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Javaid I Sheikh

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From disease to health: An evolving approach

• Growing burden of chronic diseases

• Ineffective healthcare systems, increasing costs, suboptimal outcomes

• Broad consensus on need for new approaches

• Shifting from a ‘disease’ model to systems biology and a focus on health

• P4 medicine gets P5 (population health)

• Your Health First: a health promotion platform for Qatar

• A proposed framework for population health in Qatar
Growing burden of chronic diseases (U.S.)

- >75% of healthcare costs in U.S. are due to chronic conditions (obesity, heart disease, stroke, cancer, diabetes, arthritis)

- Chronic diseases cause 7 in 10 deaths each year in the U.S.

- As of 2012, about half of all adults—117 million people—have one or more chronic health conditions (25% adults has 2 or more)

Source: CDC, Chronic Disease Prevention and Health Promotion: http://www.cdc.gov/chronicdisease/.
Example: Increasing rates of obesity

- Global obesity pandemic (2008):
  - 1.5 billion overweight
  - 500 million obese
  - 170 million children overweight or obese

Past and projected prevalence of overweight (BMI ≥ 25kg/m²)

Interrelated chronic diseases

Obesity identified as underlying cause in 26% of deaths

80% of obese people develop Type 2 diabetes

75% of hypertension is related to obesity

Source: Adapted from JAMA Campaign to end Obesity (USA), Lopez et al. (2007)
A comparison of health expenditures

Average spending on health per capita ($US PPP)

Total health expenditures as percent of GDP

Notes: PPP = purchasing power parity; GDP = gross domestic product.
Source: Commonwealth Fund, based on OECD Health Data 2012.
More is not better

<table>
<thead>
<tr>
<th>OVERALL RANKING (2010)</th>
<th>AUS</th>
<th>CAN</th>
<th>GER</th>
<th>NETH</th>
<th>NZ</th>
<th>UK</th>
<th>US</th>
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<tbody>
<tr>
<td>Quality Care</td>
<td>3</td>
<td>6</td>
<td>4</td>
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<td>7</td>
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<td>Effective Care</td>
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<td>7</td>
<td>5</td>
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<td>Safe Care</td>
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<td>Coordinated Care</td>
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<td>5</td>
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<td>Patient-Centered Care</td>
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<td>Cost-Related Problem</td>
<td>6.5</td>
<td>5</td>
<td>3</td>
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<td>2</td>
<td>6.5</td>
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<td>Timeliness of Care</td>
<td>6</td>
<td>3.5</td>
<td>3.5</td>
<td>2</td>
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<td>1</td>
<td>7</td>
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<td>Efficiency</td>
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<td>Equity</td>
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<td>5</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>7</td>
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<tr>
<td>Long, Healthy, Productive Lives</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>7</td>
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<tr>
<td>Health Expenditures/Capita, 2007</td>
<td>$3,357</td>
<td>$3,895</td>
<td>$3,588</td>
<td>$3,837*</td>
<td>$2,454</td>
<td>$2,992</td>
<td>$7,290</td>
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</tbody>
</table>

Economic burden of chronic diseases

• Seven chronic diseases* cost U.S. economy $1.3 trillion annually ($1.1 trillion due to lost productivity)
• Long-term impact of chronic disease on economic growth—the consequence of less investment in human and physical capital—is likely to be of even greater magnitude than the impact of treatment costs and lost labor supply (U.S. economic output could be reduced by much as $5.7 trillion in real GDP by the year 2050)

* Cancer, diabetes, hypertension, stroke, heart disease, pulmonary conditions and mental illness.

How did we get here...
...and what to do?
Philosophic underpinnings of modern medicine

• 16-18th centuries: scientific revolution and enlightenment
  – Copernicus, Galileo, Descartes, Bacon, Vesalius, Harvey
  – 19th century: origin of hospital medicine, germ theory of disease (Pasteur, Lister, others) leading to expansion of science-based medicine
  – 20th century ushered in the era of ‘magic bullets’ with discovery of penicillin and advent of antibiotics

• Current paradigm based on scientific positivism:
  – Reductionist (understand systems by reducing to them to their component parts)
  – Linear thinking (cause and effect)
  – Objectivity (neutral and value free observations)
  – Cumulative (incrementally build body of knowledge)
Limits of reductionism in medical science

• There are fundamental benefits of scientific positivism approach: progress has been made
• But may be suboptimal method for understanding complex adaptive systems

