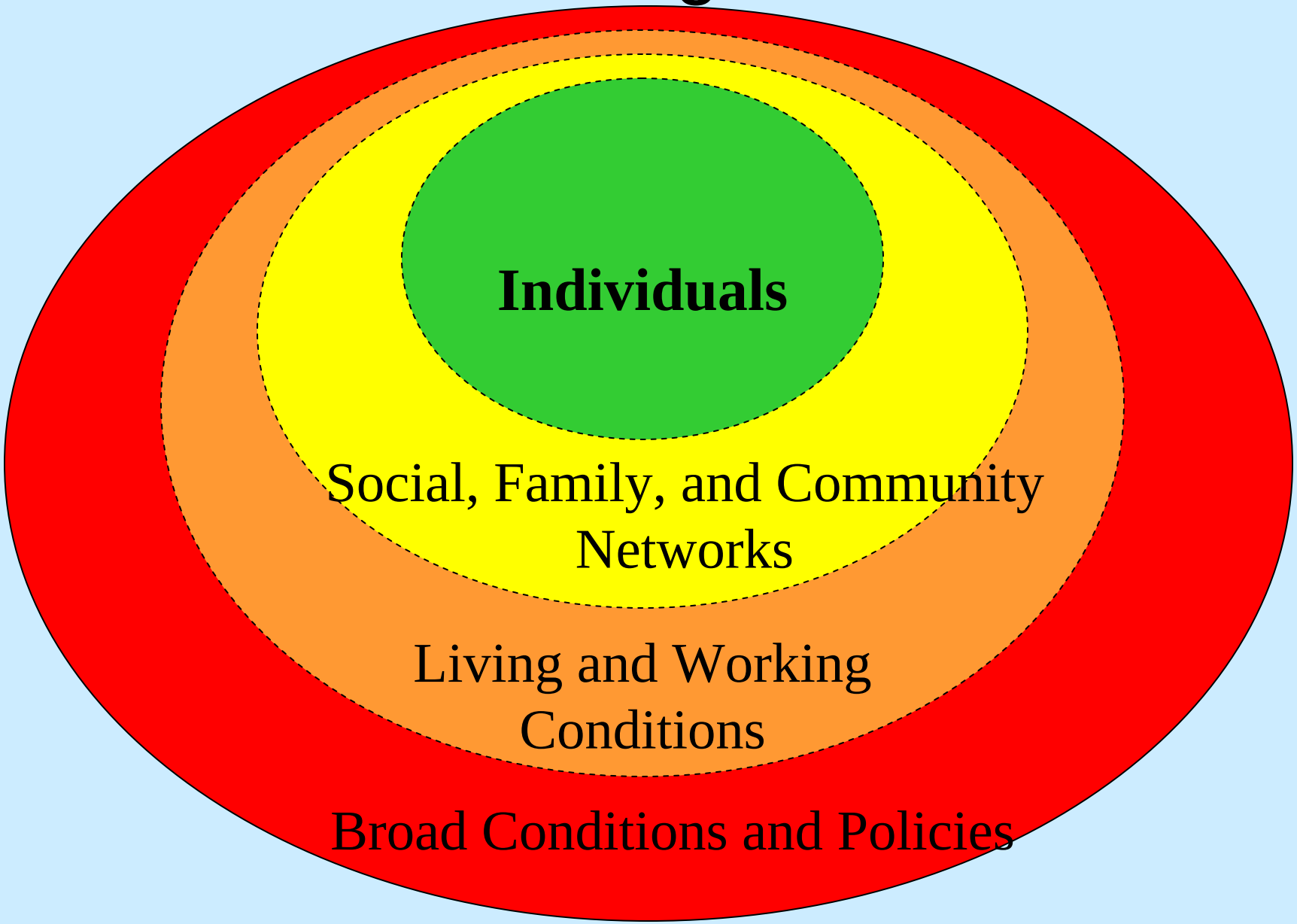
Population Health Functions

- Organized system of care
- Care teams
- Coordination of care across care settings
- Access to primary care
- Patient self management education
- Focus on health behavior and lifestyle
- EHR and patient registries
- Community Activation

Challenges to Implementing Population Health

- Mismatched physician population
- Increased Medicare population growth
- Inadequate IT infrastructure
- Lack of Predictive Analytic Data Scientists
- Lack of Population Health expertise
- Misaligned financial incentives
- Narrow definition of population health

Social-Ecological Model



References

- http://www.newyorker.com/magazine/2011/01/24/the-hot-spotters
- http://www.commonwealthfund.org/publications/newsletters/quality-matters/2013/june-july/in-focus
- http://www.pnas.org/content/108/17/6889.abstract

References

- http://www.commonwealthfund.org/publications/issue-briefs/2016/feb/evaluating-mobile-health-apps
- http://www.iorahealth.com/wp-content/uploads/2014/07/UCSF_The_Special_Care_Center_A_Joint_Venture_to_Address_Chronic_Disease.pdf

References

- http://cmr.asm.org/content/18/4/638.full
-
- http://cid.oxfordjournals.org/content/44/2/159.full
-
- http://www.iorahealth.com/wp-content/uploads/2014/07/UCSF_The_Special_Care_Center_A_Joint_Venture_to_Address_Chronic_Disease.pdf

References

- http://www.newyorker.com/magazine/2011/01/24/the-hot-spotters
-
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2836340/
-
- http://www.cdc.gov/pcd/issues/2012/11_0324.htm
-

References

- http://www.rwjf.org/en/library/articles-and-news/2011/03/evaluating-the-walking-school-bus-program-in-low-income-neighbor.html