



Team-Based Approach to Diabetes Research in Arab Americans

Linda A. Jaber, PharmD
Professor
Wayne State University

Presenter Disclosure

Linda A. Jaber

Disclosed no conflict of interest

Objectives

- Distinguish between team science and the science of team science.
- Articulate the rationale and relevance of team science in advancing knowledge.
- Illustrate examples of team science in diabetes studies in Arab Americans.

TEAM SCIENCE

The Science of
Team Science



Organize

Communicate

Conduct Research

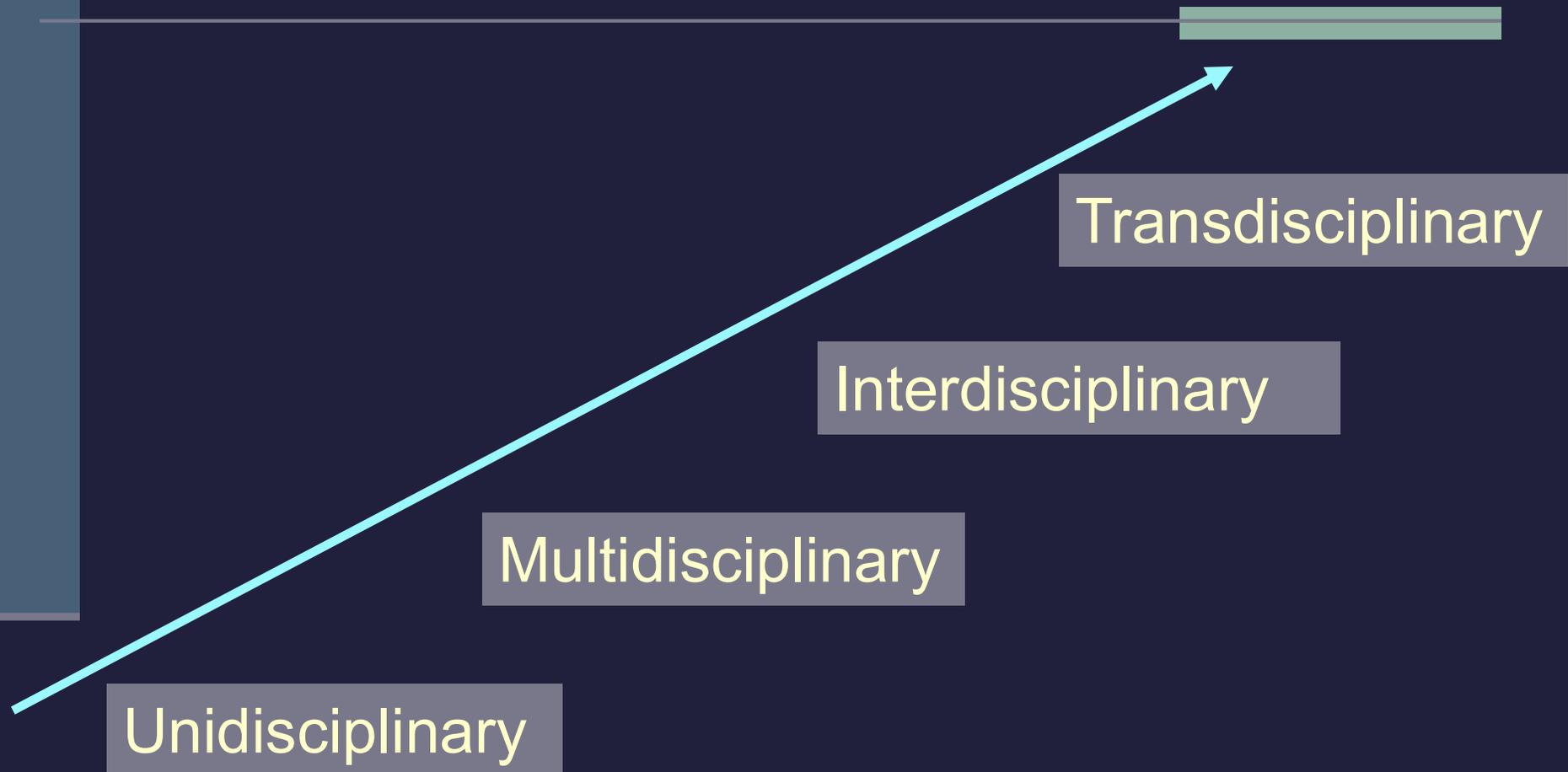


Definitions

- Team science represents the collaboration of scientists from either the same or different and distinct disciplines.
- The science of team science (SciTS) is an emerging field of research aimed at understanding the processes by which scientific teams organize, communicate, and conduct research.

