

The Life Course Visual Toolkit

Heidi A. Hanson, PhD, MS

Assistant Professor of Surgery

Co-Chair of the Surgical Population Analytic Research Core (SPARC)

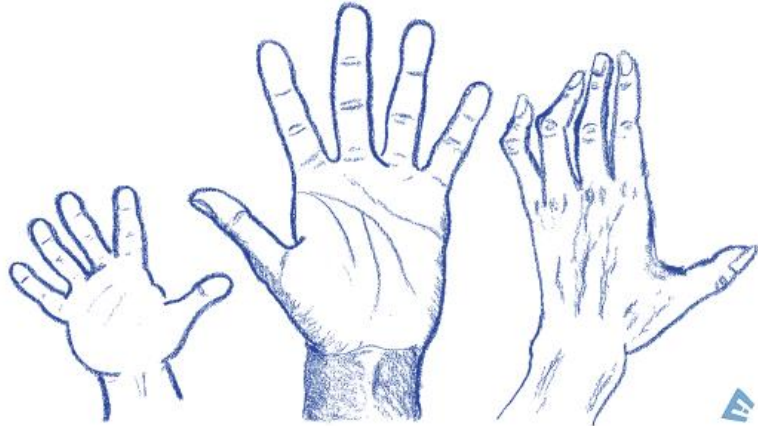
University of Utah



Life course approaches to health research



Inclusion Across the Lifespan

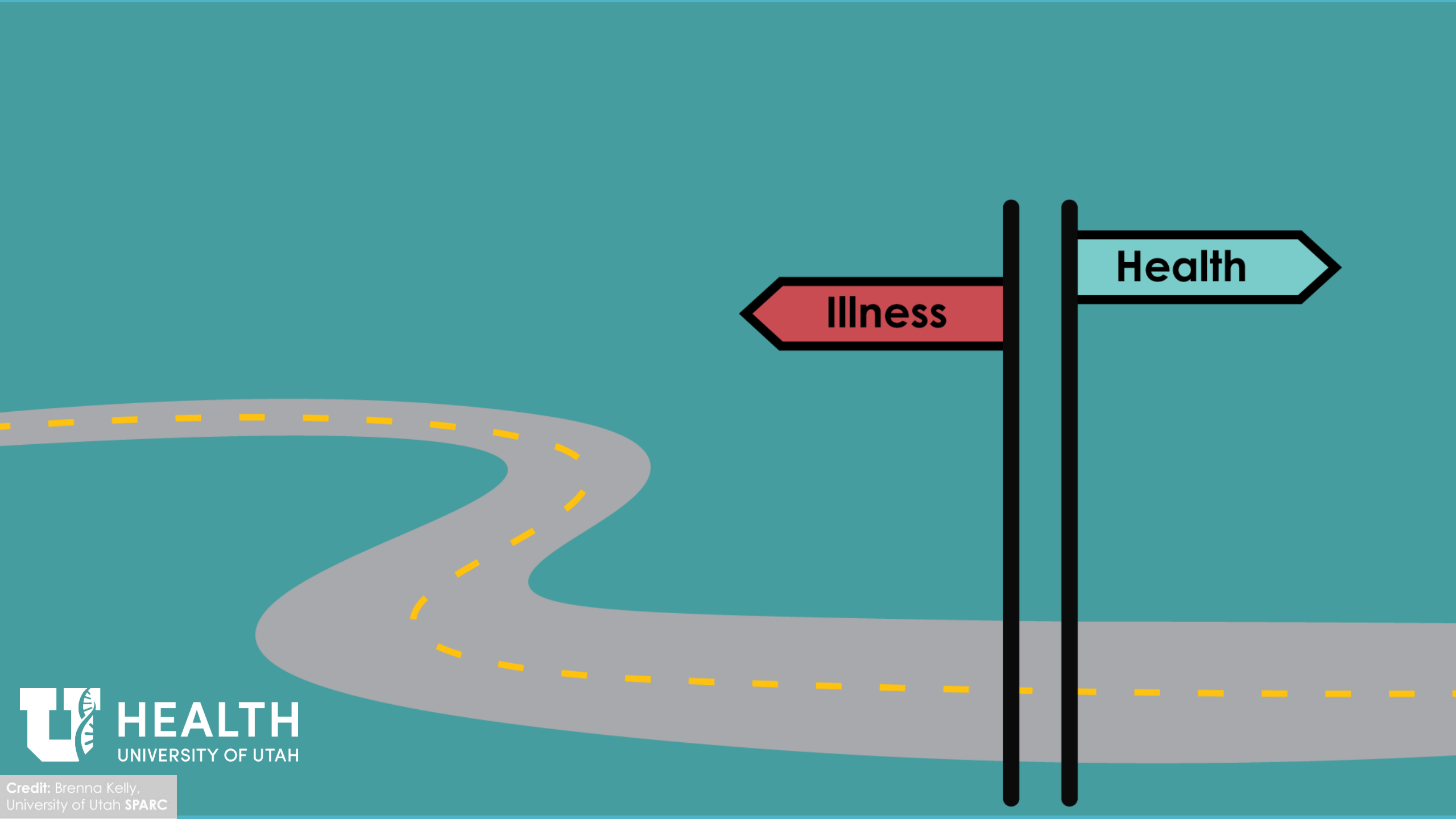


Lifespan vs. Life course

Lifespan: Measure of longevity reflecting underlying biologic aging of an individual

Life Course: Encompasses lifespan and is influenced by the interaction of contextual factors over time that affect health and develop and vary among individuals.





Illness

Health

Air Pollution Exposure Across the Cancer Continuum



Individuals are exposed to air pollution.

Cancer-Free Individuals

Can induce short- and long-term sub-clinical inflammation.

Metabolic
Cardiovascular → Pulmonary

Genotoxic, Carcinogenic Effects
Heart Rate Alterations

Blood Clot Risk

Increased risk for certain cancers

Increased risk for mortality

Increased risk for healthcare events

Asthma, COPD, Respiratory Infection, Heart Attack, Stroke

Pollution exposure accumulates over time.

Cancer Diagnosis

May increase risk for complications by:

Decreasing ability to remove chemotherapy toxins

Increasing risk for healthcare events

Increasing risk for tumor progression and mortality

Worsening inflammatory and genotoxic effects of certain chemotherapies and radiation therapy

Asthma, COPD, Heart Attack, Stroke, Respiratory Infection

Cancer Treatment

May increase survivors' risk for health events and chronic disease by:

