The Story Of Big Health

1. Biodiversity
   - Distant past: Biodiversity is under threat due to habitat loss and pollution, leading to the extinction of many species.

2. Disease
   - Early diseases: Diseases like the Black Death and smallpox were caused by pathogens that spread rapidly in crowded conditions.

3. Epidemics
   - Recent history: Epidemics like the Spanish Flu and HIV/AIDS have spread globally, causing significant mortality and morbidity.

4. Scientific Revolution
   - 1500-1600: The scientific revolution brought new understanding of the natural world, leading to advancements in medicine and public health.

5. Human Health
   - Present day: Current health issues include obesity, diabetes, and mental health disorders, which are influenced by lifestyle and environmental factors.

6. Tragedy of the Commons
   - Future: The tragedy of the commons suggests that shared resources can be overused, leading to environmental degradation.

Legends

1. Biodiversity
2. Disease
3. Epidemics
4. Scientific Revolution
5. Human Health
6. Tragedy of the Commons

Human Revolution

1. In a Time Not so Far Away
2. The Ants Who Got the Grasshoppers Marching
3. The Beauty of Sleeping DNA
4. Prince Charming - Ken Hoffman
5. Murzzah
6. From Ugly Duckling to Swan

Environmental Diversity

1. Environmental Diversity
2. Biodiversity
3. Parasitism

Global Exploration

1. Global Exploration
2. Domestication of Horses & Camels
3. Scientific Revolution

Government Intervention

1. Government Intervention
2. Sanitation
3. Printing Press

Leisure Time

1. Leisure Time
2. Printing Press
Peter and the Psychedelic Study

once upon a time, in the 1950s and 60s, psychedelic drugs like LSD and psilocybin were widely tested by psychologists and psychiatrists as treatments for a variety of conditions, including alcoholism, depression, and end-of-life anxiety.

Results were very promising, but compared to today’s standards, the tests lacked methodological rigor. And by the late 1960s, the meds were gaining more recognition as recreational drugs than therapeutic tools, which led then-President Richard Nixon in 1970 to sign the Controlled Substances Act, effectively burying the use of psychedelics for any reason. For four decades, the notion of therapeutic benefit from LSD or psilocybin was largely ignored.

Psychedelics were even feared for the danger they were believed posed to society. That is, until recently, when a handful of scientists, including UAB School of Public Health Peter Hendricks, PhD, set out to change the stigma surrounding psychedelics and to prove their worth in society.

Psilocybin is a psychedelic compound known as the active component of a genus of mushrooms sometimes called magic mushrooms. Research shows it can change the brain’s organizational framework, profoundly altering the way someone struggling with addiction experiences the world for months—or longer. Dr. Hendricks likens this to a religious experience or epiphany.

He hopes this life-changing effect can help overcome addictive processes by helping those struggling with addiction to restructure their priorities. For instance, the desire to stay clean and maintain relationships will take on greater value than getting another fix. This could also improve other negative repercussions beyond cocaine addiction, such as criminal involvement and homelessness.

GOAL. To determine if psilocybin is a safe and effective treatment for cocaine addiction.

TIMELINE. Candidates are being recruited. Final data collection is expected May 2017.

STEPS. These 7 steps in the pilot study will extend over a 6-month period.

1. MRI assessments before and after administration to gauge potential biological mechanisms of psilocybin’s effects.
2. Either placebo or psilocybin administered.
3. 7 hours of clinical monitoring until the effects of the drug wear off.
4. Within 2 days, counseling sessions to discuss the experience.
5. Questionnaire on the experience given immediately after administrative session.
6. Ongoing and long-term assessments 3 and 6 months after final follow-up.
7. Coexisting and long-term assessments 1 and 6 months after final follow-up.

Peter’s Pilot Study

COCAINETRIP
Euphoric, highly addictive experience. Stimulates brain in same way as achieving a great accomplishment. Feel more energetic and sociable. Overuse and abuse can cause blunting of emotions.