Team Science

A Hierarchy of Collaboration



Stokols D, et al. Am J Prev Med 2008;35(2S)
Klein JT. Am J Prev Med 2008;35(2S)

Team Science: Uni-disciplinary

- Research involves collaborations among investigators in the same discipline.
- Uni-disciplinary research uses theories and methods drawn from a single field.
- Intra-disciplinary is another term for uni-disciplinary research.

Team Science: Multi-disciplinary

- Research that represents collaborations among investigators from two or more distinct disciplines.
- Multi-disciplinary research involves researchers sharing their own disciplinary insights and perspectives with colleagues who are trained and work in fields different from their own.
- Note that researchers from different fields work independently or sequentially and come together periodically to share perspectives BUT they remain anchored in their respective fields.

Team Science: Inter-disciplinary

- Research involves collaborations among investigators from two or more distinct disciplines.
- Inter-disciplinary research is based upon a conceptual model that integrates theoretical frameworks from different disciplines, uses study design and methodology that is not limited to any one field, and requires the use of perspectives and skills of the involved disciplines throughout multiple phases of the research process.
- Note that researchers work jointly BUT they remain anchored in their respective fields.

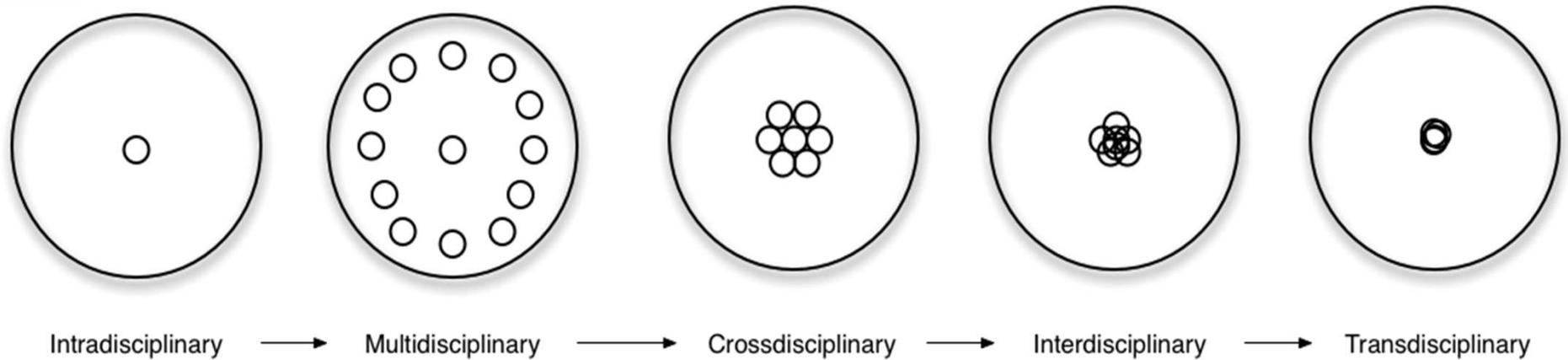
Team Science: Transdisciplinary

- Research involves collaborations among investigators from two or more distinct scientific disciplines.
- Transdisciplinary research is conducted by investigators from different disciplines working jointly over extended periods of time to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem.

Team Science- Level of Integration

- **Interdisciplinary collaborations** involve a higher level of integration among the different disciplinary perspectives of team members than is evident in multidisciplinary collaborations.
- **Transdisciplinary collaborations**, like interdisciplinary collaborations, strive toward the integration of two or more disciplinary perspectives, but are uniquely characterized by the creation of novel conceptualizations and methodologic approaches that transcend or move beyond the individual disciplines represented among team members.