Increasing risk for infection due to potential immunosuppression

Acting as a xenoestrogen to interfere with hormonal pathways

Aggravating therapy-related injury

Heart, Lungs, Other Organs

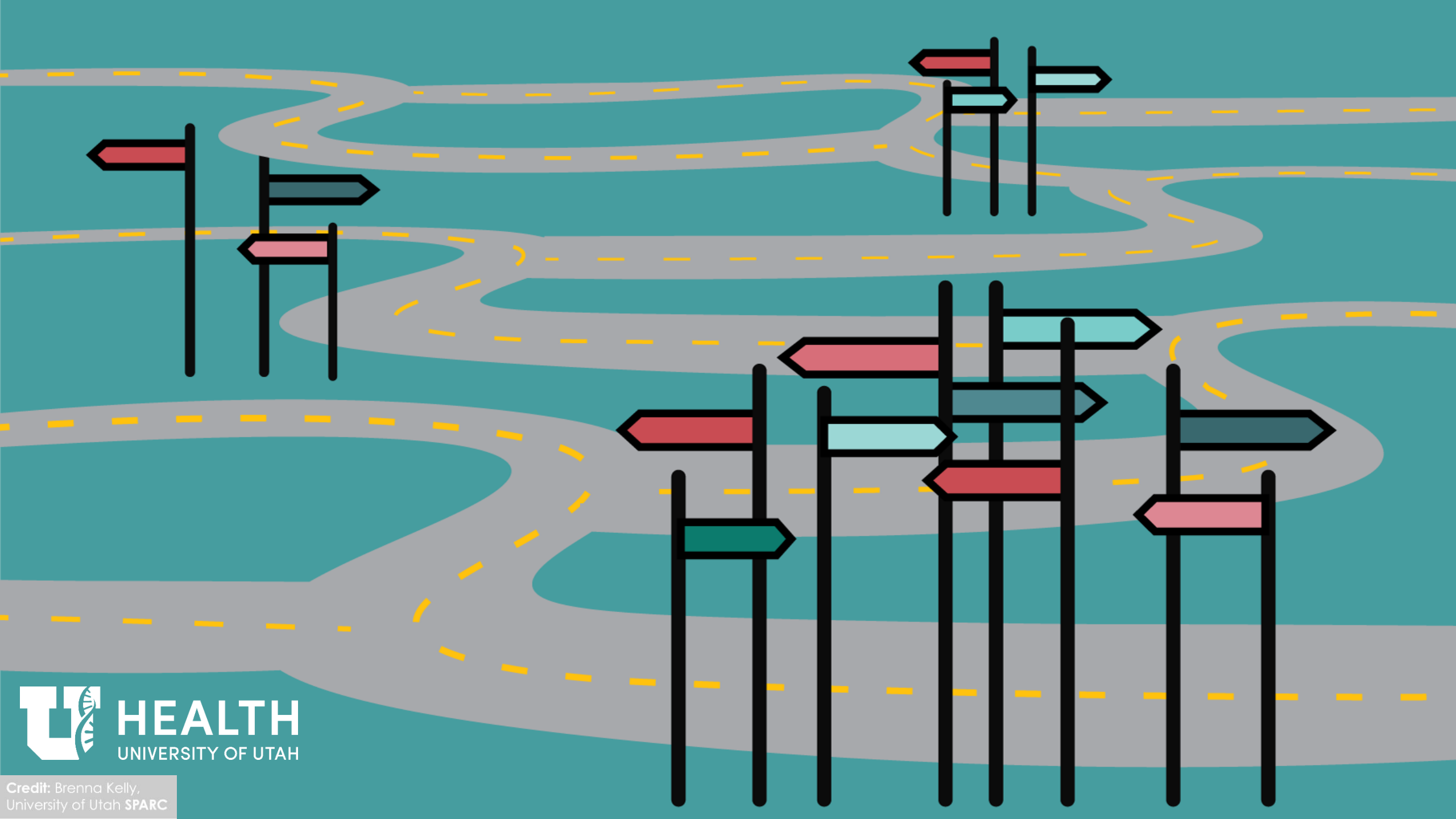
Increasing risk for new or recurrent cancers

Survivorship

Complexity of time in both exposure and outcomes

Complex diseases

Phenotypic heterogeneity



HEALTH
UNIVERSITY OF UTAH

Credit: Brenna Kelly,
University of Utah SPARC



Interdisciplinary blueprint
for matching methods to
theory: Complexity Science
and Life Course Research



Charting the Life Course: An Interdisciplinary Blueprint

5 Pathways Forward



Improving Processes

1 Integrate datasets across the lifespan.

Use transdisciplinary principles and methods, borrowing from:



Engineering



Statistics



Communication



Mathematics



Epidemiology

2 Data science cores focus on curation, cleaning, analysis, and modeling of data.

3 New ways to model high-dimensional data.

Improving Application

4 Expand traditional epidemiological methods to include systems and network modeling.



5 Improve reproducibility with standardized measures.

Life Course Visual Toolkit YouTube Channel

Increase knowledge about life course research methods and innovative approaches

- Widely available that is accessible to researchers across multiple disciplines.
- Synchronous and asynchronous learning opportunities.



**Lifespan
Enterprise
Committee**

Webinar
**An Introduction to Life Course Research
and Complexity Science**

June 18, 2020 @ 11:00 EST

Zoom Meeting ID: 928-8476-1841

Call-in numbers: +1 646 876 9923, +1 669 900 6833



Shari L. Barkin, MD, MSHS
Professor, Pediatrics
Vanderbilt University



Chirag Patel, PhD
Associate Professor,
Biomedical Informatics
Harvard University



Heidi Hanson, PhD, MS
Assistant Professor,
Surgery
University of Utah

An introduction to life course research and complexity

A how to guide for studying the exposome in complex disease with large datasets.