<table>
<thead>
<tr>
<th>Modern science/medicine</th>
<th>Post-modern science/medicine</th>
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<tbody>
<tr>
<td>• Reductionist</td>
<td>• Connectedness of components (networks)</td>
</tr>
<tr>
<td>• Linear thinking</td>
<td>• Natural world is non-linear (small changes can have major effects, and vice versa)</td>
</tr>
<tr>
<td>• Objectivity</td>
<td>• Context matters (cultural, social, economic factors)</td>
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A New Biology for the 21st century

Strategy for dealing with biological complexity: New Biology, which is an integrated and interdisciplinary approach to biology

“Biology is at a point of inflection. Years of research have generated detailed information about the components of the complex systems that characterize life—genes, cells, organisms, ecosystems—and this knowledge has begun to fuse into greater understanding of how all those components work together as systems.”

Systems approach

- **Systems biology** seeks to understand complex biological systems in their entirety by integrating all levels of functional information into a cohesive model (“[It] is about putting together rather than taking apart, integration rather than reduction [...]”)

- **Systems medicine** looks at the dynamic systems of the human body as part of an integrated whole, incorporating biochemical, physiological, and environment interactions

Medicine with new dimensions-P4 medicine

Convergence of systems medicine, patient-activated social networks, and the digital revolution has led to a P4 medicine that is predictive, preventive, personalized, and participatory.

Source: Adapted from P4 Medicine Institute: http://p4mi.org/p4medicine
P4 medicine

- **Predictive**: detect many diseases at the earliest detectable phase
- **Preventive**: preserve individual’s wellness
- **Personalized**: stratify disease to enable targeted therapies*
- **Participatory**: patient-driven networks as drivers of this process

**Key characteristics**

- Pro-active, systems-driven, cross-disciplinary, integrative
- Quantifies wellness and demystifies disease in measurable ways
- Envisions enormous data dimensionality from multiple sources to simpler testable hypotheses
- Focus is on the individual

* Precision medicine

Missing ingredient

• We are moving in the right direction: starting to deal with complexity
• However, focus is still on individuals
• Also, healthcare only targets disease, once symptoms become apparent, instead of promoting wellness
• A key component is needed to promote health and wellness broadly; i.e., a population-based approach
The 5th P: population health

“Population health is defined as the health outcomes of a group of individuals, including the distribution of such outcomes within the group”

Dimensions of population health

Focuses on interrelated conditions and factors that influence health of the population over the life course.

Identifies variations in the occurrences.

Applies the resulting knowledge to develop and implement policies and actions to improve the health and well-being of those populations.

OUTCOMES

<table>
<thead>
<tr>
<th>Mean</th>
<th>Disparity</th>
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<tbody>
<tr>
<td>Mortality</td>
<td>Race/Ethnicity</td>
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<tr>
<td></td>
<td>SES</td>
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<td></td>
<td>Geography</td>
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<tr>
<td>Fitness</td>
<td>Gender</td>
</tr>
</tbody>
</table>

Health Related Quality of Life

| Race/Ethnicity |
| SES |
| Geography |
| Gender |

DETERMINANTS/FACTORS

- Health Care
- Individual Behavior
- Social Environment
- Physical Environment
- Genetics

POLICIES and PROGRAMS
Integrating the 5th P into the P4 framework

- Potential of P4 medicine can best be realized through a partnership between medicine and population health

<table>
<thead>
<tr>
<th>P4</th>
<th>Integration of 5th P into 4 Ps</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive</td>
<td>Ecologic model of health</td>
<td>Environmental factors, lifestyle; requires complex population-based, longitudinal epidemiologic studies</td>
</tr>
<tr>
<td>Preventive</td>
<td>Population screening</td>
<td>Apply evidence-based screening using new biomarkers</td>
</tr>
<tr>
<td>Personalized</td>
<td>Evidence-based medicine</td>
<td>Apply comparative effectiveness research</td>
</tr>
<tr>
<td>Participatory</td>
<td>Essential role population health</td>
<td>Participation and education of patients, physicians, and the entire healthcare community</td>
</tr>
</tbody>
</table>
Population health adoption

- American Society of Hypertension (ASH) recently changed its mission statement to include focus on population health:

  “Many health care organizations [...] are recognizing that to deliver value-based care and prosper, they must focus on managing the health of their population”

  R. Phillips, MD, PhD
  ASH Board member
  CMO Houston Methodist Hospital
  (Weill Cornell affiliate)
An example of a ‘Life Style Medicine’ study
Lifestyle changes more effective than drugs

Diabetes Prevention Program (DPP) – Diabetes % risk reduction

3 years later

Diet + exercise: 58%

Metformin: 31%

10 years later

Diet + exercise: 34%

Metformin: 18%

Sources:
“Knowing is not enough; we must apply. Willing is not enough; we must do.”

