

# **The National Academy of Medicine 2021 Annual Meeting** **Transcript**

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## **President's Address:**

VICTOR DZAU:

Good morning and good afternoon and good evening, depending on where you are. Welcome to the National Academy of Medicine's 2021 annual meeting. I'm so honored that you are joining me today. So, let me begin with good news about some of our members. First, a huge congratulations to David Julius, who won this year's Nobel Prize for Physiology or Medicine. I'd also like to congratulate Eric Lander, who will speak to us later on. He has joined President Biden's cabinet as his Chief Science Advisor and Director of the White House Office of Science and Technology Policy. Eric will be joined by NAM members Francis Arnold, Lisa Cooper, Sue Desmond-Hellmann, Paula Hammond and Catherine Woteki, who all recently been named to the President's Council of Advisors on Science and Technology, or PCAST, as we know it. And finally, please join me acknowledging Francis Collins' enormous contributions to science through his leadership at NIH and his own research. Though he's stepping down as director, I know that he will continue to make important contributions. So, thank you, Francis.

You know, as I was thinking about this year's meeting and reflecting on the work we do as an academy, I was struck by how much the world has changed in the seven years since I became president. When I took office, the Obama administration was in full swing and Washington was preoccupied with fights over the Affordable Care Act. So much has happened since then that it feels almost like ancient history. The challenges we face today have become far more global, complex and wide ranging. Indeed, as I said in my address last year, our society is being confronted by triple existential threats. The devastating COVID-19 pandemic, the centuries long scourge of systemic racism and the climate change crisis has already begun to upend our world. These threats are not going anywhere any time soon. If anything, they're posing more challenges and uncertainty to society.

Let me first start with the pandemic, which for more than a year and a half now is still very much front and center in the US and all over the world. These past few months have been particularly frustrating as Delta variant caused yet another wave of illnesses and deaths. In the US the greatest tragedy is that this wave could have been prevented if more people would have been masked and vaccinated. And globally, many low income countries still do not have enough access to vaccines, leaving large swaths of the world's population highly vulnerable.

Next let's talk about racism. Rooting out systemic racism also continues to be an urgent priority for society. Last year, George Floyd's senseless murder at the hands of police forced a reckoning on race in this country and globally. Many leaders, including myself, pledged to take action, but we know much more work still needs to be done. And third, climate change. With unrelenting frequency, we're experiencing the damages brought by climate change, with more intense and more frequent wildfires in the West, to a more active hurricane season and unprecedented flooding in the East. The most recent report of the UN Intergovernmental Panel on Climate Change says the damage is now already baked in and that some devastating impacts are unavoidable. But if we act now there's still an opportunity to keep that devastation from getting even worse. So, as we confront these complex threats I'm reminded

of the quote from a German philosopher, Goethe, who said, "Knowing is not enough. We must apply. Willing is not enough. We must do." We know that we must do more to curb the pandemic, not just here, but everywhere. We know that we must provide equal opportunity for better health and well-being, not just for a lucky few, but for everyone. And we know that we must work together to be better stewards of our planet, not for ourselves, but for the future generations.

This is why our work at the National Academy of Medicine and across National Academies is so, so important. We are hard at work to put the best evidence possible available into action to improve people's life now and in the future.

But we also must face a new reality, the challenges we face now and the new crises that will undoubtedly come our way are increasingly regional, national and global. They are complex and multifaceted, crossing disciplines and sectors. And so, just as the world and the nation are changing, so too we must change.

Big societal challenges require new approaches to how we do our work. So, instead of just reacting to what's happening in the world, we need to be more proactive, to anticipate challenges, to help society be prepared and avoid the worst case scenarios. We need to leverage our convening power to forge radical new partnerships and inspire action in multiple arenas across the sciences, across the public and private sectors and around the world.

Now, more than ever, we need to communicate with the public about the values of science and to stand up for science when it's attacked, distorted or ignored. And we need to demonstrate the power of science and medicine to create a better world, not just for a few, but for everybody.

So, in this year's President's Report, I would describe how NAM is rising to the challenge.

Let me start with our work in pandemic. As summarized in the next slide, since the very early stages, the NAM and National Academies have taken a strong leadership role responding to COVID-19. Through our Standing Committee on Emerging Infectious Disease, we've engaged regularly with the US administration and decision makers on key issues.

The NAM has made a concerted effort to address issues related to pandemic in all our programs, from addressing pandemic response, to tackling its disproportionate effects on communities of color, to examining how pandemic has impacted older adults, mental health, substance abuse disorder and clinician burnout. And to get accurate public health information to the right hands, to the hands of health care providers, policy makers, journalist and, importantly, to the public. We've hosted hundreds

of webinars and virtual workshops on a wide variety of topics and issues. Also, as you know, we've issued statements to speak out for science. Most recently, we've been focusing on building trust in COVID-19 vaccines. In addition to working on vaccine hesitancy directly with providers and communities, our black NAM members developed a video urging Black Americans to get vaccines. This video has been viewed over 240,000 times. And thanks to Hispanic leadership in our council, our Latino and Latina members developed a similar video. Now, you have a chance to watch both of these videos during the breaks at 2:30 p.m. today, Eastern Time.

And, of course, combating misinformation around COVID-19 is a big part of the battle. Social media companies, so often the fuel for spread of misinformation, needs to do more to step up and do right. An important first step for these platforms is to identify and prioritize credible sources of information for their users. So, when NAM Council member, Karen DeSalvo, who's now the Google's Chief Health Officer, asked NAM to help to work with YouTube, we agreed without hesitation. We appointed a multidisciplinary advisory group chaired by Raynard Kington, which engaged in extensive deliberation, solicited widespread public input and released a publication, which you can see on the slide. The publication provided a set of criteria to help identify credible information, the attributes of credible sources of information and categories of entities that could serve as a reliable source of information. So, the surgeon general, Vivek Murthy, referenced our publication in his recent public advisory on misinformation health. Going forward, we are committed to furthering our work in this area, engaging with many more social media platforms and pondering to extend this initiative globally.

While here in the United States the pandemic has reviewed the best and worst of our health care system, a system capable of extraordinary care and innovation, but one that has perpetuated inequities and is unprepared to completely meet the challenges of the 21st century. So, as we emerge from COVID, NAM is looking to the future. We must capture those important lessons to create a system that is equipped for a rapidly changing world. So, indeed after President Biden issued a public letter to Chief Science Advisor Eric Lander asking for guidance on specific questions regarding science, technology and public health preparedness, we the NAM convened a working group to identify key priorities based on lessons learned from COVID-19. This slide will show you the key priorities identified. One priority identified is transforming the United States public health infrastructure. It is fragmented and severely under-resourced with workforce shortages and outdated technology systems. So, we have to reimagine, reorganize and invest significantly in our nation's public health. The working group also urged major improvement of our health data system to prepare for the next emergency. Our current system is not interoperable and abounds with deficiencies, making it difficult or nearly impossible to glean actionable insights. We need an improved data health ecosystem that focuses on foundational elements such as technical infrastructure, data architecture and modularity. Also, protecting and improving the public's health requires robust capabilities for rapidly identifying new infections and health threats. So, we need to enhance pandemic surveillance, forecasting and virus tracking. I'm so pleased that the CDC has taken on an important first step by establishing the Center for Forecasting and Outbreak Analytics.

The overarching priority of this nation should be to develop a national strategy for pandemic prevention and preparedness. The Biden administration unveiled the American Preparedness Plan, a \$65 billion proposal to remake the nation's pandemic preparedness infrastructure. I'm so gratified that many of the elements outlined by Working Group are contained in this plan. And later, you'll hear that I'll be interviewing Eric Lander during the scientific meeting on some of these issues.

This slide says above all, all the stuff we talked about earlier is preparedness. But as you know well, we really need long term transformation of the entire US health system.

The NAM Leadership Consortium, led by Mike McGinnis, convened leaders from nine sectors of the health system to assess the impact and experience during the pandemic and recommend changes for the long term future. You can see the nine sectors listed in this slide. First, a cross-cutting theme is equity. We must commit to pursuing equity across all domains of health system. This includes addressing systems, policies and barriers that perpetuate health disparities and ensure that we see meaningful progress towards revamping it. Second, COVID has forced major changes in how we deliver care. Providers have to swiftly leverage telehealth and other technology, streamline operations and embrace non-traditional care settings. We must build on this momentum to transform health care delivery, so they're safer, more efficient and easier to access. We should innovate and advance effective ways to engage, monitor, manage patients remotely at their homes and in the community by ensuring equity and access to care. Third, we have to reconsider how care is financed. COVID-19 has renewed the impetus for transitioning away from fee for service and towards value based payment models, which could drive transformation in other sectors as well. Furthermore, this pandemic has exacerbated already high rates of burnout among our clinicians and frontline workers. We must invest in their well-being. So, these are some of the project actions, they represent meaningful steps towards system transformation across the sectors.

Now, lessons from COVID-19 can and should also inform the overall public health measures, and especially as we enter the flu season and influenza preparedness. So, sponsored by HHS, we formed an international commission to do just that from a global and US perspective. This initiative issued four reports, as you see in this slide, informing future influenza vaccine development, supply chain issues, public health interventions, diagnostics and treatment strategies, and international collaboration, innovative partnership and financing based on lessons learned from COVID-19. I'm also proud that NAM is actively involved with many global activities related to pandemic preparedness response. As shown on this slide, NAM showed a secretariat for the G20 high level independent panel that's shown on the right side, which generated an important report called A Global View for Our Pandemic Age, that calls for critical actions and doubling of international financing to at least 75 billion over the next five years to close the gaps in pandemic prevention and preparedness. In addition, along with other NAM members, I've been actively engaged in the Global Preparedness Monitoring Board to provide independent monitoring to ensure preparedness for global health crises. And in the global access to COVID Tools Accelerator, or ACT, and COVAX, which works towards equitable access to COVID-19 tests, treatments and vaccines worldwide.

The pandemic has shone a harsh light on another crisis, and that is racial and socioeconomic disparities in health care and health outcomes. It is clear that people of color have disproportionately suffered and died in this pandemic because of longstanding inequities in our society.

Last year, I, on behalf of NAM, made a public commitment to address racism and center equity in all that we do. We are committed to creating an internal environment and culture diversity and equity. We will have an equitable lens, an equity lens, in all of our programs and activities.

(UNKNOWN) initiative shown on the third bullet is our Culture of Health Program, a multi-year effort supported by Robert Wood Johnson Foundation to identify strategies to achieve health equity. We're now entering the second phase of this program, which will focus on how to address the root causes of (UNKNOWN). As you can see in that bullet, we're planning two

(UNKNOWN) study addressing structural racism in health and longitudinal and cross generation causes of persistent health inequities. And, of course, those of us in STEM must address racism within our own communities. The past summer, the National Academies held a summit on diversity, equity, inclusion and anti-racism in 21st century STEM organizations. That includes universities, research institution and our own academies. The summit was informed by the work of our roundtable on Black Men and Black Women in Science, Engineering and Medicine, led by Cato Laurencin, an NAM member. You know, within our own academy, our hard work and the increasing diversity of NAM members is paying off, our members are becoming more diverse, not only racially and ethnically, but we're also consistently electing more women and more people from underrepresented areas of the country. As shown on this slide, we have much to be proud of. The class of 2021, which was just announced this morning, 50% of this class of new members are underrepresented minorities, a record number. And this class also includes a record number of women at 52%. Another record is the election of four Native Americans Alaska Natives to membership. I am so proud of the development of NAM. You know, at the NAM we are absolutely committed to practicing what we preach. To lead our internal efforts, we appointed (UNKNOWN)

as NAM's Equity Inclusion Officer, and recruited Joy Washington to the new position of Senior Administrative Officer to implement the changes. We launched the staff committee to advance racial equity of care to put our commitment into practice. As you can see in this slide, the mission and our vision.

(UNKNOWN) is also working closely with Laura Castillo-Page, our first Chief Diversity and Inclusion Officer across the entire academies to develop an academy wide strategy of promoting diversity in our workforce and culture.

Well, in regards to climate change you know we can no longer pretend that our climate catastrophe can be dealt with down the road or kick the can down the road, and that only affects future generations. Climate change is here and now. Clearly, climate change is not just an environmental catastrophe, it is also a public health crisis.

Some 20 million people are dying every year globally because of key factors linked to climate change. And sadly, just as we've seen with the pandemic, the worst impacts of climate change are experienced by people of color and other vulnerable populations because longstanding inequities in our systems of health, housing, food security and employment. We, in health medicine, have an obligation to act and to start treating climate change as the public health crisis that it is. We can and should raise the alarm about these threats. We have a duty to advocate for health and equity to be at the center of climate change planning and policy.

The Biden administration has pledged to make climate change a top priority with a major focus on environmental justice. We are working closely with these issues with Dr. Rachel Levine, Assistant Secretary for Health, who oversees the new HHS Office on Climate Change and Health Equity, as well as the White House National Climate Advisor, Gina McCarthy, and their teams. But we in the health sector must also be accountable for reducing our considerable carbon footprint. In the US alone, our sector is responsible for a whopping 8.5% of nation's carbon emissions, which occur in every part of the health care system, from hospitals to clinics, from home care to nursing homes to research facilities and throughout the entire health care infrastructure, from medical devices, drugs, equipment, manufacturing to the supply chain. So, I believe as a major contributor to climate change, we must be part of the solution.