New methods for identifying complex patterns of disease in families and linking them to their etiological roots

Lifespan
Enterprise
Committee

Webinar 2 Creating Systematic Processes for Longitudinal Integration of Datasets Across the Lifespan

July 16, 2020 @ 11:00 EST

Zoom Meeting ID: 960-2331-6259

Call-in numbers: +1 646 876 9923, +1 669 900 6833



Rosalind Wright, MD, MPH
Dean for Translational
Biomedical Research
Mount Sinai



Maureen M Black, PhD
Professor, Pediatrics
University of Maryland SOM
Distinguished Fellow
RTI International



Emily Oken, MD, MPH
Professor,
Population Medicine
Harvard Medical
School

Journey into Complexity
Science: Promise of the
Exposome

Opportunities and Challenges
in Growing, Maintaining, and
expanding a Longitudinal Life
Course Cohort

Policy Perspective in Life Course
Research

Lifespan
Enterprise
Committee

Webinar 3
**Utilizing Data Science Resources to
Prepare and Package Integrated Datasets**

Aug 20, 2020 @ 11:00 EST

Zoom Meeting ID: 993-2789-3900

Call-in numbers: +1 646 876 9923, +1 669 900 6833



Joshua Denny, MD, MS, FACMI
Adjunct Professor,
Biomedical Informatics
Vanderbilt University



Nicholas Tatonetti, PhD
Associate Professor,
Biomedical Informatics
Columbia University



Norrina Allen, PhD
Director, Center for
Epidemiology and
Population Health
Northwestern University

All of Us Research Program

Mining massive observational
data

Integration and Harmonization
of Diverse Data Resources

Lifespan
Enterprise
Committee

Webinar 4

CTSA Visual Toolkit: Developing and Validating Ways to Model High-Dimensional Data

Special Focus: Addressing Social Determinants of Health

Sept. 17, 2020 @ 11:00 EST

Zoom Meeting ID: 993-2789-3900

Call-in numbers: +1 646 876 9923, +1 669 900 6833



Sandro Galea, MD, MPH, DrPH
Dean, Professor
Boston University
School of Public Health



Milena Gianfrancesco, PhD, MPH
Assistant Professor
UCSF School of Medicine

Understanding Health across
the Life Course

Integrating Genetic and EHR
Data and Potential Biases

**Lifespan
Enterprise
Committee**

Webinar 5

**Building the Life Course Toolkit:
From Microsimulations to Complexity
Science-Informed Interventions**

Oct 15, 2020 @ 11:00 EST

Zoom Meeting ID: 993-2789-3900

Call-in numbers: +1 646 876 9923, +1 669 900 6833



Roch A. Nianogo, MD, MPH PhD
Assistant Professor, Epidemiology
UCLA School of Public Health



Laurence Moore, PhD
Director, MRC/CSO Social &
Public Health Sciences Unit
University of Glasgow

Causal Modeling and
Microsimulations for
Population Level Interventions

Moving Towards a Complex
Systems Approach to Health
Intervention Research

**Lifespan
Enterprise
Committee**

Final Webinar

Nov. 19, 2020 @ 11 EST



Applying analytical methods that can capture the multiple dimensions of time

Understanding how health develops over time is central to life course research. Analytical methods that capture the evolution of health over a long period of time can be used to describe heterogeneous patterns of health development and help to inform intervention and outcomes research.

Incorporating time (**timing, dose, and duration**) into our models is an important step in understanding the complex factors that shape health across the life course.

Gretchen Bandoli, PhD
UC San Diego



Kristin Palmsten, ScD
HealthPartners Institute



[Click to Register](#)

<https://tinyurl.com/LCWebinar6>

Special Thanks:

Executive Team:

Shari Barkin
Heidi Hanson
Frederick Kaskel

This project is supported in part by the **Life Course Intervention Research Network** which is funded by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under UA6MC32492. The information or content and conclusions are those of the author(s) and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the US Government.

Grant Numbers

VUMC: 5UL1TRO02243-04
Utah CCTS: UL1TRO02538



Frederick Kaskel, MD, PhD



Heidi A. Hanson, PhD, MS



Shari Barkin, MD, MSHS



Joemy Ramsay, PhD, MS



Nate O'Neil, MC