Johann Wolfgang von Goethe
WCMC-Q’s contributions in population health

- Road traffic injuries
- Human Development Index
- Risk factors associated with pre-diabetes in school children
- Smoking and its effect on progression of diabetes
- Obesity – epidemiology and genomics
- Assessment of risk factors for diabetes and CVD
- Disease burden of HCV in the MENA region including Qatar
- Sahtak Awalan (Your Health First)
Globalization and rising obesity in Qatar

- Qatar – WHO Steps Survey 2012 reports percentage of Overweight and obese adults as 70.1 and 41.4% respectively
- Another survey suggests that 73% of Qatari men and 69% of Qatari women are projected to be overweight by 2015, with approximately half considered obese
- Published Diabetes rates approximate 17% in adults

- **Possible Contributing Factors**
  - Rapidly rising SES and a rise of consumerism
  - Trade liberalization and easy access to varied high caloric products from all over the world
  - Changes in dietary patterns (hyper palatable fast food, refined grains, sugar drinks, others)
  - Decreased physical activity
  - Positive energy balance
### Global Drivers of Obesity Pandemic

<table>
<thead>
<tr>
<th>Environments</th>
<th>Behaviours</th>
<th>Physiology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systemic drivers</strong></td>
<td>Environmental drivers</td>
<td>Behaviour patterns</td>
</tr>
<tr>
<td>Policy and economic systems enable and promote high growth and consumption</td>
<td>Food supply and marketing environments promote high energy intake</td>
<td>Sociocultural, socioeconomic, recreation, and transport environments which amplify or attenuate the drivers</td>
</tr>
</tbody>
</table>

**Policy interventions**

**Health promotion programmes, social marketing, etc**

**Population effect and political difficulty**

In summer 2012, His Excellency Abdullah bin Khalid Al Qahtani, inaugurated YHF, a mass campaign to cultivate healthy behaviors
- Educate people on healthy trends and lifestyles
- Encourage people to adopt a healthier lifestyle

Target populations
- Qatari nationals and residents, males and females
- Special focus on children and youth
YHF Objectives

Phase I
• To create broad awareness about health issues that have arisen due to rapid urbanization
• To provide health and medical information in layman’s terminology, which is easy for the general public to understand

Phase II
• To educate, motivate, and facilitate healthier lifestyles

Phase III
• To provide an interactive platform for policy makers, healthcare professionals, and academics to target specific segments of the population for rigorously designed health promotion initiatives
• To cultivate life long healthy behaviors in younger people to achieve a healthy Qatari society in line with leadership’s Qatar National Vision 2030
Creating effective messages for YHF

General principles and success factor

• Complexity of the healthcare issues

• Characteristics of the message
  – Clarity
  – Relevance
  – Focus

• Characteristics of the message recipient
  – Attitudes
  – Health literacy
  – Familiarity with new media
“Eat food. Not too much. Mostly plants.”

Michael Pollan, 2009
Time to get moving!
YHF Objectives

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YHF Phase II: Three-pillared campaign

Motivate: On adopting a healthier lifestyle via small steps that have large impact

Educate: On healthy food choices and the importance of exercising

Facilitate: The process of leading a healthier lifestyle
YHF fitness & nutrition

Fitness
• **The Challenge**: to be able to participate in annual fitness competition between middle schools, children compete throughout the year and make posters about healthy living

Nutrition
• **The Greenhouse Project**: elementary school-based initiative to teach children about the benefits of growing and eating healthy foods
• **Your Healthy School Canteen**: rebranding of QF school cafeterias, which will be emulated in schools across Qatar
YHF results after 2 years (2014:Q2)

- **76%** of those aware of the campaign thought that it was effective
- **22%** actively participated in one or more of the YHF initiatives
- **73%** of those participating in initiatives thought they were effective
- **83%** agreed that “small changes” in lifestyle habits would “greatly improve health and wellbeing”
- **58%** were encouraged to lead a healthier lifestyle or at least consider it; another **32%** were reinforced in their healthy lifestyle choices

Source: Online survey and face-to-face interviews in 2014:Q2 (n=324)
# Sources of awareness for YHF