That is why we launched a signature global initiative, a grand challenge on climate change and human health. I did that at last year's annual meeting, and we've been working hard at this grand challenge. This multi-year global effort, chaired by NAM members Judith Rodin and Phil Pizzo, will harness both thinking and radical, innovative and collaborative partnership to focus on the following strategic initiatives, as shown in this slide. First, communicate climate crisis as a public health and equity crisis. Second, develop a comprehensive and long term roadmap for systems transformation. Third, to prioritize and catalyze multisectoral actions to drive health sector transformation. And fourth, to stimulate bold and interdisciplinary solutions to accelerate the pace of innovation and transformation. You'll hear more about the grand challenge later today at the president's forum. So, please join us. We have outstanding experts to discuss this. Now, an important part of the grand challenge, which is bullet number three, is decarbonising the US health sector. Recently, we launched an action collaborative on this topic, a public private partnership bringing together leaders from across the US health system, the federal government, industry, hospital systems, private payers, clinicians, academia, all together to identify and implement actions aimed at reducing the environmental impacts of the health sector and strengthening sustainability and resiliency. I'm co-chairing the action collaborative along with George Barrett, the former chairman and CEO of Cardinal Health, and Sir Andrew Witty, the CEO of UnitedHealth Group, and we're really excited to work closely with the Biden administration and Dr. Rachel Levine, the assistant HHS secretary, who also serves as a co-chair to this collaborative. Now, you can see in the bottom of the slide the publication just came out this week. The four of us wrote about a call to action because this action collaborative will focus on reducing our carbon footprint. By focus on key areas, and these key areas will be taken on by working groups. Health care infrastructure and supply chain, health care delivery, health professional education and communication and policy financing and

metrics. These working groups will work together to address these issues, and we have high hopes for impact of this action collaborative. I should also point out working closely with divisions across the entire academy, science, engineering and medicine on climate related projects. And to leverage the expertise of the other academies to develop an integrated approach across the academies.

So, as I'm drawing this address towards closing, let us not forget the many important projects we undertake as shown in this slide. Action Collaborative on promoting clinician well-being and fighting burnout has never been more important than ever during the pandemic. The same was true for Action Collaborative on countering the opioid epidemic, as well as our recent study, which updated the 2010 Future of Nursing report for 2020 to 2030. And importantly, the NAM Committee on Emerging Science, Technology, Innovation and Health and Medicine is developing a cross-sectoral governance framework to guide the development and use of transformative innovation while mitigating potential societal risk and unintended consequences. Lastly, I'm excited to tell you that our publication, NAM Perspectives, was recently accepted to be indexed in PubMed Central this year and it will go retro for the past two years. I believe this will increase the reach and impact of our publications.

So, last night we launched the public face of the campaign for NAM. It is the most ambitious fundraising campaign in the academy's history. The campaign goes an ambitious 100 million, which will provide resources, support NAM to fulfill its mission. Now, you see some of them listed here, they're not everything, but they are the key areas that we are raising money for. The good news is we at this public launch, we're already at 85% of our goal and I just want to thank our members and friends who have been already participating in the campaign. I'm confident that with the help of you, our members and friends, we're gonna reach and surpass that goal in a few years. I encourage everyone to join your fellow NAM colleagues to making gifts on any size to any area that's meaningful to you.

As I conclude this address, I want to acknowledge that although we still have a lot of work ahead of us, I'm grateful for the progress we have made so far. This year has presented many challenges, but also provided us some important or hard learned lessons. For one, we now grasp in a very real way that while our role as independent, objective advice the nation is more important than ever, we must also find ways to enable action. We must stand up and advocate for science and research, and in today's information environment, communicating clearly about signs and counting misinformation is an absolute must. And each one of us needs to live up to this responsibility. We've also learned how interconnected we are. When it comes to crises we face, we're truly all in this together. We need solidarity, new partnerships, new approaches and how we collaborate across borders, across disciplines and across our societies. The challenge ahead of us are not for the faint of heart. We need to create a more just, equitable society and healthier planet for ourselves and for future generations. These are big, complex codes with health and medicine right at the core. Well, this brings me back to the saying by Goethe, Knowing is not enough. We must apply. Willing is not enough. We must do." With the power of science and medicine at our disposal, I firmly believe that together there's no challenge we cannot overcome. It's gonna be hard work, but it's important work and it matters. So, let's keep doing it together.

Members, is a privilege for me to serve this incredible academy as your president. Thank you so much for your support and your great contribution. Thank you.

**New Class, Awards, and In Memoriam:**

VICTOR J. DZAU:

Alright so, every year at our annual meeting, we take the opportunity to introduce the class of NAM members who we elected last year, as well as our current fellows and scholars. So it is a great pleasure to welcome such an impressive group of individuals. Let me begin by introducing to you the members of the academy elected in 2020. Given the virtual format of this year's meeting, you'll see the names and affiliations on screen shortly. You can find more information about each one of them at nam.edu. Believe me, we elected a great class of distinguished individuals. It's so impressive. I'm very proud of the class of 2020, not only for its excellence but also for its diversity in gender, race, ethnicity, and disciplines. Now these new members would be honored and an in-person induction ceremony, that's October. Let's just hope we can all get together, and we'll bring together the class of 2019 and 2021, once we're able to join in person. And we'll be able to celebrate with all of you, with their friends, families, and loved ones. I'm really, truly looking forward to a special reception and dinner, which should be a most memorable occasion. It certainly will be quite a party. Now we showed a video of the class of 2020 members, following the introduction, the new class of fellows and scholars will be introduced. So I ask you to hold applause until all the names are read. Then let's see if we can join together from across the country on real thunderous and noisy applause. So, let's roll the video.

(VIDEO PLAYS)

SPEAKER:

The class of 2020 NAM members. Susan L. Ackerman, Rexford S. Ahima, Mark S. Anderson, Sonia Y. Angell, Kyriacos A. Athanasiou, Andrea Baccarelli, Regan L. Bailey, Laurence C. Baker, Gilda A. Barabino, Deanna M. Barch, Dan H. Barouch, Randall J. Bateman, Michelle Bell, William A. Beltran, Elisabeth B. Binder, Fredrick DuBois Bowman, Myles A. Brown, Brendan G. Carr, Nancy Carrasco, Edward F. Chang, Wang Chen, Judy H. Cho, Augustine M. K. Choi, Peter L. Choyke, Wendy K. Chung, D. Wade Clapp, Pierre-Alain Clavien, Daniel Colón-Ramos, Yolanda L. Colson.

Joanne M. Conroy, Merit Cudkowicz, Hugues de Thé, Ralph J. DeBerardinis, Ronald P. DeMatteo, John E. Dick, Justin B. Dimick, Cynthia E. Dunbar, B. Mark Evers, Heinz Feldmann, Toren Finkel, David E. Fisher, Scott E. Fraser, Christopher Friese, Sherine E. Gabriel, Levi A. Garraway, Jeffrey L. Goldberg, Steven N. Goodman, James Eric Gouaux, Jr., Garth N. Graham, William A. Grobman, John D. Halamka, Patrick J. Heagerty, John N. Hirschhorn, Vivian Ho, Holly Humphrey, Denise J. Jamieson, Joel Kaufman, Aaron S. Kesselheim, Alex L. Kolodkin, Jason Leitch, Kam W. Leong, Fei-Fei Li, Judy Lieberman, Marc Lipsitch, David R. Liu.

Susan S. Margulies, Kameron L. Matthews, Justin C. McArthur, Velma McBride Murry, Matthew D. McHugh, Jerry R. Mendell, Raina Merchant, Redonda G. Miller, Karin M. Muraszko, Alondra Nelson, Kypros H. Nicolaides, Henry L. Paulson, Corinne Peek-Asa, Anne Marie Rafferty, Aleksandar Rajkovic, Aviv Regev, Antoni Ribas, Paul M. Ridker, Pardis C. Sabeti, Eiichi Saitoh, Hongjun Song, Louis M. Staudt, Patricia Stone, Sean D. Sullivan, Melody A. Swartz, Herman A. Taylor, Jr., Hannah A. Valentine, Amy L. Vincent, Robert M. Wachter, Amy K. Wagner, David S. Wilkes, Consuelo Wilkins, Tien Y. Wong, Carlos A. Zarate, Jr., Xiaowei Zhuang.

(INSTRUMENTAL PLAYS)

SPEAKER:

The Robert Wood Johnson Foundation Health Policy Fellows 2021-2022.

(INSTRUMENTAL PLAYS)

The NAM/AAN/ANA/ANF Distinguished Nurse Scholar-in-Residence 2021-2022.

(INSTRUMENTAL PLAYS)

The NAM Fellows 2021-2023.

(INSTRUMENTAL PLAYS)

The NAM Scholars in Diagnostic Excellence 2021-2022.

(INSTRUMENTAL PLAYS)

The NAM-HKU Fellow in Global Health Leadership 2021-2022. The International Health Policy Fellow 2021-2023.

(INSTRUMENTAL PLAYS)

The Emerging Leaders in Health and Medicine Scholars 2021-2024.

(INSTRUMENTAL PLAYS)

Congratulations!

(VIDEO ENDS).

(APPLAUSE).

VICTOR J. DZAU:

Our members are true remarkable group of leaders, who committed to improving health and making the world a better place for everyone. Without our members, we wouldn't have accomplished what we have today. So that's another round of applause for all of them (APPLAUSE). So in keeping with our tradition, I'm pleased to tell you that we've announced the NAM class of 2021 this morning. Another truly exceptional class of scholars and practitioners. So we all look forward to welcome them next October. A press release with the names of the new elected 100 members can be found at [nam.edu](http://nam.edu).

This time, I would like to take a moment to remember our colleagues and fellow members who passed away since our last annual meeting. Here you see all of the names of members who left us this past year. Let us pause for a moment of silence to acknowledge and pay our respects to them.

Thank you. I'd also like to take a moment to recognize two NAM members who passed away this year. Both of them served as Vice-Chairs of the NAM Council. Both Sandy Schwartz and Tachi Yamada were integral to the formation and early years of NAM success, and serve as important councils to me during my first year as president. Not only were they ardent supporters of the academy, they were also close friends to many of us. Sandy and Tachi were taken too soon, and they will be dearly missed. Thank you.

**Welcome Remarks:**

VICTOR J DZAU:

Well, welcome back. And for those who are just joining us, welcome to the 51st annual meeting of the National Academy of Medicine. I thank you all so much for attending. Every October, we hold this meeting. It is the gathering of our distinguished members and the most important meeting of the year for the organization. Today's program, Crossing the Policy and Equity

CHASM:

Lessons from Compounding Health Crises, prompts to be most stimulating and impactful. Just listening to a title and you know that this is gonna be really important subjects that we need to discuss and really address to a large extent. So, first, I must thank our program planning committee chaired by Sue Curry who's under great job and is comprised of a group of volunteer experts, Karen DeSalvo, Paula Hammond, Peter Hotez, Ashish Jha, Maureen Lichtveld, Johnson Pat and (UNKNOWN) Simon. So Sue, thank you and any member committees thank you for all your hard work. I know it's gonna be a great meeting. You may have heard me many during the press report this morning that the challenge we're facing today are global, complex and widespread, and interconnected. Since last year's annual meeting was named confronting urgent threats to human health and society, we continue to face the persistent essential threats and inequities of COVID 19 and climate change. So, during today's program, you'll hear about the opportunities, gaps, and challenges, as well as the vital importance of advancing evidence-based policy to address the compounding health threats. Now, more than ever, we need to communicate with the public about the value of science and medicine to inform decisions that impact people's everyday lives and the power of science and medicine to create a better world and not just for a few but for everyone.

We will use the same live stream all day, which can be assessed on our website, nam.edu. On the website, you'll find today's program, speaker bios and disclosure statements and information about planning committee, and other relevant background. I encourage you to take a look in addition the meetings being live treated on Twitter using the #NAMmeeting, spelled MTG meeting. Please join the conversation. So, now, I'd like to welcome the chair of the NAM annual meeting planning committee, Dr Susan Curry, who introduced the program and keynote speaker. I think I'm gonna introduce the keynote speaker, sorry, Susan, slight changing plan. Dr Curry's Emerita dean and distinguished professor of

health management and policy at University of Iowa. She's also a member of the NAM council. So, please join me in welcoming Sue.