Continuum of Team Science



Which of these configurations is most productive in generating novel, high-quality, and high-impact research?

Team Science- Example

Unidisciplinarity	Pharmacologists collaborate to study relationships: Nicotine consumption and insulin metabolism.
Multidisciplinarity	Pharmacologist, psychologist, neuroscientist contribute research from their fields to study links- nicotine consumption, brain chemistry, caloric intake, and PA levels.
Interdisciplinarity	Pharmacologist, psychologist, neuroscientist collaborate to study links- nicotine consumption, brain chemistry, caloric intake, and PA levels. They design the research by incorporating concepts and methods drawn from their respective fields.
Transdisciplinarity	Pharmacologist, psychologist, neuroscientist collaborate to study links- nicotine consumption, brain chemistry, caloric intake, and PA levels. They develop a neurobehavioral model of these links that extend beyond the concepts and methods of their respective fields.

Team Science- Rationale

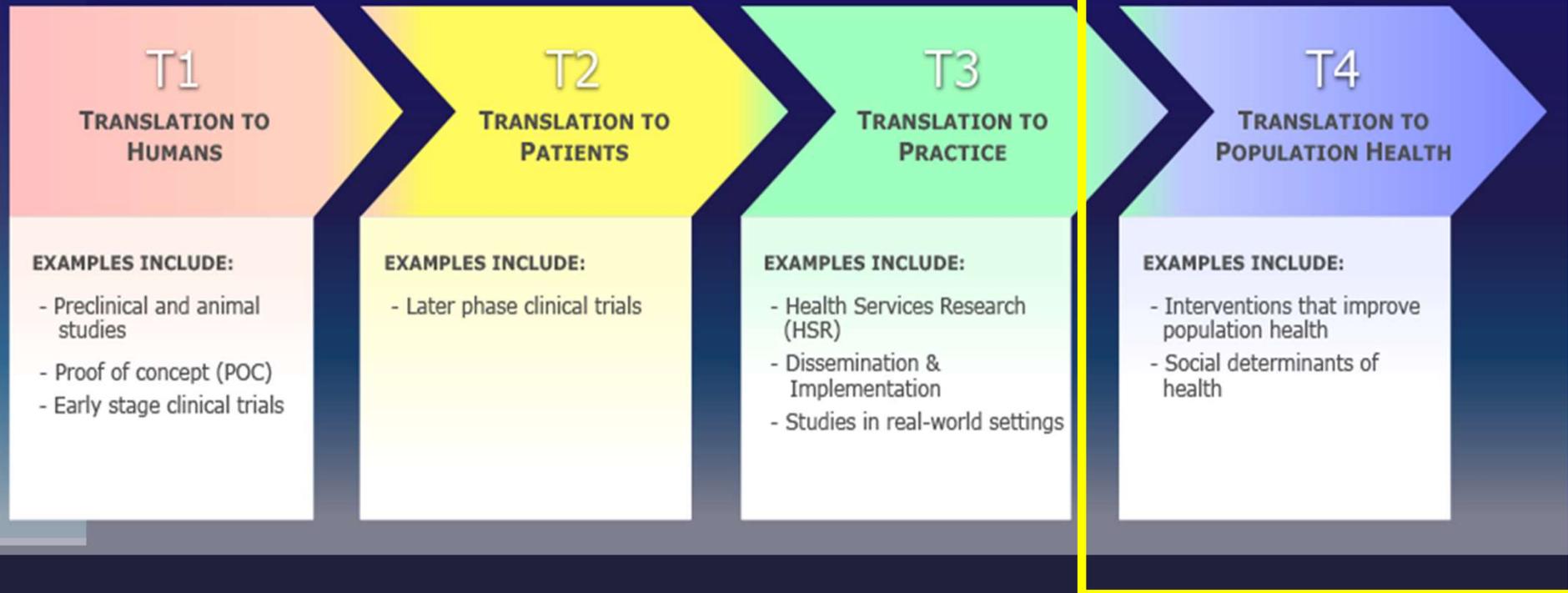
- Emergence of social, environmental, and public health problems of enormous complexity and of multifactorial etiologies (global warming, population growth and aging cancer, CVD, diabetes, AIDS, health disparities, etc.). Addressing these complex problems requires integrative, transdisciplinary approaches.
- Rapid growth of specialized knowledge in multiple fields creating a need for partnerships among scientists.
- Increasing advances in technologies requiring a new interdisciplinary approach to successful application.