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Online</td>
<td>40%</td>
</tr>
<tr>
<td>Supreme Council of Health</td>
<td>23%</td>
</tr>
<tr>
<td>Television</td>
<td>21%</td>
</tr>
<tr>
<td>Schools</td>
<td>18%</td>
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<tr>
<td>Flyers/leaflets</td>
<td>18%</td>
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<tr>
<td>Cinema</td>
<td>18%</td>
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<tr>
<td>City Center Mall</td>
<td>13%</td>
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<tr>
<td>Outdoor Billboards</td>
<td>11%</td>
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<tr>
<td>On buses</td>
<td>11%</td>
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<tr>
<td>Radio</td>
<td>10%</td>
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<tr>
<td>Landmark</td>
<td>10%</td>
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<tr>
<td>Villaggio Mall</td>
<td>10%</td>
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<tr>
<td>Hyat Plaza</td>
<td>9%</td>
</tr>
</tbody>
</table>

Source: Online survey and face-to-face interviews in 2014:Q2 (n=117)
YHF the Greenhouse Project

Attitudes & behaviors of participating children

- Noticed big change: 55%
- Noticed small change: 25%
- Too early: 20%

Specific changes in attitude of participating children:

- Eating habits: 54%
- Importance of planting: 21%
- Interest in science: 13%
- Responsibility: 6%
- General health awareness: 6%

Source: Online survey in 2014 of participating teachers and supervisors.
YHF the Greenhouse Project

- Received a score of 8.2/10 on encouraging children to consume more vegetables and fruits; children actually started bringing healthier lunch boxes to school

Source: Online survey in 2014 of participating teachers and supervisors.
YHF Objectives

Phase I
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Developing a framework for population health utilizing global and local data
Challenges

• How do we evaluate and promote health and wellness in a rigorous fashion at the population level?
• How do we develop measures of quality and positive outcomes for population health, and how do we collect and use these?
• How can effective cross-sector partnerships be formed and implemented to help accomplish the task?
• How do we obtain the necessary resources for population health initiatives?
County Health Rankings & Roadmaps program

- Collaboration between RWJF and U of Wisconsin Population Health Inst.
  - Measure annually vital health factors
  - Provide tools and guidance to understand data, develop strategies to promote health

County Health Rankings & Roadmaps program

- Model of population health that emphasizes the many factors that, if improved, can help make communities healthier

Quality measures for population health

Institute of Medicine Committee on Quality Measures for the Healthy People Leading Health Indicators (2013):

- **Finding**: Multi-sectorial health system currently uses a vast and complex array of measures of quality in an uncoordinated way

- **Recommendation**: Partners in population health (public health agencies, healthcare organizations, communities) should adopt a portfolio of quality measures:
  - Follow set of criteria for selecting and prioritizing measures
  - Centrally developed and managed; endorsed by external experts
  - To be used for assessment, improvement, and accountability of the multi-sectorial health system

## Practicing P5 medicine in Qatar

<table>
<thead>
<tr>
<th>Discovery &amp; basic research</th>
<th>Translational research</th>
<th>Clinical research &amp; trials</th>
<th>Adoption / commercialization</th>
<th>Population health</th>
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<td>QBRI</td>
<td>HMC</td>
<td>SCH</td>
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<td>QU</td>
<td>Sidra MRC</td>
<td>QSTP</td>
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<td>WCMC-Q</td>
<td>PHCC</td>
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Integrating research into population health—contd

• Focus on translational & clinical research:
  – Phase 4 clinical trials, health services research, clinical outcomes research
  – Population-level outcome studies, social determinants of health
• Foster community partnerships in initiatives linked to local needs
• Build interdisciplinary team science
• Customize and define metrics of population health
• Encourage broad participation by faculty in devising rigorously designed, targeted, population health studies
Proposed framework for population health in Qatar

- Define PH quality measures for Qatar (IOM)
- Develop infrastructure to collect QM data
- Create interactive platform for P5 medicine
- Qatar healthcare sector
- Qatar biomedical research
- Qatar population health initiatives

Develop cross-sector partnerships in Qatar, with strong support from highest level of organizations
Conclusions

From an individual’s disease to population health

• A palpable shift is under way from a disease model to a health focus

• P4 medicine (Predictive, Preventive, Personalized, Participatory) needs to integrate population health (P5) for a transformative model of health and wellness of large groups of people

• A population health platform (YHF) led by SCH/WCMC-Q, with broad participation of healthcare stakeholders and multi-sectorial involvement, is a must for long-term well-being of Qatari population

• Qatar has the vision, ambition, and resources to make such a transformative model successful
“It does not require a majority to prevail, but rather an irate, tireless minority keen to set brush fires in people’s minds.”

Samuel Adams
Founding Father of the United States