SUE CURRY:

Oh, well, let me welcome you as well to our 51st annual meeting and the 2021 annual meeting scientific program,

CROSSING THE POLICY AND EQUITY CHASM:

Lessons from Compounding Health Crises. I wanna add my thanks to the 2021 annual meeting planning committee and also to the amazing staff NAM staff for their guidance and really valuable contributions to developing the scientific program and working to organize this virtual meeting. As Dr Dzau mentioned, the program planning committee developed the program today, which covers similar topics to last year. As we all know, the existential health threats and inequities of COVID 19 and climate change persist. So, similar to the IoM, NAM seminal report Crossing the Quality Chasm, our program today focuses on the question of how do we cross the policy and equity chasm. The quality chasm report made an urgent call for a sweeping redesign of the healthcare system and provide evidence-based guidance for healthcare policy transformation. Many of the principles in that report are relevant today. Now, today's program centers on the importance of science-informed policy for addressing compounding health crises. With COVID 19 and climate change, both COVID-19 and climate change present somewhat different challenges. So, for COVID 19, there has been the imperative to create policy in the presence of a rapidly evolving evidence base. For climate change, policy has lagged a well-established science space. But in both instances, there is a clear gap between what we know and what we do. And in both instances, a key question is how do we build the bridge between science and policy and do so in a way that reduces health inequities. We have three panels during the scientific program today in addition to special closing remarks for Secretary Xavier Becerra of the US Department of Health and Human Services. And that will be followed by the president's forum, the role of the National Academy of Medicine, and the health sector in addressing the climate crisis. We are really excited to feature 12 outstanding panelists today who will be speaking on disruption, construction, and learning from COVID 19 in panel one. And that will be moderated by Carl Zimmer of the New York Times toward actionable policy and climate change in human health in panel two, to be moderated by Laura Helmuth of Scientific American. And in panel three lessons learned from compounding health crises, to be moderated by Alan Weil of Health Affairs. We will hear from diverse perspectives spanning disciplines, such as infectious disease and bioethics to environmental planning and environmental health to communication and public health. Each panel will have approximately 15 minutes at the end of the session for an audience question and answer period. We encourage you to ask questions using the Q&A tool under the live stream. The program will be recorded and posted on NAM website later this month. I'm a little bit early but I'm gonna turn the program back to Dr Dzau who will introduce our keynote speaker, Dr Eric Lander. And Dr Dzau and Dr Lander will be in a fireside chat for this exciting kickoff to the scientific program.

### **Keynote Address**

VICTOR J DZAU:

Thank you, Sue. Thank you for really your leadership in organizing today's program. Well, it's a great privilege for me, of course, to welcome Eric Lander, a good friend, and President Biden's Chief Science Advisor, and Director of White House Office of Science and Technology Policy. Now, Eric is the keynote speaker for our meeting. But as he's also creative, he decided he and I should have a fireside chat. And so I would be happy to do this with him. But let me first introduce him. As I said, he's President Biden's science advisor, and Director of OSTP. But he is formerly the President and Founding Director of the Broad Institute. We all know that well, researchers do. That's closely affiliated with MIT, Harvard, and five of Boston major teaching also. Believe me, that's quite a feat. And he's able to bring that together to focus on genomic medicine. Now, Eric was one of the principal leaders of Human Genome Project. And as you know, he's a geneticist, molecular biologist, and a mathematician. That's where he started his career. He's played a pioneering role in reading, understanding and biomedical application of a human genome. And he's developed powerful methods for discovering the molecular basis of human disease that are used all over the world. And no surprises, he's received numerous national and international honors for his work. Now, Eric has been a scientific adviser to federal government across multiple administrations. In fact, he was peak as Co Chair to Obama, President Obama. So, he has advised, not only white house, but HHS and Department of Defense. So, Eric, welcome. Good morning.

ERICLANDER:

Hello, Victor. Can you see me?

VICTOR J DZAU:

We can see you in your blue shirt.

ERICLANDER:

Excellent. The thing you left out, Victor, is I'm also a member of the National Academy of Medicine. And I think it's relevant. And that's why I thought we should do a fireside or a keynote conversation. Because, you know, I am coming as the President's science advisory and all that. But I'm coming as member of the National Academy of Medicine, of course. Because it's a community I know and love. And I just want to say how much I appreciate the MAM. Has been doing throughout the pandemic, and thinking hard about questions related to public health and climate. And so it's great. It's great to keep off a conversation with you. And I hear you might even take a couple of questions from the membership as well.

VICTOR J DZAU:

Yes, we will do that as well. So, I think what we should do is, look at our conversation. Three parts. Are they totally interrelated? First of all, I'm going to ask you a question about how you sign, see signs forward in the future? And secondly, I want you to talk a little bit more about pandemic preparedness, and public health. And third about climate. I know these are all things that you're working on, and Pique has is working on. So, Eric, in 1944, President Franklin Roosevelt also vetted to a science advisor, Dr Vannevar Bush. He asked the question how science and technology could be best implied to benefit nation's health, economic prosperity, and national security in decades that follow the Second World War. And as you know, Dr Bush response came in form of a seminal report called 'Science, The Endless Frontier' that would set the cause of scientific discovery in America for next 75 years. And I just want to read a quote from what he wrote. He said, the most important way in which the government can

promote industrial research are to increase the flow of new scientific knowledge to support a basic research and to aid in development of scientific totality. While you all know, this prescient report was a guiding force for changes in science and innovation our country for decades, that led to the Modernisation American Research University, the creation of NSF, and later NIH, and many others. And shaped much science policy. So, much has happened. And, of course, when you were appointed on these, selected, shall we say, and then later confirmed as the Science Advisor to President Biden. He wrote you a similar letter on January 15, and asked you about five questions. Question about what can we learn about pandemic, and address the needs of public health? And we'll come to that as kind of a second part of our conversation. How can breakthrough science technology create powerful new solutions to address climate change? That's our third topic. And here he's saying, "How can we assure United States as world leader, and technology industry of the future, also critical to our economic prosperity, national security, and competition?" In which case he listed China. So, I want you to talk about that. And, of course, how can guarantee the fruits of science technology can be shared across America, among all Americans? And what's the long term health of science technology in our nation? So, Eric, 75 years. What next 75 years will look like.

ERICLANDER:

Well, Victor, thank you for calling attention to this wonderful letter that President Biden sent. It's formally addressed to me, but it's actually addressed to the entire community of science and technology. And I don't mean just people who happen to have degrees in our work in jobs of science, technology, do people care about it? So, you know, the president entrusted me with providing an answer back to him. But it's all of us who have to think about these questions. So, you said that whenever Bush produced this amazing report in science, The Endless Frontier, and he called attention to the importance of the centrality in our strategy of continued commitment to producing new scientific knowledge and new talent. And, of course, that's going to have to continue. But you're asking, well, what goes on in the next 75 years? Well, for one thing, the science itself, I think, it just has so much possibility right now. There is so much that we look ahead that we couldn't even imagine a couple of decades ago. I'll give a couple of examples, but I won't mostly talk about scientific possibilities. But I can't help emphasizing it to say how much science continues to transform itself. And that this fundamental frame that Vannevar Bush set out is correct. There I think about in the field of biology and medicine, the transition of biology to being a digital science with digital information is now leading to the idea of programmable biology, programmable medicine. This is a really important transformation. It's been happening over the coming decades, you know, from being able to read out the genome digital information that codes the genes and all of that information to then more recently reading out all the variation in the human populations, and then reading out how the genes are read out, the RNA expression patterns in all the cell types in the body is going on, to then being able to read out and understand regulatory programs. We're not there yet, but we're gonna get to a deep quote, maybe comprehensive understanding about how to read that regulation. And then what will happen is, and is beginning to happen already, that people will think about how do you program cells? How do you put in a patch to the code that might do something to help, you know, make a cell that's becoming insulin insensitive become more insulin sensitive? You can think about doing that. If you think about this in a digital way, if you think about it with nucleic acids carrying instructions anywhere from the temporary and RNA to a more permanent sort of thing. And we will see people who write code for cells. We see it already in this pandemic with mRNA vaccine. So, the idea that one can sit down rather rapidly, and write

code. And one can ask, can I do this for cancer? Could I make cancer vaccines? What else could be done? With digital reading can I do cancer diagnostics in quite general ways with reading things out saved from annual blood tests? They're just a swirl of ideas that I think even those of us who are close to the world of genomics never could have predicted just how far those ideas would go. And they'll go even further than what I can imagine today because of this basic investment in fundamental knowledge and talent. So, I'm excited about that. And outside our own fields, you know, just in the past several months I'm excited about things like fusion energy. Something that was talked about since I was an undergraduate student. Well, that was really getting wagons. There are a dozens of startups in fusion who might actually make working fusion reactors that really could contribute. So, there is no end to this endless frontier. I think we've confirmed the endlessness of this frontier. But we could also think about what did Vannevar Bush not get in that report. What did he not think of and what did he maybe, you know. Well, just really, what did he not think of? I think there are a lot of things that have to be said. And they really go to the heart of what President Biden has asked us all to do, which is to reimagine, reinvigorate the science and technology strategy for the next 75 years, give or take to the end of this century. And one of the first is, Vannevar Bush's vision of science was a very elitist. It was a vision of work done at a very limited number of elite institutions, largely done by the kind of scientists he knew, which were largely white males scientists working in these kinds of institutions. And I think it's clear we're not going to succeed unless we really open up that vision dramatically. The science hasn't been welcoming to people with regard to gender, to race. So, having the resources to go into science. And with regard to region, scientists still are very regionally biased to where it takes place. Highly concentrated than North East in the West Coast. And when President Biden writes, how do we ensure the participation of all Americans in science itself, and in the benefits of science, we really need to take that seriously because it's not the right thing to do, but it's going to be essential to our succeeding as a nation. And so we need people around the table participating in science who are going to ask a wide variety of different questions and bring different perspectives. And I think this is one of the single most important things we have to do. I take seriously that this has to be a whole country of all Americans from all backgrounds. I know this is something the National Academy of Medicine thinks a lot about, but I just want to emphasize that at the White House, this has become a very major focus as well. And we are hoping early in the new year to come out with some really specific things we can do to help accelerate this. I think other things that were not as apparent to Vannevar Bush, the need to take on collective problems that require global cooperation. Issues like solving pandemics can't be done in a city alone, in a country alone. It takes a world working together. Climate takes a world working together. This was not the case in the time of Franklin Roosevelt. Our problems are so much more interconnected. And that is going to require thinking about science differently. They also involve scale that is different. An awful lot of the early NSF that Vannevar Bush conceived was about individual investigators at the bench. We still need that, it's obviously the life for sure. But we now need to understand how to build great portfolios of projects of all different sizes, because we can't be afraid to take on larger scale problems if that's what it's going to take. And we have to preserve individual creativity, even within the large scale problems. So, there are important things about the sociology here. And industry has become an important front of discovery. And we have to think about the spectrum across academia to industry in terms of what can be done, and ensuring the openness of all this. Vannevar Bush's world was a simpler world with regard to these things. Much of the science took place on your lab bench tree.

VICTOR J DZAU:

That is exactly right.

ERICLANDER:

So, you know, also I gotta say, in 1944, and the post war years, the US was sort of the only game in town with regard to science and technology. There was no serious competition for the United States. We are now in a world where everybody has read the playbook, and many countries are actively participating in science and technology. And there's even serious competition. In many ways in science and technology for the United States to succeed we need to think about how we ensure that we are seen on a global stage by, of course, including everybody within the US, but also thinking about the alliances. Making sure that we view this as not just Team USA, but reaching out working closely with allies and having it be easy for people to come into the US to do science and to share ideas and projects. And, you know, the United States has to remain the most attractive destination for scientists all over the world to come and practice science, be trained and do science. I know that the Nobel Prizes this year in the sciences of the Americans who received Nobel prizes, all but one was an immigrant to this country. And so we are stronger and the world is stronger when we keep open those borders. And maybe the last thing I'll say on this picture for these next 75 years. And this is still a work in progress. And I want to hear from everybody about what we should say to President Biden about the strategy. But something else that I don't think Vannevar Bush thought enough about at the time was public trust, the need to earn public trust. Maybe after World War II it wasn't much of an issue, the public just trusted scientists for a lot of reasons, including sometimes missteps by science itself. And sometimes through misinformation. We really have serious issues about trust, and trust is going to require us approaching this with humility. We can't just say, "Well, the public doesn't get it." We have to first ask, are we truly including? Are we truly making sure that science benefits all? Are we speaking clearly. And we need to earn that trust every day, and we need to bring a humility and a persistence to it. So, these are some of my initial thoughts about the response to President Biden. They will get more refined, and we'll actually write something at some point. But I don't want to do it too soon before we hear from everybody. So, this part is an open invitation to everybody to join in it.

VICTOR J DZAU:

Well, Eric, I know that you have been very inclusive, highly consultative, as you think about the future. You've always been a visionary. But I think you're certainly now listening to many other ideas that are coming from different parts. Love to hear your idea of inclusion and equity, which I think is so so important, and really looking at science with a much broader perspective than from a few. But, you know, as you said, 75 years science has changed tremendously. I mean, you emphasize the nature of science has change from individual scientists and teamwork, but much larger labs. Convergent science, the rise of open data, open science, and big facilities. But, you know, there are many sciences as funding is getting more difficult. As individuals working in teams, how do I get recognized? And as you said, there are many other considerations where I'd like to come back. But what do you say to the scientists, but the younger people that you've mentored so many of them, how this will prepare them for the future? And how, by looking at your vision of how science should move forward, that they, in fact, will have a great opportunity and great future in it?