Team Science- Rationale

- Deep strengths in single disciplines are insufficient to address basic research questions.
- NIH report in 2018: on “The Increasing Dominance of Team in Production of Knowledge” and that scientific collaboration is truly beneficial to moving science forward.
- There had been an increased public and private investments in team science initiatives.
- It's no longer sufficient to simply discover things. Funding agencies, especially NIH want to know how the work will improve population health and lives. Close interface of bench and bedside is required.

Phases of Translational Research

Clinical and Translational T Phases



The implications of this changing 21st century research paradigm for universities are transformational - business as usual will result in the decline of the university's research enterprise.

Team Science- Example

- The documentation of the more than 3 billion base pairs comprising the human genome could not have been completed without the computer-assisted collaborations of tens of thousands of scientists around the globe.

- Spring BJ, Moller A, Falk-Krzesinski HJ. JAMA 2011;306:1925-6.

The Science of Team Science

- The science of team science is an emerging area of research aimed at understanding the processes by which scientific teams organize, communicate, and conduct research.
- The field focuses on better understanding the conditions that facilitate or hinder collaborative research efforts, and on evaluating and enhancing the outcomes of collaborative research, training and translational initiatives.

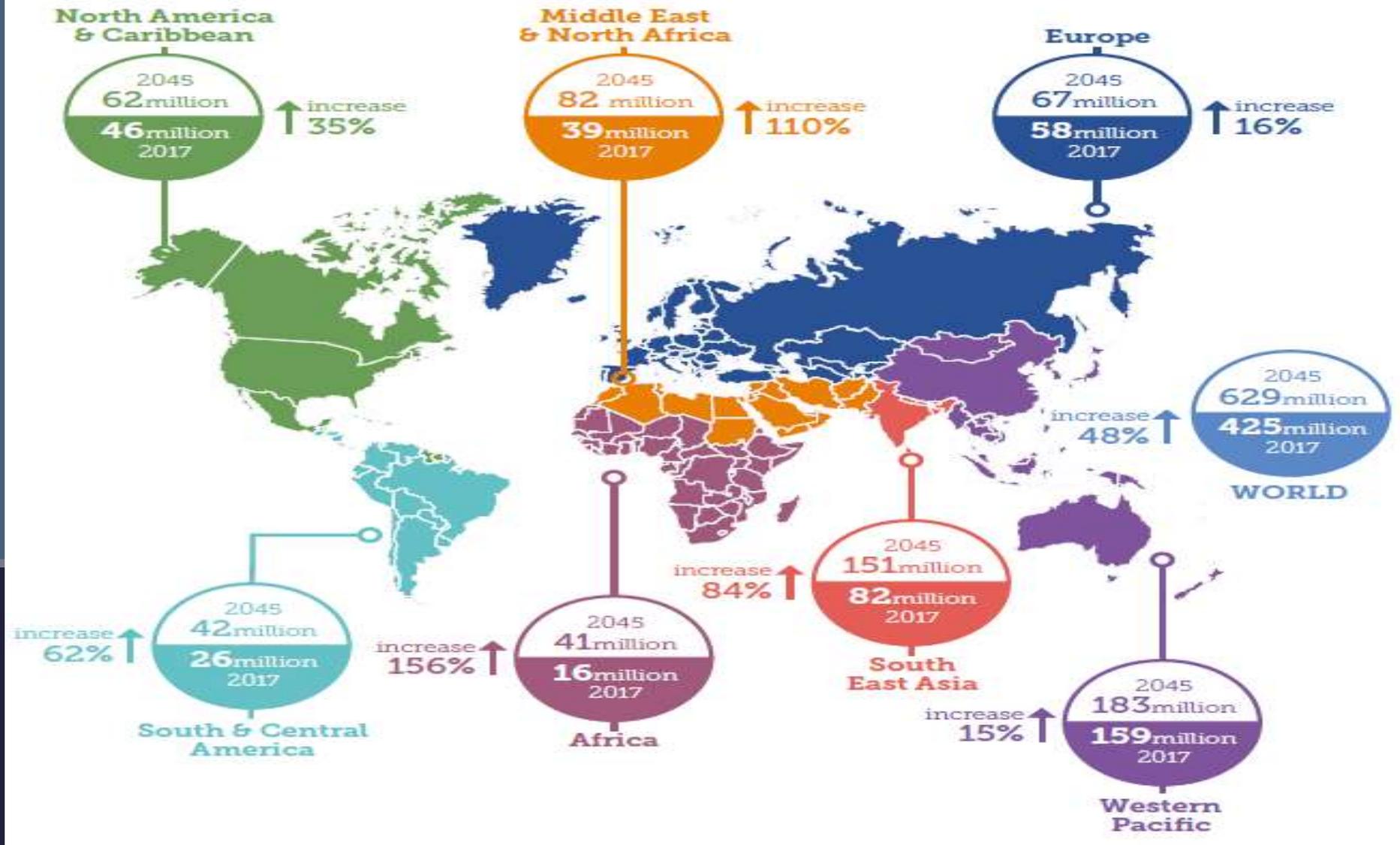
The Science of Team Science

- Major fields of inquiry in SciTS are: models for the study of team science, the structure and organization of team science, team characteristics and dynamics, design and outcomes of training programs to support team science, translation of team science findings to practice and policy, and scientific and societal outcomes of team science such as discoveries and innovations, knowledge dissemination, and public health impacts.
- TeamScience.net is an online learning tool to foster learning and enhance skills needed to perform team-based biomedical research.

Diabetes....

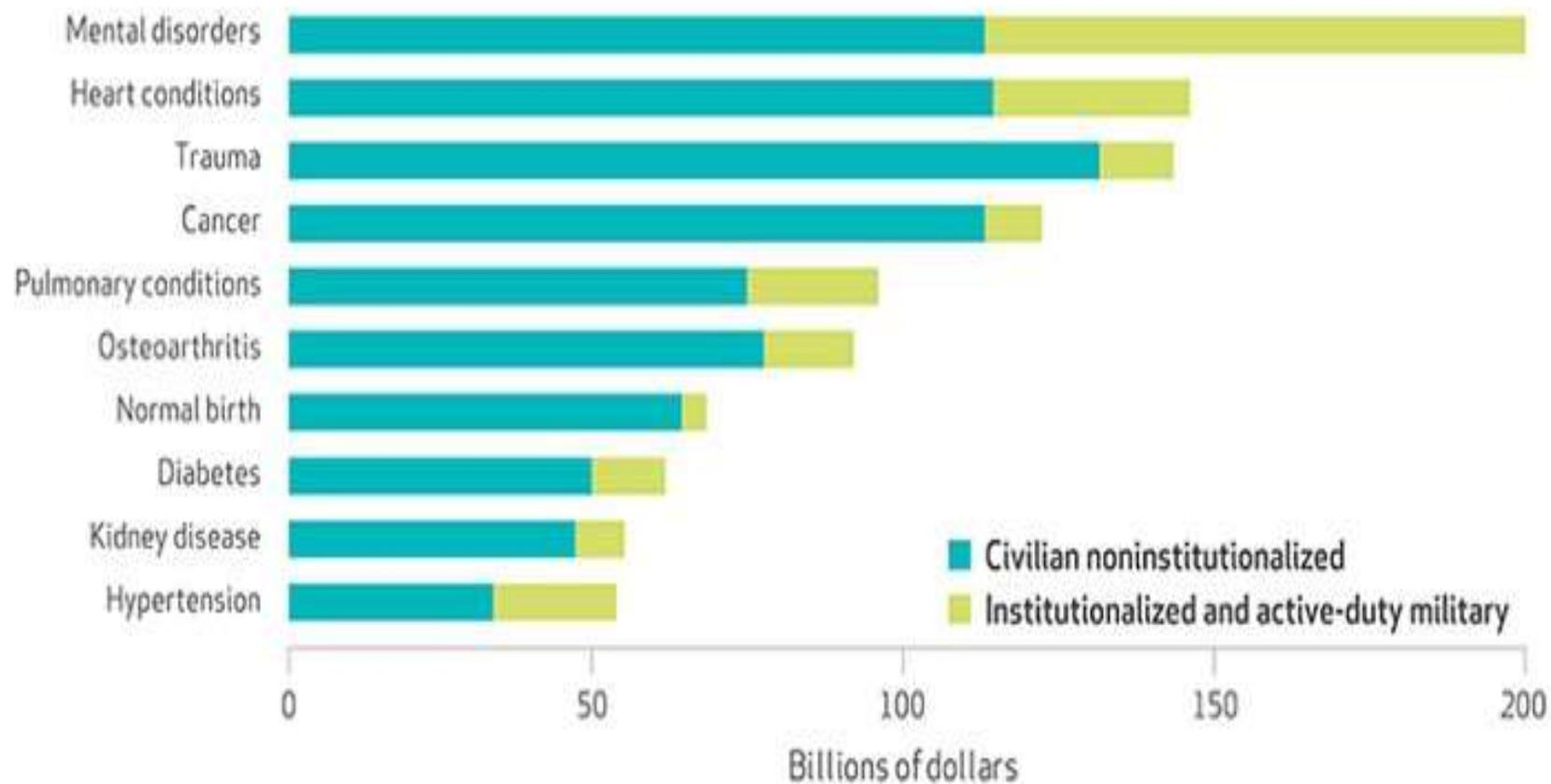
- Diabetes is the ideal framework for team science.

