Science MATTERS!
... IN CONNECTICUT

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The science of Cause and Effect

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Science is trying to answer the 'why' and the 'how' in response to broad questions. Questions like "why are some people taller, heavier, sicker, or die earlier than others?" If we all were exactly the same, like the Stormtroopers in Star Wars, there would not be much to investigate or explain. In the field of health disparities (HDs), we ask "what causes differences in health outcomes between racial/ethnic groups?" We then use what we learn to develop strategies to reduce or even eliminate these differences. Ultimately, our goal is to create more opportunities for every individual to enjoy better health, what is referred to as health equity.

The 'science of cause and effect' helps us to answer such questions. In many cases, we are able to determine what is to blame for poor health. This science has been formalized mathematically in a manner similar to other branches of math, with axioms, theorems, and demonstrations. The science of causality has advanced tremendously and is becoming indispensable to all scientists that use and analyze data or information. As a result, we now have precise ways of answering 'what if' causal questions like 'what if this person lived in a different neighborhood or/and ate more fruits and vegetables, how much healthier would they be?' However, sometimes it is difficult to determine if one particular person is in poorer health because of the food they eat, neighborhood they live in, or their family history.
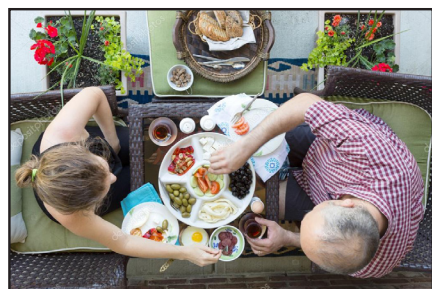
When we think of scientists, you might imagine them in labs, surrounded by microscopes. However, scientists come from many fields, like psychology, anthropology, sociology, and medicine. For example, psychologists develop theories or well-thought explanations of causes-and-effects, to describe why some individuals experience mental health challenges. They explore how families operate in ways that support mental health, and why some individuals are able to bounce back from hardships more quickly than others.
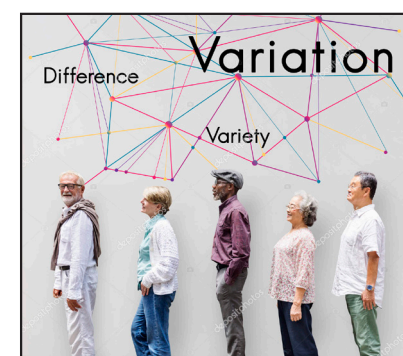
At UConn HDI, we use science from psychology and other fields to better understand the causes and the effects of health disparities, e.g. to determine if they are best explained by environmental conditions, access to healthcare, the way doctors care for patients, etc. Moreover, we work to translate the data and scientific evidence about health disparities into programs and policies. We also track and monitor health outcomes for population groups at greatest risk (e.g., boys and men of color). We form relationships with community members to learn directly from them about the causes and effects of their poor health.

Science is increasingly reported on in the news and in online sources, with words such as effects, impact, contributing to, driven by, attributed to, etc., which all hint at causality. Many causal 'what if' questions asked by scientists are also regularly asked in courts of law, which need to decide on guilt; for example judges in the US courts use the Daubert standard for evaluating scientific evidence; it states, among others, that scientific knowledge derives from the 'scientific method' and needs to be 'peer reviewed' (some scientists review quite a lot).

WORDS to know

Causality: The science of determining whether some event is causally related to another, i.e. how to attribute blame or credit.

Blood glucose: The level of sugar in one's blood. It tells doctors and patients when one is 'normal', pre-diabetic, or diabetic. It can be measured as Hemoglobin A1c, or as fasting glucose. ones.

Health disparities (HD): Avoidable differences in health outcomes (like diabetes, heart disease, or mortality) between racial, ethnic, gender, age (or other kinds of) groups, that are due to other factors than genetic or biological

Experiment: Intervening in naturally occurring events to force a change, e.g. helping people lose weight, and observing the resulting benefits.

Observation: Recording of naturally occurring events, e.g. CT residents' mortality, weight or HgA1c levels.

SKILLS and KNOWLEDGE

Being a scientist requires a method of research that is systematic and can be replicated: anyone doing it like you will get the same results. You can run an experiment by varying something, or forcing a difference, e.g. making some people eat more, and seeing how many more of them become diabetic. Because one cannot just force (randomly) some people to become heavier, because it would be unethical, you can instead compare diabetics to nondiabetics in terms of their weight, and make statistically adjustments to figure out to what extent excess weight is to blame for diabetes. You can also help people lose weight and in the process gauge the health benefits of this 'reversal', but the health benefits of losing 10 excess lbs. are not the mirror image of the potential harmful effects of gaining an excess 10 lbs.

Meet the Scientists

Dr. Emil Coman is involved in turning data or observations into scientific evidence; he started his journey delving into physics, then analyzing how people communicate, and now he uses statistics to understand a host of causes and effects in several health sciences.

Allison Joslyn's (MA) passion for inspiring action through research began during childhood while providing her father materials on smoking effects (he stopped smoking!). Also, her curiosity of nature vs. nurture in childhood led her to explore sciences and sociology in high school, where she then dived into applied health research in college.

For Students and Teachers Making Curriculum Connections, see the following:

Connecticut State Department of Education (CSDE) - Common Core State Standards (CCSS): Mathematics

- CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them
- CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others
- CCSS.Math.Practice.MP5 Use appropriate tools strategically

CSDE - Next Generation Science Standards: Scientific and Engineering Practices

- Asking questions and defining problems; developing and using models; planning and carrying out investigations; analyzing and interpreting data; using Mathematics and computational thinking; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information.

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NEWS IN EDUCATION