ERICLANDER:

Well, the opportunities for young person coming into science today are so huge. I just think of how much information is at their disposal, how much technology is at their disposal to ask really these questions. You know, my own career slogging to get a sequence for one gene or identify a particular gene, people can now take much bigger pictures. And yet at the same time, you know, it is always challenging, and has become even more challenging. To start up a lab, to figure out how to work in teams, I think it's incumbent on us who have been in the system for a while to really address these issues that make solid that can make science the most satisfying career. Which is, individuals however they're working, whether they're, you know, alone in a lab bench or in teams, can really exercise their full creativity in getting real credit. And that requires rethinking a lot of our rules. I mean, everything from why in the world the authorship of the paper is a linear string. For example, when credit is not a rank order thing, I think we ought to be asking fundamental questions about the rewards of science, how often young scientists need to be going back to the well for another little brand and another little brand. And so I think if we're going to keep the ecosystem of science truly vibrant, we are going to have to be prepared to think about all the components, these components of how we think science is done. They're not, you know, ancient traditions. They were all invented with the last five years. They can be reinvented, we should think really creatively about that. The sharing of ideas, you know, pre publication through archives and things like that. They are not without problems, but they open up all sorts of ways to speed the sharing of information. And the app will then have to deal with the fact that sometimes that information might be premature and not right. So, I see a lot of,, frankly, the same innovation that we do at our bench, we have to do to science itself. We should view science as a thing that we apply science to.

VICTOR J DZAU:

Yeah. Very recently I participated in a meeting that you hosted about particularly research security, and relationship with China. I know that you certainly believe in global collaboration, as you said about global talent. How do we compete with China? And what are the concerns about the security?

ERIC LANDER:

Well, look, of course, there were concerns about security. Let me say that first. There are instances where China has sought to unfairly gain access to nonpublic information and has engaged in things in some cases that, you know, should be regarded as industrial espionage. This is very concerned with abuses of system. And there are appropriate things to do to make sure that we have researched security, I feel strongly about that. We have to ask people to disclose their contacts. And that kind of disclosure, whether it's about foreign contacts, or frankly just conflicts of interest. You know, when you're writing a paper, what companies do you have stock in and things like that? Disclosure is a very important part. But all that said, I'm also worried about going too far. Saying that, well, let's take the most extreme case, which sometimes happens. Scientists of Asian descent being targets of suspicion, Americans of Asian descent being targets of suspicion, simply use their Asian descent because they might have family in China, because they might have friends in China. I think we have to be very careful that the solution to research security does not end up cutting us off from what is our greatest superpower, which is that the US is the magnet for the best people in the world to come here and to collaborate and to interact. So, xenophobia, in all its forms, especially against people. You know, against Americans, people work in America is unacceptable. We should be very open to having people from around the world work in this country. And we have to balance. That's we, of course, have to take

security seriously. And we have to take very seriously that it is our openness that has been our greatest strength and will be our greatest strength. If we erect some barrier around the United States to keep it safe, we will guarantee that it will decline because it will not have the lifeblood of intellectual discourse that drives science.

VICTOR J DZAU:

Yeah, absolutely. Totally agree. Let's turn our topic to lessons learned from pandemic. I know President Biden asked you about what are lessons learned and implications for science, medicine and public health? And I want to talk to you about this, but also the fact that the American preparedness plan love to have you say a few words about that as well.

ERIC LANDER:

Well, there are so many lessons from the pandemic. One of them was, how can we avoid having future pandemics? That's one we took up as one of our first things here. We released in September the American pandemic preparedness plan, which lays is an aspect of that. How we can transform our capabilities. There are other aspects like what we can do about public health, which is incredibly important that we're working on. This one, this report is on how to transform our capabilities. Because I think this pandemic appeared at a very striking moment. Had it been five years ago, we would not have had the tools that we had to do things like make mRNA vaccine, so. Or, you know, some of the diagnostics that got made. But five years from now, we ought to be able to do much better. Much, much better. And so this pandemic showed us the challenges of the pandemic in so many ways, scientific and medical challenges, public health challenges, equity challenges. Because, of course, the burden of this pandemic fell so disproportionately on marginalized and vulnerable communities. Each of those needs attention. Let me pick up this first that was in the first report here on capabilities. We need to be able to generate vaccines in 100 days. Well tested approved vaccines in 100 days. OK, it took us 314 days to generate an approval of the first. That's amazingly good compared to anything in the past, and yet for the future won't be good enough. Imagine we had done this in 100 days. It would have meant in the spring of 2020 there were already vaccines, and what that would have meant to millions of lives. We also need to make sure that we have enough vaccine to vaccinate an entire world within the next 100 days. Can we do this? Can we do this whatever virus hits us next? Well, we're going to have to take it seriously. There are 26 families of human viruses, we've got to be prepared for all. We've got to be able to know. In some ways, we were a little lucky that this was a Coronavirus, compared to other choices because we knew more about Corona viruses. But luck is not a plan. We need to be able to make vaccines that will help us against viruses that mutate even faster. Might put in multiple antigens. So, and I could go on, and this plan for members of the Academy. There's a scientific appendix that talks about this. We need to think about therapeutics. You know, about small molecules that can complement vaccines that could inhibit polymerases and proteases from all these viral families. And that might even be developed in advance. So, we would have them available when a pandemic hits. We need diagnostics. I mean, ultimately, and I'm not very patient about this, we would like diagnostics that are super cheap. Under \$1. So cheap that every American could do it every day at home. Know if they had an infection and seek care rather than having to go out somewhere to find the test. We have to keep our mind focused on this rather than forgetting about that. We need early warning systems where we're actually able to monitor. I'm not sure that we should ever tolerate this idea of unexplained fevers. Patient came in with a fever, it wasn't explained. Well, maybe we should view part of medicine and

public health that we're going to run a diagnostic test. And if it's something that recognizes, it's a circulating flu, great. And if it falls out of all the knows, we are to go send it off for sequencing to see if there are unknown circulating. Why do we? You know, we take for granted many things. Like, everybody has a thermometer in their house. But we might want to begin to think that there are a lot of other things we should take for granted. There's, of course, public health. Strongly we need to be able to do so much better on public health. Our public health system, we do not support adequately the connections between the federal the state and the local levels. It's clear from what happens here are not strong enough and need to be restored. Always EPA is now working in parallel on an effort to figure out what we can do about really strengthening public health. And this is not in my opinion. Mostly for the next pandemic. Because mostly it's for every day. A lot of the solutions that are needed make a difference every day, and use that as a more over the horizon for a future pandemic. Which is why we put it in a different bucket right now that we're working on. The things I was saying first were kind of fundamentally about pandemic preparedness that will have effects every day. This is about something that's fundamentally about every day getting our public health. And I could go on. I advise anybody interested in this to read this report. We take it very seriously.

VICTOR J DZAU:

Yeah. You know, this one in New York Times. The front page says threats, resignation and 100 new laws, why public health is in crisis. Right. So, I think clearly that we need to reimagine public health. But being able to give it the authority and the ability to draw. And there is so much interference now. Right.

ERICLANDER:

Yeah. And I say that PKs is extremely interested in this question. PKs has now stood up at its first meeting where the pandemic came up. And I expect that PKs will also be weighing in on this. And I gotta say, a lot of our thoughts are informed by very good work the Academy has been doing on this. So, starting with what the Academy, the National Academy of Medicine has done on public health, is going to be a very important foundation for what we do. But we all need to be thinking hard about this.

VICTOR J DZAU:

Well, I wish I can keep talking to you for a long time. I've got this question list as long.

ERICLANDER:

Why could have it? But just not now. But I will have more opportunities to talk and more opportunities to talk to members of the Academy. Before we get to say to everybody, we need everybody on this. Whatever else you're doing, this is a special moment right now with regard to public health medicine, generally, in the wake of this pandemic. And everybody who's part of this meeting should be thinking about what they contributed. At OSTP, we're very eager to hear from everybody because all the assignments we have from the president, you are included, I think, on the CC line implicitly. So, please do your part.

VICTOR J DZAU:

Eric, I do want to ask you about climate. So, that, in fact, is also an agenda. So, tell us what you thinking, how can science and innovation help us address the issue of climate change as negative consequences?

ERICLANDER:

Look, there's so many ways in which science can play a role. But let me sort of few of them just very quickly. There are technologies that are here and now and we need to deploy them. And science plays a significant role in that. Because even though you might say that technology is here, and now, you know, solar panels are now producing electricity even more cheaply than fossil fuels. That's just remarkable. Fallen 10 fold in cost. Wind has fallen dramatically in cost. There are things that we should just be out there deploying, but we need to figure out how to connect ribs that can handle power flowing in both directions. Not just from the central power plant, but from power being generated in different sites and sent back onto the grid. It's an amazing systems problem, which requires systems engineers. So, science is going to play a big role in this deployment, regulatory policies incentives will all that. But all these pieces will require science to really work as a system. But then lemme just leap over the horizon. You know, over the horizon, you can even imagine things like I mentioned, like fusion energy. I mean, in fact we can see fusion reactors become practical. Well, you think about it. These are things that required nothing special in the way of fuel. They produce no long term high level radioactive waste. They inherently are not that expensive to build. They'll be expensive in the beginning, but they have no expensive pieces with them. And one wonders, do they, or other technologies, have the ability to get us to, for example, ultra cheap electricity? And if you have ultra cheap electricity, what other climate problems can you solve? Well, then you start thinking about yield making. The big problem there, a lot of that can be solved with ultra cheap electricity. Or what about fuels for jet planes or ships? Well, with super cheap electricity, you might be able to make it out of carbon dioxide from the air to produce fuels. Well, there's a tremendous amount that policymakers are going to have to do, and the Congress will have to do. But in the end, it's up to scientists and technologists to do their part, which is ultimately, it's not going to happen immediately, but ultimately to make net zero carbon energy cheaper than any alternative. In the long run, the world will ultimately abandon fossil fuels when, in fact, everything else is, when the net zero solutions are just playing more efficient and cheaper and available to everybody. That's the kinds of things that scientists should be thinking about and dreaming about. Believe me, the interim countries have to get together and work to decrease carbon emissions, they have to have the right kind of regulations in place, etc. But for the long future, ultimately science has the ability to take the problem off the table by saying they're just playing better solutions that not only don't produce greenhouse gases, but they're actually more efficient and let people around the world have more energy. We want people to have more energy for prosperity in their countries, we want to have it without pollution so we can attend to the very important questions of environmental justice. We want all of these things. And it's only scientists in the end that can do that. And so we have to do our part of it. And it comes from dreaming about possibilities and going into bench and working on it. I know it's not that most of the members of the National Academy of Medicine would do those sorts of things. What we all do as, science technologists, and we need it.

VICTOR J DZAU:

Eric, as I said, I can talk to you forever. But time is running out. I do want to thank you for those inspiring conversation. You know, when I think about this, what you really emphasize is not only the technology and the possibilities, but the benefits it must have to society. And then importance of inclusion, and dealing with mistrust. And I think one other area I know you care a lot about, you and I spoke about this, is to look at signs as mitigating the risk and harm they could do as we have amazing emergent technologies. The issue of ethics, the issue equity, the issue of accessibility, you name it. And we have

many conversation about this. And I know you have a broad sense of science in this way, including social science, behavioral science, many others.

ERICLANDER:

This is why it's so important to have everybody at the table, because we can think of amazing technologies. We have to work as hard to think about all the ways that they might possibly go wrong, and how they might hurt people. How we could build technologies that could, you know, facial recognition technologies that could discriminate against black Americans. Well, you know, you frankly have to have people at the table who are going to be empowered and have the perspective to say that we have technologies and the problems that have the potential for great advantage, but we need to have more women at the table. We need to have everybody at the table. Because if we're going to make sure that these technologies serve everybody, we have to look at the upsides together, we have to look at the downsides. And if you asked me about, how do we build trust in science? It's by being totally open about the fact that, yes, science can sometimes have downsides. And we know that, and we care about that, and we work on it. I think it's that level of honesty and commitment to addressing that and getting everybody to address like that. That is the foundation for any trust. If somebody comes and tells you, "Oh, just trust me, I'm a scientist." (INAUDIBLE). I want to run the other way. If somebody says, "Please be part of the problem. This has got such a potential upside." And, yet, we've got to be careful not to get the things wrong. I want to sit down and talk to them. And even more so for people who come from marginalized groups who have every right to be suspicious.

VICTOR J DZAU:

So, Eric, thank you for leading the nation in science and being the Chief Scientist of our nation, and really being the adviser to President Biden and working as members cabinet. I just want to thank you, and thank you for all the things you've done, yourself assigned. And now 'cause you'll be doing it in much broader way for the nation and globally. I'd like to turn it over to Sue, but certainly want to give you a big round of applause.

ERICLANDER:

And to you Victor.

VICTOR J DZAU:

Thank you too.

### **Panel 1: COVID-19: Disruption, Construction, and Learning from COVID-19**

SUE CURRY:

I wanna also join Victor and others in thanking Dr Lander for his remarks, and it's always hard to stop something that is incredibly interesting, but we have wonderful panels and I think many of the topics that Dr Lander raised are going to get unpacked more in our panels. So, let me introduce our first panel. This panel is disruption construction and learning from COVID-19. And it will be moderated by Carl Zimmer. Carl Zimmer is the author of 14 books about science, and he is a columnist for The New York Times. Zimmer started his career at Discover, where he served as a senior editor for four years. He went

on to write hundreds of articles for magazines including National Geographic, The Atlantic and Wired. Carl contributed to The New York Times since 2004 and has been a columnist since 2013. Not surprisingly, his journalism has won numerous awards from the American Association for the Advancement of Science, the National Academies of Science, the National Association of Science Writers. His books include *Life's Edge*, *The Search for What It Means to Be Alive*. Published this March, and *She Has Her Mother's Laugh*, *the Powers, Perversions and Potential of Heredity*, which won the 2018 National Academies Communication Award. Carl was Professor Adjunct in the Department of Molecular Biophysics and Biochemistry at Yale University. Please join me in welcoming Carl.