Diabetes: A global emergency



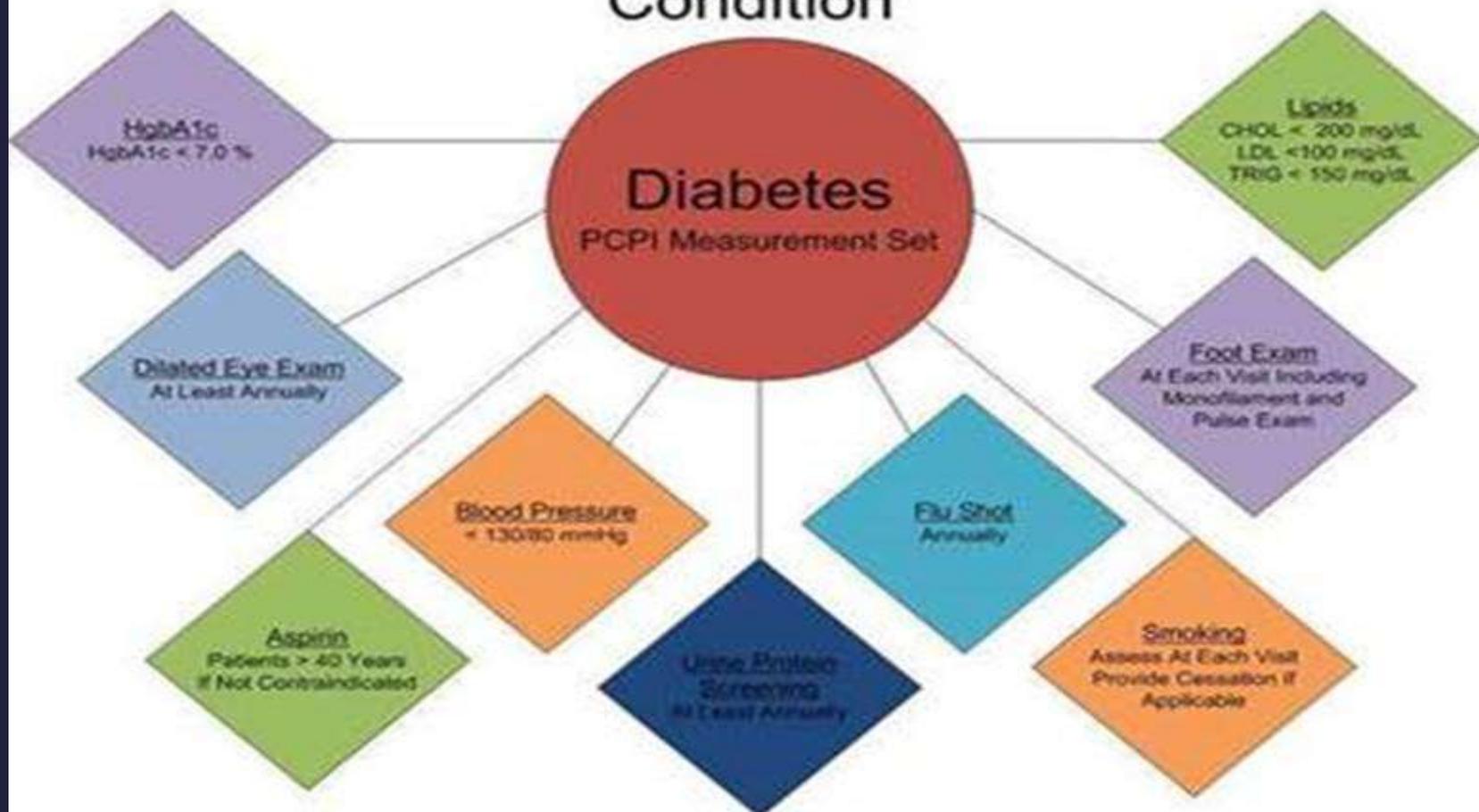
Ten Health Conditions with the Highest Spending