PSYLOCIBIN TRIP
Introspective experience. More meaningful, but potentially unsettling or fearful, which boosts the desire to do it again, although considered life-altering. Few side effects and extraordinarily safe when used carefully and responsibly in a clinical setting.
When I was at UAB in the 1990s, I remember being taught that the most important disease vector was the 747. Indeed, the ability for someone who is ill or incubating an infectious disease to be on another continent within a few hours raises the specter of global disease spread. But if rapid public health actions are on the ground, then that pathogen introduction need not result in an epidemic. - Payne

In the early years, HIV was considered an acute infection. Now, with advances in treatment, HIV is viewed as a chronic condition. In the U.S. and other developed countries, people with HIV can have normal life expectancies. And after steep declines in the 1990s, life expectancy in developing countries is creeping back up. - Bennett

My great grandfather, whom I knew in childhood, was a physician on the Eastern Shore of Maryland and graduated medical school in 1898. That was 30 years before Alexander Fleming discovered penicillin. He told me that when he started, he practiced medicine with lances, leeches, and tinctures of shaken up turpentine, egg whites, and herbs. In return, patients often paid him in chickens, oysters, and fish. If an infectious outbreak occurred in the community, he'd isolate the ill and let the outbreak burn itself out. This sounds like it was a medieval period, but it actually still lies within living memory for some people. - Payne

Epidemics have historical characteristics. I used to work in the area of addiction and drug treatment. It's always interesting that drugs of choice are cyclical. Every 20 years there's another drug out there causing trouble. - Collins

Epidemics have historical characteristics. I used to work in the area of addiction and drug treatment. It's always interesting that drugs of choice are cyclical. Every 20 years there's another drug out there causing trouble. - Collins

Modern epidemics will continue to occur where poverty, conflict, disaster, and apathy permit pathogens to prevail. - Payne

One of the issues you have to look at when there are dramatic improvements in treatment, like HIV disease, is the impact it will have on economic resources. It's good that now a person with HIV who stays on their medications as prescribed, can live a normal lifespan. But at the same time, you have to look at what they will spend on healthcare with medications and hospital stays. It can add up to $300,000 in a lifetime. - Collins
The Media who Cried Zika

O ne day last winter, in a land far, far away, the World Health Organization (WHO) declared the mosquito-borne virus Zika a global public health emergency. The organization strongly suspected that the dramatic increase of babies born with the neurological defect microcephaly in Brazil in 2015 was the result of their mothers contracting the virus while pregnant. Because international travel and warmer temperatures encroaching on the Northern Hemisphere, WHO warned that Zika could become a problem within months in North America, including in the United States.

The news media swarmed with stories causing mild hysteria in households across the country. But UAB School of Public Health’s Craig Wilson, MD, cautioned, “the overall risk of Zika becoming a major problem in the United States is pretty minimal.”

Is Zika the Wolf?

Zika spreads through the Aedes aegypti mosquito or rarely through sexual conduct with an infected person. People infected with Zika usually exhibit no or mild symptoms, such as flu-like signs, rash, and/or conjunctivitis. Zika has been linked to cases of microcephaly in babies born to women who contract the virus while pregnant. The risk is undetermined.

Brazil is considered the epicenter of the Zika outbreak, where a 20-fold increase in microcephaly has arisen in some states. Zika has also been linked to neurological problems including Guillain-Barré syndrome, though the risk is undetermined.

Or Is Zika the Sheep?

Zika is similar to the mosquito-borne chikungunya virus. Of the more than 3,000 cases of chikungunya reported in 2014, only 11 came from mosquitoes within the U.S. The others were contracted while visiting countries with chikungunya outbreaks.

Cases of possible Zika-linked microcephaly are most rampant in big cities, such as in Brazil, where populations of people — and mosquitoes — are far denser than in the U.S.

Unlike with sanitation measures in the U.S., many of the affected areas of Brazil have poor sanitation services and road structure creating plenty of stagnant water collection areas to serve as mosquito breeding grounds.

The Aedes aegypti mosquito typically does not fly more than 300 meters from where it is born. Once infected with Zika, a person becomes immune, making the virus likely not an issue by next year.
here once blew an ill wind and monstrous gale that affected the people far and near. Unbeknownst to them, the air’s tiny particles held the power to awaken their DNA, activate their genes, and jumpstart potential health problems.

UAB exposure scientist Ilias Kavouras, PhD, and his colleagues have set out to solve the mystery of how that epigenetic process occurs and find a preventative and possibly even a cure.

Last year, the team used emerging technology to prove just how little exposure to the air particles was needed to trigger that mechanism. “We know the particles modify the activity of enzymes that are involved in DNA methylation,” Kavouras says. “We didn’t know it happened at such a low dose.”

That, he says, could be the reason 14 percent of U.S. soldiers serving in the Gulf exhibit respiratory symptoms upon their return, often resulting in a lifelong battle with asthma. “There are so many serious dangers those soldiers go through, and then they get asthma just because they were in that region,” he says. “We want to prevent that.”