CARL ZIMMER:

Thank you, Dr Curry. I'm very glad to be here, and it's gonna be a really fascinating panel. We wanna have four scientists who are going to share their thoughts about what we've been through scientifically and medically in so far in this pandemic and what lessons they think we have learned or should have learned. And I think that this is a really, you know, this is a really crucial thing for the scientific community to be doing at this point in moving forward. I was actually inspired as I was preparing for this panel to go back and look over a century ago at the pandemic that last wreaked so much havoc on our country. The flu pandemic of 1918, there really hasn't been anything to compare to COVID-19 since then. And what really struck me was how the scientists and doctors themselves were grappling with the mystery, but they were contending with. I mean, you have to bear in mind that they did not really know what caused the pandemic. We were able to identify SARS-CoV-2 just in a matter of weeks as the cause of COVID-19. But when it came to the flu, people thought it was caused by bacteria. The flu virus would not be discovered until 15 years later. And so, you know, there this one passage really captured my attention from a Harvard doctor named Milton Rosenau. He published a paper in 1918 where he was puzzling over how he couldn't fake link the flu to a kind of bacteria that people thought was the cause of the flu. And he wrote, "We entered the outbreak with a notion that we knew the cause of the disease, and we're quite sure we know how it was transmitted from person to person. Perhaps if we have learned anything, it is that we are not quite sure what we know about the disease." Now, just three years later, Rosenau (UNKNOWN), Warren Vaughan published a magisterial book called *Influenza An Epidemiological Study*. And Vaughan was putting forward some of the important lessons that actually had been learned by looking at how the virus spread from person to person, the kinds of things that could slow its spread and so on. And he closes the book with this marvelous line, which I think kind of applies to what we're gonna be talking about today. He said, "Much work has been done and great experience gained by both the physicians and the nursing organizations during the last epidemic. Now, is the time to prepare for the next epidemic or pandemic, with the remembrance of 1918 fresh in our minds and we can establish a working system, while if we delay until the expected arrival of another epidemic, much of our painfully acquired knowledge will have been forgotten." So, I think today we're going to learn about some of the lessons that scientists and doctors have been learning, not just about the virus itself, but how pandemics are managed should be managed. How structural weaknesses in our health care lead us to be vulnerable to pandemics and how important even communication can be to the fate of the pandemic. So, we will start with Akiko Lwasaki. Akiko has her slides up already, but I'll just quickly introduce her. Akiko is the (UNKNOWN) professor of Immunobiology and Molecular, Cellular and Developmental Biology and professor of Epidemiology and Dermatology at the Yale School of Medicine. She's also an investigator at the Howard Hughes Medical Institute. So, I'll leave it to you, Akiko.

AKIKO LWASAKI:

Thank you, Carl. So, I'd like to speak to this panel about my own personal learnings during the pandemic. And I titled my talk from bench to bedside and to the world to reflect some of the learnings that I have gained through my team's bench science, as well as learning from the patients and also how we, as scientists communicate with the world. So, next slide, please. So, just a little background about myself. I used to be, I'm still I'm a basic scientist. We used to do a lot of animal models to model viral infection and diseases and trying to understand how we can leverage that understanding to make better vaccines. So, this whole panel is really entitled disruption, construction and learning. And so there was no bigger disruption to my lab's research than the COVID-19 in the history of our lab. And essentially, one day everything was shut down, and we had been doing all kinds of other research on viral immunity, but most of us just dropped whatever we were doing and started to work on COVID-19. And some of us started to model the COVID-19 using animal models, and others were trying to learn from the patients what's going on to the immune system in the COVID-19 disease. So, one of the first things we had to do was this great disruption leading to construction, meaning new way of approaching science. And that had to do with from basic science in mice to human translational research. And there was a lot of learning that I personally had to do, as well as the rest of the my lab in terms of logistics, how we approach this problem experimentally, and also how we analyze human data, which is quite different from what we normally do in the animal experiments. And then the next sort of challenge or construction really had to do with how we approach science from lab centric to team based science. And this was a dramatic shift in the way we were interacting with each other, not just sort of the zoom versus in-person kind of meeting, but also from one lab to several labs around the world and data sharing, which became a very important part of this science in the pandemic, particularly the use of preprint servers. And then personally, you know, managing large groups of people all over the world across the world became a very important task for me with respect to transparency of communication, expectations that everyone has about each person's role, as well as balancing, you know, research and family life. I have two daughters who had to do remote learning as well. So, balancing all of that together at the same time, trying to balance a large number of groups became quite a learning experience. I did summarize some of these in a recent personal view in Neuron for anyone who's interested. Next slide, please. So, the reason I said from bench to bedside to the world is because during this pandemic, we as scientists were also called to communicate science-based facts and scientific expertise to the world. And you know, I do communicate with multiple different platforms, including Twitter and a more traditional media like The New York Times. We've also written some op-eds about certain misinformation that was circulating. This is just an example of vaccine hesitancy that was, you know, quite strong in pregnancy. You know, what would happen to pregnant women if they're vaccinated? There was a lot of confusion and fear among young women because of the exclusion of pregnant women from vaccine trials combined with misinformation and disinformation. And what can we do to change this in the future? I think this is an important thing that we have to think about now. Next slide, please.

The other thing that's related to this is when is it appropriate to use scientific data to inform policy? This has come up over and over again and we are facing this right now with respect to many issues related to, you know, booster and vaccine induced immunity versus prior infection, mix and match.

AKIKO LWASAKI:

There are so many questions that everyone has on their mind which science, you know, is rapidly being done, but it's just not catching up with the expectation of the people as well as you know, when is it sufficient for the science to inform policy? And this is clear and consistent messaging is challenging because the change, the data are changing, the variants are changing. That the same message we had for the non delta may not apply for Delta or the future variants. So, this has been another big challenge in the community. Next, please.

AKIKO LWASAKI:

So, all in all, I think we need to really start to think, you know, seriously about science communication as scientists. Scientists are generally tend to shy away from engaging the public. Scientists should, I think, in my opinion, pay back to society through communicating clear and fact-based, you know, communication about issues that come up using our own expertise and how might scientists engage its critics most effectively? This is a topic I think all of us grapple with. Next, please. So, I wanna end with the slide, just highlighting what Dr Eric Lander already talked about, which is the pandemic has impacted certain member of the community much more disproportionately, such as women and underrepresented minorities. And it's already known that female scientists suffered a larger decline in research time and output compared to the male peers, especially those who have small children. And also during the pandemic, women are posting fewer preprints and starting fewer research and just sort of having to take a lot of responsibility at home as opposed to in the lab. Also in the media, male voices have been dominating the scientific commentary on the pandemic in many countries, and so this also needs to be balanced because scientists come in very different colors. And also to restore damage done by the current pandemic. What do we do now to restore this damage that was disproportionately affecting women and underrepresented minorities? And we need for the future to design better and resilient support structures to prevent this from happening again and start to think about the steps needed. So, there's a really nice article in UNESCO about all these issues, but I just wanted to highlight this before I go, to the next panelists. Thank you.

CARL ZIMMER:

Great, thank you, Akiko. We will next hear from Dr Saad Omer. Dr Omer is the director of the Yale Institute for Global Health. Saad is a professor of medicine and epidemiology at Yale University School of Medicine and Public Health. So, Saad, the floor is yours.

SAAD B. OMER:

Could you project my slides? It's my pleasure to be here. And it's my pleasure to talk about consequentialist research in a fact resistant pandemic. I'm a big fan of research that is non consequentialist. We shouldn't ask questions too early about why someone is studying zebrafish biology, because if we don't ask the question of relevance too early, we get some of the most exciting things on the applied side, for example. But within the pandemic there's a strong case of focusing on immediate consequentialist research where we say, what are the challenges and work backwards to finding the right disciplines and finding the right team. So, I will share my experience, which is a small, tiny portion of what happened. But it's an illustrative example of how several groups came together and tried to answer tough questions. And in my perspective, the ones whose output I personally like took

this approach that look at the question work backwards through disciplines and teams. And then the output. Next please. So, there were three warnings at the outset. And I wrote this op-ed in the New York Times on January 23, 2020. And you know, those of you who have written these op-eds know that you have very little control over the headline, but you can make suggestions, et cetera. The title was somewhat provocatively, and this was written when there was one confirmed case of COVID-19. It wasn't even called COVID-19 at that time in the US. So, there was one confirmed case in the US, there was obviously news from China, et cetera. And the title was is America ready for another outbreak? And the subheading was even more provocative, at least the first part, it said no, but there are clear steps the government needs to take. And the first warning, next.

Let the scientists lead, not just because, you know, it's parochialism, and I like gonna hanging out with my peers and they should, you know, be the philosopher kings of the world.

SAAD B. OMER:

The reason was that we knew, and that's the argument I put forward, that this pandemic, this new virus will change in unpredictable ways, or this outbreak at that time could evolve in unpredictable ways. So, therefore, those who are closest to synthesizing and assimilating new evidence should be closer to decision making. Next. The second warning was absolutely no false assurance, and it's now, I think, self-evident that doing so hasn't served us well. Next. The last thing was that there will be new sources of public and scientific misinformation. A third of my portfolio has been on vaccine acceptance and some of that work, although the rest is more conventional clinical trials and epidemiology and are increasingly in collaboration with basic scientists, et cetera like Akiko actually, that we have worked on some of these questions. But the idea was that there will be preprints, I argued, were a force for good. But they can also be a force for a source of misinformation and sometimes disinformation. Unfortunately, all of these warnings turned out to be prescient. Next. So, a few examples one, of our earlier studies that came out in a National Academies journal that turns out a bit later but a preprint was shared in mid June, I think 2020, and where we looked at what is the impact of policy versus voluntary behavior when you implement sort of shelter in place orders. So, I collaborated with economists in our school of environment. So, borrowed from that field and we worked together to figure out and what we found was it's actually both of these things matter. People start modifying their behavior voluntarily, and we used in this case a sample of cell phone data. And we figured out that the behavior would be modified even if you didn't put in certain place. So, there would be, as a consequence, impact on the economy if you didn't have this quote-unquote lockdown orders. But these orders actually have an impact on social distancing and time spent at home. So, both the voluntary behavior and policy interventions are important, and we try to quantify and went into some mechanisms for that. And you can read the full paper. Next. The other thing was in as early as fall 2020, we were thinking with the other groups that there is some pandemic fatigue setting in. And then we identified, we looked at national surveys and we identified, we created a non-pharmaceutical interventions adherence index with colleagues and found that initially there was a lot of compliance in the US. But then it dropped. And there were some differences between regions. But then it leveled off. And so we started talking about the preemption of the impact of this pandemic fatigue as early as late 2020 and early 2021. Next. And then there were these early reports, and we knew from SARS-CoV-1 that, you know, you should be looking at feces, you know, broadly both for transmission. But there was this other blip of data that someone had identified

viral RNA in feces. So, look, I work in global health a lot and there's always the glass is never 90% empty, it's always 10% full. So, the hope was, could we use this as an alternate mechanism to follow the outbreak and even predict the outbreak? So, we worked with Jordan Peccia at the School of Engineering. He's an environmental engineer. And the idea was, could we identify this in sewage but not also identify it, SARS-CoV-2 RNA in sewage as a way to monitor the outbreak, but also use it, apply epidemiological methods to see if they could warn us, even by a few days of surges, et cetera. Next. And we did. Next as well. So, we did do that both through epidemiological analysis and sort of data from the sewage. And this was done. This work started during the harshest lockdown, where students from various groups, including medical students, engineering students, went down manholes to collect specimens. And as a group, this was one of the earliest academic outputs on this topic, not just identifying the RNA, but also using it as an epidemiological tool. And it wasn't sort of one person's doing. It is, again, team science, starting with the problem, working backwards to the solution. Next.

And then I was fortunate to be a part of the committee of the Academies formed on coming up with an equitable allocation of COVID-19 vaccine, but also was fortunate to have a similar role as a member of the WHO COVID-19 Vaccine Working Group. And we came up with the mortality first approach.

SAAD B. OMER:

One could argue that you could go in different directions, but I think because of the fact the second third order of priority has been different and now we are reaching in certain countries a level where we could attempt to interrupt transmission. The fact that the initial focus on mortality has held out. And here, one of the reason why I brought up this slide is, look, a lot of comprehensive medicine. You know, medical education programs and (UNKNOWN) programs have courses on ethics, behavior, et cetera. And those of you who are at earlier stages of your career, pay attention to them. They have good solid information, so often delivered by world experts. And those are the things that come in handy when you have to integrate this information. Even at this level during a pandemic, next.

And then a lot of groups have been doing vaccine effectiveness studies with the vaccine effectiveness studies leverage, in this case, the VA database to look at vaccine effectiveness in High-Risk population. But again, I don't think we have leverage enough of our electronic systems to do these vaccine studies and asked nuanced questions.