Ten medical conditions with the highest estimated spending in 2013

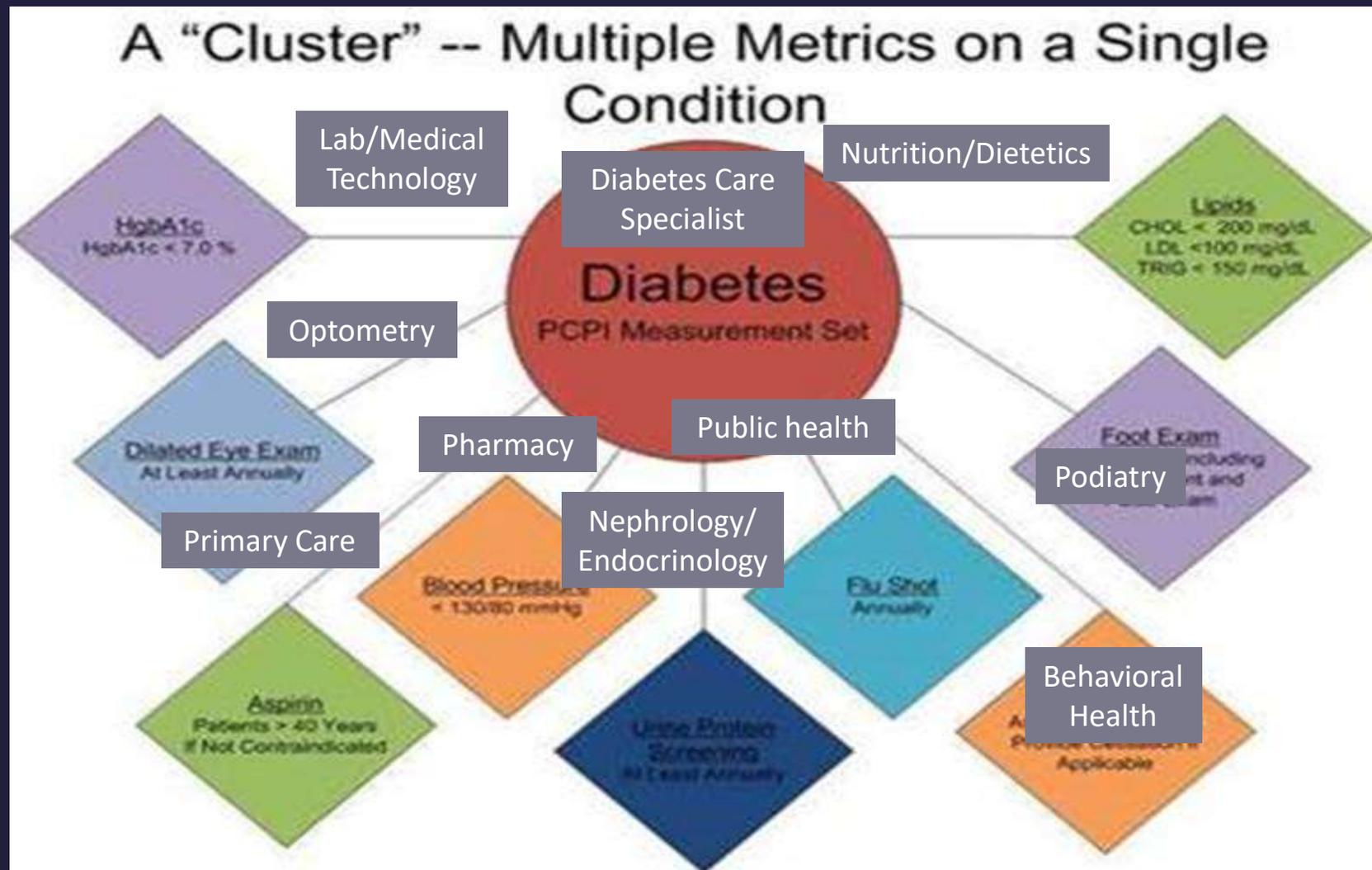


Diabetes is a Complex Condition

A "Cluster" -- Multiple Metrics on a Single Condition



Diabetes and Team Science





Illustrations from my research program in diabetes

Research program-

An illustration of unidisciplinary research

- Part of my research program focused on:
 - Determining response differences to chronic hypoglycemic agents in patients with type 2 diabetes.
 - The effects of chronic dosing, age, and obesity on the PK and PD of hypoglycemic agents.
 - The effects of SGLT2 and GLP-1 agonists on energy intake and appetite ratings.

Research Program- Arab Americans

Illustration of team science research

1

- Epidemiology of Diabetes and pre-diabetes
- Epidemiology of the metabolic syndrome
- Risk factors for these disorders

2

- Characterization of the metabolic defects underlying the progression to diabetes
- Association between Vitamin D and Insulin resistance and diabetes
- Racial differences in sensitivity and specificity of A1C in identifying diabetes and pre-diabetes

3

- Barriers and facilitators to adopting diabetes prevention activities
- Feasibility of culturally-specific lifestyle modification model in diabetes prevention
- Factors predicting response to diabetes prevention intervention

4