For the past fifteen years, Kavouras has been working with the University of Arkansas for Medical Sciences, the Desert Research Institute, and Harvard T.H. Chan School of Public Health on exploring the connection between human health and air pollution through different mechanisms.

Their most recent study delved into the epigenetic effect on different cells from various particle sources, including traffic exhaust, agricultural dust, and wood burning. “We found that dust particles and wood burning cause a more pronounced effect than traffic exhaust and pollen,” Kavouras says. The findings, published last December in Toxicological Sciences, could also potentially explain the increased health risks firefighters face from forest blazes.

Animal studies have already proven that methylation can be modified if enough methyl groups exist. “But how can we alter it? We have to find out, because by nature methylation changes,” Kavouras says. “That’s why we’re seeking funding — to find the cure by understanding the mechanism. That can define how we protect, prevent, and treat it,” he says.

The solution could be as simple as folic acid. As a donor of methyl groups, pregnant women take folic acid to inhibit some birth defects caused by poor methylation.

The repercussions of understanding the air particle mechanism could mean a far-reaching impact for the general public. For instance, as of 2014, 17 million adults and 6 million children suffer from asthma, according to the National Center for Health Statistics.

But air pollution affects more people than just those with asthma. Air particles play a role in numerous respiratory diseases and even cardiovascular conditions. Atmospheric aerosol is already a recognized human carcinogen, according to the International Agency for Research on Cancer.

Kavouras believes the understanding of this epigenetic mechanism will potentially solve many of these threats. “As the public health component,” he says, “we could find out how we can prevent or even treat these diseases caused or worsened by particle pollution that affects all of us.”
Huzzah!

Welcome to the spring class of graduates across the UAB School of Public Health’s undergraduate and graduate degree programs. Your hard work and dedication have opened the door to a promising future. Here’s to a successful journey ahead.

Rachel L. Stokes
aka Cinderella - Optimistic, creative & extremely resourceful; thinks outside the box.

Heard to say: “I became interested in public health in middle school. I got really involved in this science project about elements and how they affect us. I convinced my parents to let me test out our house for radon. It was my first exposure to the idea of preventing disease. Why treat an illness when you could prevent it?"

Plans to get MPH, become a doctor, and serve as an officer in the U.S. Public Health Service.

Katherine Hymel
aka Fairy Godmother - Uses existing resources to provide others with an opportunity to thrive.

Heard to say: “Public health isn’t just seeing a patient in the exam room — it’s figuring out how to reach the 100 other patients who couldn’t be there due to barriers like cost, transportation, or lack of insurance. Public health training challenges you to view the world from a new perspective.”

Plans to get MPH and JD in nursing to become an attorney practicing in community health law.

April Hoge
aka Snow White - Persecuted amid diversity; uniter of ideals.

Heard to say: “When I was a junior, the School of Public Health began offering an undergraduate degree in public health. I decided to change majors, while keeping a chemistry minor. I have loved every second of it. I feel fully prepared to move on to the next step toward my goal of preventative medicine.”

Plans to get MPH, become a doctor & work with the veteran population.

Kecey Nicole McAllister
aka Pocahontas - Loves environment & people; thinks everyone deserves the right to equal health.

Heard to say: “I always thought that I wanted to be a dentist. But one semester, I took a public health class as an elective, and it was amazing! I was empow- ered to go to school each day, if just for one class. I know I will be able to make a difference in someone’s life.”

In the MPH program, plans to work for a nonprofit advocating an environment-friendly justice system.

Albert Schweitzer Fellow

aka Mulan - Constantly focused on the good around her, innovative in adversity; designs new solutions at problems arise.

Heard to say: “In the MPH program, plans to get MPH & direct DdYocDting on enYiUon - mental justice issues.

Heard to say: “Mental illness is not physically seen, like a broken leg. So unless someone shares, you have no idea how many people need support. Mental ill- ness affects 1 in 5 adults in the U.S., yet mental health affects all of us.”

Plans to get MPH & direct a nonprofit to reduce stigma related to mental illness.

Heard to say: “I became interested in public health in middle school. I got really involved in this science project about elements and how they affect us. I convinced my parents to let me test out our house for radon. It was my first exposure to the idea of preventing disease. Why treat an illness when you could prevent it?"
here once lived a man so sunny, his naysaying neighbors could not help but dance to his tune. At least that’s the hope of UAB School of Public Health’s Susan L. Davies, PhD. She plans to study positive deviants — glass half-full, thoughtful people who may influence others to accept and act on accurate public health messages.