SAAD B. OMER:

And we all admire the fantastic work coming out of Israel. But the reason why they had been able to do this is their health system. Of course, it's a smaller country, but we have smaller parts of our large country. And I think we need to have these investments in data systems. And again, so that these questions can be answered quickly and efficiently. Next. And then the issue of vaccine acceptance. So, we did this 12 country study with again, an economist collaborator in this case. And we found that overall in low and middle income countries, while there is heterogeneity and there needs to be work done on vaccine acceptance, the acceptance is higher almost every step, irrespective of the subgroup in low and middle income countries or off a COVID vaccine. And the reason it turns out it's important is now it's the talking point has been used as a red herring, do not have vaccine equity that these countries

are not prepared to deploy vaccines. Frankly, we never had that discussion. We had data in May 2020 and other surveys were showing that there will be some softness of demand in certain sections of the US society. But we never had that discussion in the US that we should not have enough supply of vaccine because there is some work to be done on the demand side. Next. And now we are doing social media studies in collaboration in five countries with partners such as UNICEF, Facebook and Public Goods Project, where we have already done in our initial stage 27 campaigns designed and lodged with minimal investment compared to advertising budget. Tens of millions of Facebook users have already been used and we have already have certain lessons from these randomized trials. So, with the each campaign, we run a randomized trial and learn from this. The next step will be actually measuring on the ground coverage. Next. And we have found that values based messaging works and local language content is more penetrable. But again, this insight on values based messaging and it's not just a warm and fuzzy word, there's a whole science behind it. And we use the moral foundations theory to come up with specific values based messaging, using social medias on insights that has helped. Next. And lastly, in July 2020, a few of us got together, I partnered with colleagues in Stanford and University of Indiana who were law professors to come up with a framework based on some of the empirical data all of us had generated over the years to come up with a framework of vaccine mandate that said that all of combining data, combining ethics, combining law, you should have six triggers before you implement the mandate. The pandemic should be inadequately contained. The vaccine should be (UNKNOWN) recommended not just FDA authorized. There should be adequate supply of transparent communications, infrastructure to deliver it to all sections of the population, inadequate voluntary response. And so that has been shared with policy makers, and some of that is imperative on their part. But that kind of a framework has, you know, has been found useful by at least a few people. So, again, another example of partnering with different starting with a question working backwards to solutions in a pandemic. Next. And then we generated several products around vaccine misinformation management field guide with UNICEF, its first draft and public good project. Those are partners there. And this has been translated in multiple languages of vaccine messaging guide and with WHO an overall acceptance guide. And the reason I'm bringing it up is often there's a lot of recognition that we need to communicate effectively. But often we don't realize that there's a whole host of evidence behind it. And we owe it to the public that we apply the same level of rigour in vaccine communication, science and public health communication science as we do in vaccine development science. Next. So, here are a few examples of consequentialist science, many of those group did it much better than our group. But the idea is, and the reason why I took this frame is because the National Academies and especially National Academy of Medicine, because of the fact that it broadly defined its discipline, its mandate. Its intake of members is broad from various subdisciplines of medicines and adjacent disciplines makes it very suitable for addressing a lot of these consequentialist challenges as they arise. And in between those challenges that are not just short-term emergencies, but long term problems like global climate change and its impact on health. I'll pause here. Thank you.

CARL ZIMMER:

Thank you, Saad. Next, we will hear from Dr Matthew Wynia. He is a professor at the University of Colorado School of Medicine and a Colorado School of Public Health and is director of the Center for Bioethics and Humanities at the University of Colorado. And before I hand it over to Matthew, I just want to just mention that, you know, if we have time, we will be happy to take some of the questions from the audience and offer up some answers. So, you can leave questions and I'll be provided with

them and we'll see how much time we have for questions at the end. So, great. So, Matthew, the floor is yours.

MATTHEW WYNIA:

Thank you so much. It's a tremendous honor to be included in this discussion today. I was just inspired by Dr Omer's list of tremendous research accomplishments over the last 18 months that had actually a little bit both emphasizes and as a counterpoint to one of the main points I wanna make today. I'm gonna just make three points. I'm gonna point out, number one, we don't have the evidence we ought to have to make policy decisions in this pandemic. And that's because we don't have the infrastructure, we need to be gathering evidence on a regular basis when there are disasters. So, and I'll give a little bit of data on that from our recent National Academies report that I was involved in. And then number two, I'm going to say there is an intractable ethical challenge in gathering good information, especially clinical information to guide clinical decision making in the sense that individual doctors want to be able to move forward with the best evidence they've got. And yet we really need their engagement in order to collect better evidence to inform decisions so that we're sure that the things we're doing really are making a difference in a positive way. And then that is fundamentally a complex adaptive challenge for which there is not a simple technical fix. But there are ways that we can do better and they have to do with adaptive trial designs and things like that. And then the third point I'm going to make is, in medical science, we've known about the hype cycle and the hype pipeline for a long time. They're very real. And what we're learning now is that they are also evolving. So, that they don't just involve professionals anymore. And there are significant consequences of that dynamic. But I want to spend just a minute on. So, we go to the first slide and start with this point one, which is that we don't have the evidence we ought to have. This is from a study completed in 2020. So, pre-pandemic, they're almost entirely pre-pandemic. The study chair was (UNKNOWN) and Autumn Downey and (UNKNOWN) did an amazing job or an enormous study lasting over two years, examining the evidence base for public health emergency preparedness and response. Looking at all the research done in these domains over the last 20 years since 911. And I've circled the area here where I was most involved, which was looking at research on non-pharmaceutical interventions. So, that things like masking, distancing measures, quarantine, business closures, travel bans and so on. And you'll note number one, compared to some other areas of public health, emergency preparedness and response is actually a fair number of research articles in this area that, sorry events, just one to put the circle around non-pharmaceutical interventions. So, that 10% represents about a 125 studies. But only ten of those studies were actually quantitative studies that were comparing two alternative interventions of the type that Saad just mentioned a moment ago sort of RCT type research on pandemic response or on public health emergency response. So, next slide. So, this is the conclusion from our study, but the question to be raised here is why is there so little evidence? And I'm not gonna provide all the answers to that. We can talk about it in Q and A. But you all know there are many challenges to conducting rigorous research of the randomized controlled trial type during a pandemic. And I think the question we need to face today is what is the infrastructure needed to ensure that every time there's a major disaster, we learn from it to improve our resiliency, our prevention strategies, our response strategies. We really don't have in the way that we have an NIH to look at basic science around specific disease types. We don't have a piece of our national scientific (AUDIO DISTORTS) that is really designed, purpose built for disaster response studies. So, next slide. next point here is that there is a barrier to evidence collection that is an ethical dilemma and in bioethics. So,

I feel like I really had to hammer this home. If you hit advance once more, I'll just put a quote up from this terrific article from The New York Times last summer. So, next please.

There it is. I just heard, this article, by the way, if you didn't get a chance to see it when it came out is very well worth looking up, because it really describes stories from ICUs about people in this dilemma together, desperate patients and their doctors who serve as their advocates really want access to potentially promising drugs as quickly as possible. They don't always feel like they can or should wait for definitive trials.

MATTHEW WYNIA:

Once they have a sense, the benefits are likely to exceed the harms they wanna be able to move forward. And yet, without definitive trials, we'll never know if the interventions we're using are actually effective or possibly are harming people. And we've seen multiple examples of this during the pandemic. I'll mention a couple as we go here. Next slide.

This is a great example of how we manage this problem very early on. It seemed like convalescent plasma made a lot of sense. The FDA gave it an emergency user authorization.

MATTHEW WYNIA:

And not only that started advertising around the country, saying, if you've had COVID and you've recovered, here's something you could do to feel like you are making a contribution to the COVID response. And I mentioned before, there are a number of things that drive us in the direction of trying things because they seem like they might be a good idea. Unfortunately, issuing an EUA and this level of sort of hype around convalescent plasma means it took a long time and it took mostly trials from overseas. And if you could advance once more here and then advance once more. It took us too long really to find out the convalescent plasma doesn't really work. Notice the date on this paper. This paper didn't come out until a couple of weeks ago. And we've been using convalescent plasma for over a year. Next slide. My last point, there are multiple reasons. Some of them are listed here, why scientists, their institutions, the news media tend to hype exciting new findings. And through traditional way of thinking about hype in science is to approach this as a matter, essentially, a professional self-regulation. And the public in this instance is seen as sort of the victims. They are at the receiving end of the hype pipeline. Go to the next slide.

The challenge here is that social media is changing this equation while interventions to prevent hype focused on reining in professionals are valuable. They're not going to work once the information has sort of escaped the scientific community and is out in the world and is the subject of hype by non-professional actors. Next advanced once more. So, you know that's just one example, but political leaders, social media influencers are now an integral part of what we used to call the hype pipeline. Hydroxychloroquine is just one example. I'm sure you can think of others. Next slide. And in fact, this is my last slide, but it's just a brilliant quote, I think, from an art, from a group in Brazil, looking at how to address hype in this new environment where professional self-regulation will no longer be sufficient

because we have to learn how to diffuse information, misinformation, hype after it has been released into the world. And there are at least... I'm gonna just give you two reasons for hope about this. There's a lot of reasons to be cynical, but a lot of reasons to be a little down about the challenge of addressing misinformation once it has become widely disseminated. But I think there are two things to think about that give us hope. Number one, there are multiple studies and Saad mentioned these as well on rebutting and debunking this information. There was some early concern years ago that rebutting false beliefs can actually backfire and end up entrenching the mistaken belief, but more recent studies in social psychology find this backfire type effect is actually not that common. There are several studies have looked at backfire effects specifically when looking at politically polarized issues, specifically, even looking at people who self-identify as political conservatives and so on. And it turns out countering this information works. It doesn't work perfectly. But even when you're dealing with very polarized and very sort of difficult issues like environmental dangers of fracking or what causes pay gaps between that and women, real data can supplant misinformation. And there are a number of effective techniques things like presenting facts in a causal explanatory manner as a story, right, you need. If someone has a story already, the way to change that is to replace it with a different story showing how correct information can actually fill in gaps that the story contained because it was filled with false information. And last, the second reason for hope, you might worry that social media is billions of people. So, there are billions of nodes of potential misinformation. There's a little truth to that, but it turns out network modeling shows there are social media focal points. So, NPR reported last spring, for example, there are really 12 people out there who put out most of the misinformation on vaccines. So, these points need to be mapped and surveilled and misinformation coming from these points can then be addressed more quickly and more effectively. So, I'll end there and look forward to the conversation.

CARL ZIMMER:

Great. Thank you, Matt. Thanks so much. So, our final speaker of the panel before our discussion will be Dr Yvonne Maldonado. Bonnie is Professor and Chief of the Division of Infectious Diseases, Department of Pediatrics at Stanford University School of Medicine. She is also the Senior Associate Dean for Faculty Development and Diversity at the Stanford School of Medicine. So, Bonnie, floor is yours.

BONNIE MALDONADO:

Thank you so much. I am an infectious disease epidemiologist and a pediatric vaccinologist working primarily in the global health sector. So, the work that I've done with COVID, I'm not gonna talk about today, but certainly, you've been involved with clinical trials, epidemiologic studies, laboratory-based, genomic analysis, et cetera, that have really served, I think, to help us disrupt and construct new models about how to affect and address new pandemics and the existing pandemic. However, one area that I think we really need to focus on, and sadly, I think we have not really done a great job of even disrupting yet much less constructing and learning from is what are social determinants. So, we have a long history of trying to understand these social determinants, and nowhere has it been more starkly revealed how these social determinants have come to play in the health of our nation, in the health of our world and how we have essentially ignored these areas, even with research policy framework. So clearly, more disruption and construction needs to take place. And I'm going to talk a little bit about that today and hope that all of you can really take these back to your own areas of research and remember that these are critical. So, if I can get the next slide, please. As we all know, since 1980, the healthy people initiative has set measurable objectives to improve the health and wellbeing of people nationwide. Healthy

people 2020 first introduced social determinants of health. So, it's only been a few years since we even saw these objectives since 20... they started in 2010. And we do have Healthy People 2030, including social determinants of health. Now, these are also shared in general with the World Health Organization recognizing the social conditions and environments are shaped, shaped by a wider set of forces, including economic and social policies. Healthy People 2030 is the fifth iteration of this initiative, but only the second that includes SDOH. And these include objectives in five domains as shown here, healthcare access and quality, neighborhood and built environment, social community context, economic stability, education access, and quality. So, next slide, please. So, why are these important? Well, we can see just there are many papers in this area, but just two bar charts, bar graphs here show you or pie charts show you that if you look across Europe, US and Canadian studies, and there are many others as I mentioned, looking at social determinants of health as compared to medical or genetic determinants, they far outweigh the impact on not only disease but wellness in all populations. So, between 30 and 50% of more of our health, our longevity are all of the determinants that keep us healthy and well are not determined by our genetic code but as they say by our zip code. Next slide, please. Now, I like this. Look at the PAHO framework, although WHO also has a nice framework for addressing social determinants of health and equity. And the reason I really enjoy looking at this particular framework is that there is a greater emphasis on structural racism, colonialism, and the importance of relationships to land. There's also a greater emphasis on the environment and climate change and a more explicit focus on human rights, inequities according to gender, ethnicity, sexual orientation, life stage, and disability. It also recognizes the interrelations between these and emphasis on leading dignified life as a desired outcome. Now, this conceptual framework is also helpful another way is that it really does look like it's an interplay, so you can enter this particular framework at any place and really take it altogether, move from one framework to the other, taking a comprehensive approach to tackling these structural determinants of health and the inequities that we face, not only in the US but around the world. Next slide, please. So, what do we have to guide our research in the US? Well, there are many frameworks you saw the PAHO policy framework. But even within our own federal agency, we do have frameworks, not only for healthy people, but from a research perspective, the NIMHD that does have its own framework. As you can see here, looks at levels of influence, domains of influence and health outcomes. And fortunately, we can see that these are areas that we can study specifically in either one box or another, or even multiple boxes to look at influences of social determinants in a research-based manner. Now, unfortunately, this is only one institute. And the funding for these are quite difficult. I would just have to be honest. I personally have a US4 in this area from NIMHD. And we're currently working with RADx-UP that is a rapid acceleration of diagnostics for underrepresented populations. So, we have received funding in these areas. But as you heard before along with the science, these grants came through, you know, about a year after we knew about the pandemic. So, we clearly need better ways to address not only the basic research that's involved here, but how do we rapidly engage underrepresented populations,