- The diagnostic utility/performance of A1C
- UKPDS cost savings model in relation to A1C levels
- Genomic study to examine the association between HP gene and lipid and glucose measures
- Barriers and facilitators to diabetes self-management
- Diabetes knowledge, myths and perceptions

Co-Investigators/Collaborators

University of Michigan

William H. Herman, MD
Morton B. Brown, PhD
Robert M. Anderson, EdD
Martha Funnell, MS, RN
Gretchen Piatt, PhD

University of N Carolina

Stephen Sills, PhD

ACCESS

Adnan Hammad, PhD
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Helen Berlie, PharmD
Nicole Pinelli, PharmD
Elizabeth Bertran, PharmD
Dana El-Masri, PharmD

Conclusions

- "Paradigm shifts occur in science when the old ways of making sense of the world are no longer useful or appropriate. The need for a transdisciplinary approach to the study of health and disease is critically needed because the traditional silo approach to these issues clearly is not adequate to the challenges we face."

Thomas Kuhn. *The Structure of Scientific Revolutions*. University of Chicago Press, 1996

Resources

- <https://cancercontrol.cancer.gov/brp/archive/scienceteam/index.html>
- <http://www.teamscience.net>
- American Journal of Preventive Medicine 2008;35(2S)
- Julie Thompson Klein, Department of English and Office for Teaching and Learning, Wayne State University

Thank you