Most studies focus on “those doing poorly or those in the middle, the ‘unhealthy majority,’” she says. “We ignore the positive deviants — people who may have the same resources and circumstances, but still manage to avoid risk, beat the odds, and outperform their peers.” Davies says these individuals possess uncommon traits that confer resilience and result in better health outcomes.

In a previous study, she examined disproportionately high HIV rates in young African-Americans living in the Deep South. “The level of distrust is so high, you still have people in Birmingham that believe you can get HIV from sharing a fork,” she says. “We’ve known this to be false since shortly after the virus itself was discovered, so how are we doing such a poor job of communicating this? Many of those at risk rely on their social networks for health information. If we don’t have accurate information from credible sources going in, we’re not going to dispel that type of misinformation.”

One respondent said: “[HIV/AIDS] was created by the white man trying to destroy black people.” Another one said, “…you got what’s called the disease control center, so they control how many strains they gone put out of this...they control how many people…gone get this disease.”

Davies says, “The question becomes, ‘How do we infiltrate that network and replace inaccurate messages with healthy, action-oriented messages?’” Like rays of hope, there were informed statements from some of the respondents in the same discussion group: “Talk to your kids. If we start off with our kids, we can wipe AIDS out,” one said. “I think people, it got to start with us…” said another.

“If you’re in a group where people are feeling powerless and yet talking about solutions starting with ‘us’ that’s powerful,” Davies says. “They have an opinion about something and it’s not contingent on what their buddies think, but they are not in your face about it. They just find easier ways to get things done, and they do it in ways that are very smart but haven’t been thought of by others.”

Research shows positive deviants exist in every community and can bring about change in difficult situations. “We can learn from them and bridge the gap much more quickly through them,” she adds. For a one-year project, Davies received a pilot grant (“Back of the Envelope” award) from UAB School of Public Health to test whether these individuals can produce community change.

by Nancy Dorman-Hickton
Fairy Godmother
Theresa “Terry” Habshey

With a kind heart and watchful eye, Theresa Habshey has once again swooped in like a Fairy Godmother to the students of the School of Public Health. Addressing public health issues can provide specific and practical solutions to many of the problems facing a world where, increasingly, what happens locally is no longer just local.” So says the first administrator of UAB School of Public Health and the

**Prince Charming**
Ken Hoffman, MD, MPH

gets past, when the School was new and fresh, a Prince Charming named Ken Hoffman quizzed mightily to earn two public health degrees. “I was pushed academically,” recalls the newly anointed Alumnus of the Year. “I took 57 credits in one year. I just loved it.”

The 70s, he says, was a different era for students and professors. “Dr. Roy Mundy taught me how to make moonshine. I was taking pharmacology and studying fermentation, and that Christmas, we made moonshine in little jugs,” he recalls. But like Prince Charming, Hoffman hit a snag while fulfilling his dream. Though he’d completed requirements for both his MPH in epidemiology and MSPH in environmental health in 1975, the EPA blocked his defense and his degrees because of its sensitive topic on the contamination of the Tennessee River. Four years later, his MSPH research was unveiled at a UAB public health seminar and, in 1998, became a chapter in Dr. Clif Cleaveland’s book, *Sacred Smoke*. In 1986, UAB awarded him his MPH.

“Receiving that degree was a validation of everything that Dr. Lehman and I did,” Hoffman says. Nicknamed “Rabbi” by the legendary and beloved professor Herman Lehman, Hoffman even briefly lived with the family and, during Dr. Lehman’s terminal illness, served as a consulting oncologist.

Hoffman’s devotion to the School shines through with on-going financial support, especially for the Herman Lehman Endowed Scholarship. He also served as the driving force behind the School’s first ever reunion last fall. “If I had to do it all over again, I’d do it all over again,” he says.
The Poison

Throughout the land, an evil befouls our soil, endangering living creatures. Called benzene, this volatile organic compound is an offshoot from numerous manufacturing processes that create paint, rubber, styrene, nylon, resins, lubricants, explosives, detergents, drugs, and pesticides. The petrochemical, petroleum and coal industries rack the土. Mother Nature also occasionally releases benzene into the land and air from volcanoes and forest fires, and mankind emits it regularly through car exhaust and cigarette smoking.