(INAUDIBLE) quality issues and get those going very early on when there is a crisis, because with many of these populations that we're discussing, the underlying allostatic load, the underlying social determinants that lean in a negative sense towards poor health are already in existence and are ready to push these individuals and these populations over the ledge. So, if I could have the next slide, please. So, let's talk about the overarching issue. What is the overarching issue here around that big chasm? And again, remember, we're talking about today, I'm going from policy to equity. Here's the reason why we cannot do that. This is the house that racism built. Racism is viewed as a dynamic societal system shaped

by that and reshapes other social institutions, such as the political, legal, and economic system. This is the bedrock on which our country was founded in many other societies as well. The pathways by which racism affect people are interrelated and mutually reinforcing, and importantly, implicit biases, which again, as a dean in this area, I deal with on a daily basis and we continue to see that implicit bias can drive and lead to and reinforces inequities in political, legal and medical institutions. It is ingrained into our social fabric. Next slide, please. So, what do we mean by social determinants of health? Now, I know that this is a very simplistic approach, but many people really still don't understand what are we talking about and what does this mean in an individual person's life or even in a community. Well, we're talking about things like poverty, frontline jobs, proud of living spaces, a reliance on crowded public transportation, social food deserts, or swamps, and inadequate insurance coverage. And all of us who saw patients who did clinical trials, who did epidemiologic analysis, even those of us who work in the laboratory saw these individual factors and more play out in our populations at risk for COVID-19 and specifically. And we know that these will continue to affect people, not just COVID 19 related, but any other aspect of their lives, because they are on the margin. And how are they on the margin? Let's look at the next slide. So, if you look here, this is just a very small example of some of the areas that people looked at in this Kaiser Family Foundation survey experiencing loss of employment income, difficulty paying, usual household expenses, and food insufficiency in the household. This to me is the most heartbreaking one as a pediatrician, watching children who cannot, don't have food on the table in a very vulnerable period of their lives. And you can see that it was quite extensive during COVID-19, even with all of the social safety nets. But those safety nets didn't reach all of our populations. So, in black there, you see the populations in the racial and ethnic minority populations really experienced the highest risk for just these three factors. And we can imagine that can go on and on about maltreatment of children, developmental disabilities and delays, obesity increases in populations at risk, et cetera. So, this is quite a very small snapshot of what health inequities will do, not only for this COVID-19 pandemic, but for health overall. So, next slide, please. So, what can we do? Well, this is just one small area, but I'd like to point out the social vulnerability index that was put together by the CDC many years to go to identify communities that need support before, during, and after public health emergencies. And this is a really simple tool, but it's actually a powerful one. It's an open database, and it's a measure of social determinants using census data and zip code. And you can rank each county and census track on 15 social vulnerability factors, grouping them into socioeconomic, housing composition and disability, representation of racial and ethnic minority groups, and housing and transportation. And these data can be used for research purposes. They can be used for policy purposes. They can be used for direct public health interventions. Next slide, please. And how does this play out for COVID? This is a striking example of how easily this can be mapped out. So, here on the left, you see that social vulnerability index that I just mentioned, and you can see that overall when you scale high levels of social vulnerability to low levels, with the darker blue being higher levels of inequity and lighter being a lower levels of inequity or no inequity. And you overlay that map from last year's COVID 19 hotspots or case counts per a hundred thousand. And they are almost a perfect match. So, you can see how social vulnerabilities really drove this pandemic, especially early on. And not only that, I don't, I can't go through it now, but if you take this down to a more granular level, you can see by pulling out those counties there on the right, you can find out whether rural counties or urban counties were more involved, whether household density was an issue. And you can do this, not only overall in this big map, but you can do it by census track and you can do it by county and individual public health officials, researchers, et cetera, can go in and tease out individual factors by region and really try to make a difference. So, if we really are serious about making

a difference and not just publishing papers and talking about white papers, how to get social determinants on a PR, you know, on people's radar, we need to actually get into the weeds pound the pavement. I'm a CDC-trained epidemiologist, and our symbol is the shoe with a hole worn through it because we pound the pavement. We go out there, you find the people who are at risk and you do something about it. And I think this is where bridging that chasm between policy and equity really lives. And I'd like to stop there and thank you for your attention.

CARL ZIMMER:

Thank you so much, Bonnie. That's it gives us a lot to think about. So, one of the things that kinda came back to my mind as I was hearing each of you speak was that some of the key problems that you were pointing out with what happened, what has happened during the pandemic, in a sense, there are problems that are far from new. And I'm thinking of myself as a journalist, I and my colleagues, we have written in the past about the problems of structural racism. We have written about the challenges that women in science face. The hype cycle is not new. I remember blogging about it years ago. And even the understanding that there were that miscommunication could lead to bad outcomes in terms of health, I mean, we've been dealing with that, even just with vaccines for years. So, it feels... I get the impression from the presentations that in some ways on the cusp of the pandemic in January 2020, we already knew what a lot of the problems were and then they happened.

(LAUGHS) So, I'm kind of wondering maybe if each of you might want to reflect on, I mean, if maybe I'm wrong, but if you agree with that, like, what was the disconnect? If we understood for example, that trials are often poorly set up to really come up with a good outcomes so that we end up with a situation like convalescent plasma, where it takes months to figure out, well, maybe this isn't all that we had hoped for. If we knew about these problems and have these tools in place at the beginning of the pandemic, why did they continue to be such a problem during the pandemic?

BONNIE MALDONADO:

So, let me go ahead and give a start. Again, I mentioned I trained CDC, we've known for decades, decades that public health is seriously underfunded in this country. And I don't think it's appreciated well. It's very hard to prove a negative. So, we know that if you avoid disease it's very hard to show that there's actually a success there, but there's actually also some reason for hope, because if you look overall at our public health structures in the last century, I think we've done an amazing job. We just need to keep moving forward. I think we've been sitting on our laurels for too long. And at the global health level, if you look at the Millennium Development, Millennium Development Goals through the next stage, the sustainable development goals, we did... as a world, there was tremendous progress. So, when people understand, if there's a call to action, if you really put emphasis in these areas, you can really make a difference. Now, obviously, we lost a lot of ground over the pandemic globally, but not as bad as we thought we had. And I think this is... this, unfortunately, we live in a crisis mode. Many of us do, I think the world lives in let's solve the next big problem. I teach a class on epidemiology of infectious diseases. And we always say that the media attention to diseases, the inversely proportional to the incidence of the disease. So, let's take advantage of this moment in history to really start that process and not forget why we did it and make sure that we build these teams, these collaborative teams, not only among researchers, not only among public policymakers, but our communities of color, our communities around the world are lower and middle-income colleagues and make sure we build all of those connections and have actionable items that we can really move towards.

CARL ZIMMER:

Thanks, Bonnie.

SAAD B OMER:

I'd be happy to go next.

CARL ZIMMER:

Great, Saad.

SAAD B OMER:

Yeah. So, I think, I really agree with Bonnie and I think these are really good. It's a good diagnosis and I'm not gonna repeat that. And I think all of these causes loosely using the word. I know there are people who work on, who may be listening, who actually work on causal inference. But so, hence the caveat. And so, I think these are important, but I would go a little bit deeper if I may. I think proximal causes are important and useful and needs addressing. But at this pandemic, it wasn't a failure of science. And fortunately, or unfortunately, we knew how rapid tests were done, we knew PCR was invented way before, we knew how cohort studies are done, we knew how randomized control trials and pragmatic trials were done. Ivermectin is old, and its limitations could be recognized earlier. We knew there is a whole body of research on vaccine acceptance and public health messaging, et cetera. All of that is there. I think if we had a failure. And this is not a partisan statement, and I'll qualify that why I'm saying it's not a partisan statement, it was a failure of governance. It was a failure of governance to let it slide that public health preparedness funds were cut and were not reinstated. And public health departments were starved of resources. It's a failure of governance spanning multiple administration that looked at public health as a sideshow and looked at got unarmored a little bit too much by technological solutions, rather than leveraging technology for a consequentialist purpose coming back to what I said earlier. It's a failure of governance that creates global vaccine equity as an afterthought. It is in our self-interest not just because history will judge us poorly if we have another big surge like India during the winter months in Nigeria or Kenya or any other large country or a small country. As it is, mortality is high enough in many parts of the world, justifying immediate action on global vaccine equity. But it is also in our self-interest to ensure that we minimize opportunities for the virus to mutate. So, all of this stuff, it's not just in recent past, it's not a failure of science. It's a failure of governance. And it's not a failure of governance in a part in a partisan sense. It's a failure of governance that we as a society as a whole need to pay attention to, not a certain specific administration. Obviously, there's accountability in democratic societies for individual administration, but that's not what I'm focusing on.

CARL ZIMMER:

OK. Thanks. Akiko or Matt, I don't know if you had anything you wanted to add.

MATTHEW WYNIA:

Well, I'll build on what Saad just said. I agree this was a failure of governance. And the strategies of governance are amenable to scientific examination and study. As you know, because you've done some of these kinds of studies where you approach problems in a couple different ways and see which one works better. And we have opportunities for this every time there is a disaster, every time there's a drug

shortage, every time, right, there is a resource shortage of any kind, we have an opportunity to learn more about how to effectively allocate scarce resources. And we've largely failed to do that. So, I think it is a failure of governance. And I'd love to see research on these governance issues. And I'd love to see a home for that research. I think there will be funding for it now because we're coming out of a pandemic. That funding will eventually dry up because we've seen this cycle before, when there's a major national disaster of some type, we get an infusion of funds. And then, eight or ten years later, it's gone. And if we are wise about this, I think there is infrastructure that can be built with those funds. There are structures that can be established that might allow for ongoing research and learning over time. Beyond this, what will inevitably be a wave of funds to prepare, but what's gonna prevent us, you know, after the 2009, H1N1 pandemic, which fizzled in terms of how many people it killed. But it was still a major event and it depleted our national stockpile of N95 respirators, which were then not replenished, what's gonna prevent us from having to learn those lessons again and again. Right. And that's where I feel like having some infrastructure in place that will synthesize lessons learned and make sure that we are, as we do with kidney disease, as we do with heart disease, as we do with cancers, we need to build the evidence-base for public health emergency preparedness and response. And that requires comprehensive strategy and core infrastructure suits a purpose.

AKIKO IWASAKI:

Yeah, I just want to... But I... So, thank you, Saad, for saying it's not a failure science. In fact, there's a lot of drugs and treatments that were examined in the preclinical studies around the globe including my own laboratories that have prevented sort of some of these other drugs from going forward that may not have had any impact or even harmful impact. So, there is this sort of unseen science that was done to prevent some of the non-promising candidates from going forward. And I think that's sort of underappreciated that a lot of us sort of chipped in and did this research during the pandemic, which is never comes to surface.

CARL ZIMMER:

So, we just have a few minutes left, maybe just we could round things out instead of looking at the sort of the deep problems that were sort of highlighted in the pandemic. I'm just curious, like if any of you, if there's anything in particular, a lesson that's new and surprising to you over the course of the pandemic, something that kind of popped out like you thought, "Wow, I hadn't thought about these kinds of challenges before in this particular way," or "Here, here's a totally new tool that I want to use going forward." And what would be one of those surprising new lessons that you really hope that your colleagues and future generations don't forget so that you really hope will be, you know, you can be a big thing or a little thing, but just maybe one thing that, you know, if you could put it in a time capsule for future generations, it would, people would remember it from this experience we've had. We can go in the same order. How about you, Bonnie?

BONNIE MALDONADO:

Yeah, I would say, frankly, again, I'm not, unfortunately, I wasn't surprised by this pandemic, obviously, we didn't know it was coming, but I wasn't... we knew something was gonna happen. We worked with other pandemics in the past in this country and other countries, but what I think was really startling was the power of the collective. That's what really was amazing to me given the fact that we were relatively isolated from one another in physical terms, virtually the collective really pulled together to highlight

specific issues for good and for better or worse. So, for example, we have the misinformation collective, but we also have the youth collective. We had people who were really just highlighting social issues, highlighting the societal structures, the gender-based issues that came up that we had really thought about, but I think really hadn't pulled together. And I think that power was vibrant. It was palpable. And I do think that's something we can tap into one of my colleagues. I won't say who she is, but she might remember. Years ago, we were talking about a vaccine that worked really well in the developed world, but not well in the developing world. And she was asked if she was a glass half empty or full person. And she said, "I don't look at it that way. I just look at how big the glass is." And I think that's what Saad alluded to earlier. And I think that's a great way to look at it. With this collective approach, it doesn't matter what increment we make, any incremental change is gonna make a difference. And that's where... But again, we have to be careful because that collective can work for good or for, I wouldn't say evil, but just for at cross purposes for the good.