While benzene in the air combines with other chemicals and generally evaporates within a few days, benzene on the ground sticks around. Contaminated soil loses usefulness and dangerous, leaking benzene into groundwater. After 17 months, a study showed only 1 percent of the benzene leaking from an underground gasoline storage tank would be degraded.

Few days, benzene on the ground sticks around. Contaminated soil lays useless and dangerous, releasing benzene into groundwater. After 17 months, a study showed only 1 percent of the benzene leaking from an underground gasoline storage tank would be degraded.

One of the 20 most widely used chemicals in the U.S., carcinogenic benzene lurks in 1,000 of the EPA’s 1,684 current or former most serious hazardous waste sites in the nation. These long-term federal clean-up activities often require the removal and incineration of the valuable top soil to make the areas inhabitable or arable again.

The Alchemist

Charging to the rescue is Claudiu Lungu, PhD, at UAB School of Public Health with his tiny army of thirty, malleable activated carbon fibers (ACF). The porous activated carbon will drink up the benzene. Currently granular activated carbon (GAC) is applied to soil in crucifixion trenches which first have to be dug, filled with the carbon, and then scooped free of the granules again. “It’s working, but it’s not very efficient,” he says. ACF which are currently based on polymer precursors are efficient but are too expensive to be used in large amounts.

So Lungu partnered with Uday Vaidya, PhD, a materials engineer at Oak Ridge National Laboratory and the University of Tennessee to find a cheaper source for the base materials. They targeted waste products of industries, such as natural fibers used in textile industry (hemp, jute or flax) and carbon fibers used in auto-making.

“What we obtained so far works well but it’s still a powder,” Lungu says. “We want a mat so we can lift it from the soil and remove the contamination with it.”

The Spinning Wheel

Lungu and his team sought to pair the activated carbon powder with a fiber that could be woven. Natural fibers didn’t work. So they turned to the magic of electrospinning polymers. This process uses electric force to stretch out charged threads to fiber-like diameters of 10 nanometers.

The material Lungu and LAAB’s Vinoy Thomas, assistant professor in the department of material sciences and engineering, spun was like polymer cotton candy. “We believe this is going to be a double hit,” Lungu says. “The cotton candy has some porosity and then when we put in the carbon powder and further process the mix, we increase that porosity.”

They successfully wove a small amount. “It could be scaled up, but we’re not there yet,” he says. “It’s about funding.”

The Gold

Lungu, Vaidya, and Thomas envision the cotton-candy ACF mat, which looks like black felt, laying atop contaminated soil, leeching out the toxins, and then easily being removed and incinerated. They even foresee treating the mat with a chemical to naturally destroy trapped toxic compounds that might be susceptible to UV rays.

Right now activated carbon fibers are pricey at about $50 per pound depending on their porosity, which ranges from 900 to 2,000 square meters per gram. The porosity for the toxin-cleaning blanket will be low end. “For soil, we don’t shoot for very high performance. What we’re trying is to make it economically feasible at a high volume with a relatively decent performance,” Lungu says.

If he had all the funding needed, Lungu sees producing a full-size prototype within two years. He also envisions mats being made to leech out specific volatile compounds, not just benzene. They might even cleanse the soil of heavy metals like arsenic and lead, or decontaminate water.

ACF cotton candy mats — pure gold.

by Jane Ehrhardt
Ugly Duckling to Swan

In an ugly duckling village called Ensley, cracked concrete, shattered windows, and overzealous weeds blighted the downtown area. "If your neighborhood looks rundown, it’s not going to be a source of positive feelings," says UAB School of Public Health’s Bisakha “Pia" Sen, PhD. “Because of urban blight and the negative emotions of being in a disadvantaged community, people can get depressed. That puts them at risk of a lifetime of poor health behaviors.”

Brian Hawkins, a community development consultant, agrees. "In the Ensley community, there is hypertension, obesity, diabetes, and other preventable ailments," he says.

Now public art and gardening are transforming Ensley’s blighted downtown into a swan. The first phase — a Bethesda Life Center wall mural and raised bed garden — was funded by a UAB Center for the Study of Community Health grant. Hawkins, an Ensley native, spearheaded the project. Renowned artist Ukuu Tafari painted the first vibrant mural, which depicts the community’s ideas of rebirth. Hawkins also led volunteers as they built the planting beds.

"The idea is that pride in community ownership will translate into better health," says Sen. She is working with Hawkins and Bethesda director Bettina Byrd-Giles to obtain more funding to create similar pocket parks throughout downtown Ensley.

The premise is that hope in the community makes risky health behaviors, such as drug use, less likely, and good actions, such as exercise, more likely. "We want the community, especially the youth, to feel pride in belonging to Ensley," Sen says. "This is community health in the truest sense. This is about feeling better about who you are and where you come from."

photographs & story by Nancy Dorman-Hickson
In a Time Not so Far Away...

Long, Long Ago...

From near and far, the people poured forth to fondly celebrate their bygone years at the School of Public Health. Held last October, the first reunion drew 75 graduates from 1968-1990 who recalled that era of school intimacy when public health in academia had begun growing around the nation. But time held no sway at this gathering. “When you come back to a reunion, you’re 20 years old again,” says Ken Hoffman, MD, a cohost of the event. “The looks may change, you’re grayer, balder, fatter — but the voice is the same.”

Dr. John Waterbor adds, “It was a great time to connect with our students, faculty, and staff that set our School in motion, and laid the foundation for our many successes today.”

The Health Revolution

Fairy tales begin with “Once Upon a Time” and end with “Happily Ever After.” What happens next in public health fails to fall so readily into place. What is public health’s future? The possibilities stagger. Whether your prediction leans toward the aptly named Brothers Grimm or cheery Walt Disney, it’s clear our field is and will continue to be crucial in answering humanity’s needs. Utopia or dystopia? We in public health will help guide the path of destiny the world takes. And that’s no fairy tale.

by Nancy Dorman-Hickson
"I had incredible mentors who invested in me and encouraged me through all three of my UAB degrees."

MUZI RASULNIA
Co-Founder, PockHealth

At UAB, our alumni share a vision that has led thousands of them to make gifts to The Campaign for UAB. Like Muzi Rasulnia, who came to UAB for the dual MPH/MBA program, our team of faculty mentors who guided him along the way. He made his first gift shortly after graduation, and has been giving ever since, while creating a successful startup that guides patients with chronic illness through their care plan. UAB invested in Muzi. And now Muzi invests in UAB.

Ever Faithful. Ever Loyal.
The Story of Big Health

UAB School of Public Health
Spring 2016
Once upon a Time...

Once you heard the story of Big Health? Several years ago, Bill Gates and David Christian started the Big History Project as an “attempt to understand, in a unified way, the history of the Cosmos, Earth, Life, and Humanity.” Big History is the “modern scientific origin story” told from the perspective of many disciplines. Christian defines eight thresholds in Big History, each associated with increasing complexity. The conditions that allow the transition from one threshold to another are called Goldilocks Conditions — “circumstances that must be right for any type of complexity to form or continue to exist.” The universe creates increasing complexity when these Goldilocks Conditions are met.

In this issue of UAB Public Health, we introduce Big Health, an attempt to explore and understand how the health of the Cosmos, Earth, Life, and Humanity is an integral feature of Big History. With each eon, complexity and interactions of the Cosmos, Earth, Life, and Humanity increase, reflecting their many components and interconnected consequences. Likewise, Big Health seeks to understand health from a historical perspective of increasing complexity of life.

Big Health has seven thresholds that demarcate the major historic transitions defining health. For each transition there are ingredients necessary for increasing complexity and the Goldilocks Conditions that facilitate the transition to the next threshold.

Big Health may provide a framework for thinking about health in a broader historic context and may give us different ways to think about health and wellbeing in an increasingly complex global ecology. Our goal with this issue of UAB Public Health is to begin to explore what Big Health may mean for public health of the future. This has been a fun exercise that, as you will see, has engaged many of our faculty. We hope you will be intrigued and will enjoy this adventure into the shadowed past, illuminated present, and yet-to-be-formed future.

Max Michael, MD
Dean

\[ \text{Thresholds} \]

\begin{tabular}{|c|c|c|}
\hline
\textbf{Threshold} & \textbf{Ingredients} & \textbf{Goldilocks Conditions} \\
\hline
1. Biodiversity & Evolution & Environmental diversity \\
\hline
2. Disease Increasing & Increasing biodiversity & Symbiosis, Parasitism \\
\hline
3. Epemics & Emerging civilizations & Intergenerational disease transmission \\
\hline
4. Scientific Revolution & Scientific method(s) & Scientific revolution \\
\hline
5. Human Health & Public health & Government \\
\hline
6. Tragedy of the Commons & Globalization & Scientific hubris \\
\hline
7. Health Revolution & Not yet known & Not yet known \\
\hline
\end{tabular}

Big Health