CARL ZIMMER:

Great. Saad, quickly, like your favorite lesson that you wanted to hold on to?

SAAD B OMER:

Well, I will say that sort of I will borrow from an international affairs scholar, Tom Nichols, his hypothesis. I think he has a book coming out saying that the US is an unserious nation in terms of, I don't, I don't... I think it's unfair to just single out the US. The global society is increasingly unserious. And the reason I'm saying that is that we have an increasing proclivity towards fluff, towards talking points, towards varnishing uncomfortable truths, towards what is the output for the next grants and the preliminary data for the next arrow one rather than looking at the big picture, looking at what is. And this is drawing implicit lessons from the great recession of 2008-2009, where it was the earning reports, not the long-term health of companies. Similarly, I think we are going in that direction both as a society, as science as well. So, I think we'd have to get serious because the big climate change in a big challenge in health that is coming, it is already at our doorsteps. There's the planetary health impact of global climate change. All of these things like inequity, gender imbalance, our inability to operationalize science, and all of that is going to be pretty substantially of a pretty substantial magnitude and more sustained in that for planetary health, et cetera. So, as a summary, I'm not saying that we need to stop cracking that jokes. As my students know that I have an unhealthy taste for corny jokes in my class. I'm saying that we should, as a society get serious about looking at real solutions not looking at short-term press releases, and making sure that the science stands up to that is up to the challenge that is in front of us, which is planetary health.

CARL ZIMMER:

Great. Thanks. Matt?

MATTHEW WYNIA:

Yeah. I'll once again, I think I'll build on what Saad has just said. I think there is a sense in which we tend to varnish the truth and the difficulties of some of the situations we face. And in particular, I think the pandemic has really raised to the surface among many other things. The explicit tension that sometimes exists between efficient use of limited resources and equitable use of limited resources. And that tension between efficiency and equity is an intractable problem. It will never be solved perfectly. But

what the pandemic has done is really forced the issue. And I think in so far as we had tried in the last 40 years to subvert that issue and say, no, we can have it all, we can have high efficiency and we can achieve equity. I think that the pandemic has shown us that may not be true, that in order to achieve equity, we are going to have to pay something. And the question is being raised, what are we willing to pay to ensure a more equitable future?

CARL ZIMMER:

Right. Thank you. Akiko?

AKIKO IWASAKI:

Yeah. So, I resonate with what Bonnie said about the different collectives. I think there's a really nice parallel in science that what I've learned and what others have learned is the sort of the power of scientific collective and team-based science. And this is something that I not only will put in a capsule, but will carry through. I think, in the rest of my career to do this team-based science. And there's a fundamental problem in the way in which scientists are evaluated by authorships. And this was also highlighted by Dr Eric Lander's top talk. But we need a circular authorship. We need to kind of have everyone in the team be sort of valued at the same time with the same emphasis. And that's not happening in science. And often it's the first and the last authors that are emphasized. But if we really want to volume team size the way in which we evaluate science and scientists also have to change. So, that's something that perhaps a capsule would help in the future.

CARL ZIMMER:

Great. OK. All going in the time capsule. Thank you so much. And thanks to the academy for inviting me to moderate this fascinating panel. And I hope the audience has learned as much as I have. So, thanks to everyone.

SUE CURRY:

Thank you.

Well, I wanna thank a panel one that was absolutely stunning and great moderation and great comments. Please join me in thanking this fabulous panel.

(CLAP)

## **Panel 2: Toward Actionable Policy in Climate Change and Human Health**

SUE CURRY:

Now, I'd like to introduce the second panel of our program. This panel is Toward Actionable Policy in Climate Change and Human Health, and it will be moderated by Laura Helmuth. Laura is the Editor In Chief of Scientific American and a member of the National Academies of Sciences, Engineering and Medicine, standing committee on Advancing Science Communication. She has previously been an editor for The Washington Post, National Geographic, Slate, Smithsonian and Science Magazines. She serves on the advisory boards of SciLine, a program of the American Association for the Advancement of Science that connects reporters with scientific experts, high country news and five hundred women scientists.

She has a Ph.D. in Cognitive Neuroscience from the University of California at Berkeley and attended the University at Santa Cruz's Science Communication Program. She is active on Twitter at @laurahelmuth. And I'm gonna turn it right over to you, Laura.

LAURA HELMUTH:

Great, thanks so much. Thanks to the National Academy of Medicine and the meeting organizers for bringing us all together today to talk about the important issues of bridging the policy and equity divide and figuring out how to understand and fix compounding health crises. And thank you so much to all of you in the audience who are joining us today for your intention to and for your engagement in these urgent issues. And also, I'd like to welcome all of the new National Academy of Medicine members. Congratulations. So glad that you that you joined the club and glad you could be here today. So our session today is titled, "Toward Actionable Policy in Climate Change and Human Health." In other words, what are we going to do about all of this. So that's some of the biggest crises, the biggest challenges, the biggest dangers of our time and future generations time, unfortunately. So as, you know, as I think most of the audience know, Pew Research Center and other organizations have a lot of really important survey data showing that a large majority of the people in the United States recognize that we have had an increase in extreme weather, that climate change the danger to ourselves and our future. And they want policies to deal with it, they want politicians to deal with it. And we also find that the people in United States and other wealthy countries are concerned and think we should be doing more, and that this is especially true of younger generations. So the popular will is there, but the policy seems to be lagging. And also, the science is there, and this is maybe a little bit in contrast with the previous session focused on COVID, where, you know, we were talking about making policy as the science was still being sorted out. But for climate science and for the impact of climate change on health, there's a lot of important science still happening. But the results of it have been pretty clear. So, we're gonna talk today about some of the policy challenges that science can inform and talk about how to include equity in every policy decision. So thanks again for coming. Please add your questions. We want to know what's on your mind, what kind of questions you have for the panel. And also we're hoping that the panelists will have questions for one another as we have a robust discussion after the formal presentation or the informal presentations. This is all fairly informal conversational. We wanna really talk in straight talk with each other today. So, we've got a great series of speakers and I'll introduce them in the order that they'll be presenting. We're starting with Dr. John M. Balbus, who is the Interim Director of the new as of a month or two ago, the new office of Climate Change and Health Equity, which was established at the end of August within the U.S. Department of Health and Human Services. And he is one of the newly elected members of the National Academy of Medicine. And our next speaker is Dr. Marshall Shepherd. He is the Georgia Athletic Association Distinguished Professor of Geography and Atmospheric Sciences at the University of Georgia and director of its Atmospheric Sciences Program and a member of the National Academy of Engineering, the National Academy of Sciences and the American Academy of Arts and Sciences. Then we'll be joined by Dr. Michelle Bell, who is The Mary E. Pinchot Professor of Environmental Health at Yale University School of the Environment, who also has appointments at Yale School of Public Health and School of Engineering and Applied Science. And she is a member of the National Academy of Medicine as well. And then our final speaker, Dr. Michael Mendez, is an Associate Professor of Environmental Policy and Planning at the University of California, Irvine. So thanks again to all the speakers for joining us, and I'll turn it over to Dr. John Balbus to start us off. Thanks very much.

DR. JOHN BALBUS:

Great. Thank you so much, Laura. It's really a pleasure and an honor to be here today with this great panel. And I thought I saw my slides up before. So I'm gonna share just a very brief presentation about our office, which is in many ways a first home within the federal government for making this pivot, Towards Actionable Policy in Climate Change and Health. So I'm just gonna share our initial approaches to bridging that divide as to use your language. And Laura, (UNKNOWN) the next slide, please? So just a quick reminder that our office was created as one of the mandates for the Department of Health and Human Services under Executive Order 14008 of President Biden, Tackling the Climate Crisis. The mandates were to establish the office to stand up a new interagency working group that will work to decrease the risk of climate change to vulnerable populations, including children, elderly and people with disabilities, and also to stand up a biennial health care system readiness advisory council. Next slide, please. So, our office is taking on this issue of climate change and health equity in three broad priority areas that we're working. The first is working to reduce the risks of climate change or to build the resilience against health impacts of climate change for all Americans, but especially for those most vulnerable to the impacts bearing the greatest burden of current health disparities. The second priority area is to work to address underlying health disparities and underlying deprivations in the social determinants of health by informing as much as we can climate actions and investments such as the major infrastructure investments that are being discussed and planned now. And then the third priority areas working directly with the health sector on their decarbonization, reducing the greenhouse footprint of the health sector and also building resilience of operations and systems in the health sector. Next slide, please. And this is a schematic just to show how the climate change world needs social determinants of health. So, the center-colored boxes there are the pathways from upstream climate drivers like increasing temperature, sea level rise or increasing intensity of precipitation all the way down to human health impacts. And this occurs through a variety of exposure pathways. These could be extreme heat waves, wildfire smoke, flooding events, changes in the distribution or the intensity of vector borne diseases. And from a climate change perspective, we think about vulnerability in three different buckets, if you will, and those are on the left. The first is being more likely to be exposed. The second is sensitivity. You're being more likely to have a health impact given a certain amount of exposure. And the last is the adaptive capacity to avoid the impacts of the bad outcomes. And each of these realms of vulnerability is associated with social determinants of health. It's not accidental that some people live in areas that are either prone to flooding or in urban heat islands. In many cases, this is the result of systematic racism for decades. It's not an accident that some people have underlying health disparities. There are communities that have much higher rates of asthma or other respiratory diseases, obesity, hypertension, mental health problems. And again, this is often related to living conditions. And then the third is the variety of ways in which social determinants of health interact with people's ability to either shelter in a healthy place to avoid threats, to be able to evacuate, et cetera. Next slide, please. So, these are the ways that our office is working to make this connection, to make this pivot towards actionable policy and we'll build it out, you can build it out eight clicks. It's a build-out slide. So, we're working to harness data and science to be able to identify the communities with the disproportionate exposures. Working to address the underlying health disparities that I've referred to; asthma, diabetes, hypertension, all of which make people more vulnerable to either bad outcomes from hurricanes and severe weather events or heat waves. Working to both promote the research, but also to pivot to action and policy in terms of achieving the public health benefits of multi-sectoral climate actions. Work in the transportation sector and bioswales and natural solutions to resilience, et cetera. Working with both the federal and the private health sector to reduce greenhouse gas emissions.

Fostering innovation in partnership with some of the innovation centers of the federal government and climate adaptation and resilience. Our offices is a hub, as I've said, for climate and health. And so we're working to provide coordination among the federal agencies and across the Department of Health and Human Services. We will be working to provide trading opportunities both within our walls, but also out in the community and also exploring partnerships with the philanthropic and private sectors. Next slide, please. And the way we're doing this, and you can build this out, this is for clicks. We are working with, in the Department of Health and Human Services, as we've laid out in the recently released Climate Adaptation Resilience Plan, to go one by one and to identify the best opportunities to be able to ensure that the resources, quite large resources that HHS puts out into the United States and communities every year are doing the best they can to to enhance the resilience of communities. We're also working on recognizing that we can do all we want within the Beltway, within headquarters of Washington, D.C., and we won't have lasting and significant impacts in communities. And so we're taking a regional strategy working through our regional health offices, which have existing partnerships and existing structures to work both with the other levels of government, with state, territorial, tribal and local governments, but also with community-based organizations and with the philanthropic sector and the academic sector on a regional basis to start to have these conversations, to work towards closing that policy gap that Laura was referring to. And then our office will be doing direct outreach brand making and as I've alluded to, fellowships and internships. Next slide, please. So, Laura talked about the policy gap, and I hope that in our panel today, we can talk about how we close this. We have, as Laura said, really some of the more robust impact assessments for health in the United States that exists in the world. Our 2016 report was very comprehensive and we have some idea of the ways that we can improve resilience through early warning systems, through energy assistance and air conditioning assistance. But what we need to do is to understand at a very granular level, you know, where are we not meeting the needs, where the needs exceeding the resources or where are they needing to be redirected to ensure that we close that adaptation gap and make communities as protected as possible. So with that, I'll close and look forward to our discussion. Maybe you can just show the last slide. There we go. If anybody wants to reach my email address and also the website of our new office.

LAURA HELMUTH:

Great, thank you so much. And thanks for that excellent image of the very dramatic bridge showing the stakes and the canyon we're trying to cover. So, thanks very much to John Balbus for our first orientation talk of this session. And I'd like to turn it over to Marshall Shepherd to bring us into the extreme weather climate gap. Thanks so much.

DR. MARSHALL SHEPHERD:

Thank you, Laura. And thank you, John, for that excellent transition, because the extreme weather climate gap that I'll speak on briefly is really aligned carefully with your notion of a gap there that that bridge was crossing. There you see my coordinates. I invite any and all of you to follow me on Twitter because I believe in engaging beyond the ivory tower and academy's webinars and so far with your outstanding venues. But social media really allows us to get this information beyond our ivory tower door, so feel free to follow me on Twitter. Next slide.

I want to start with a contemporary discussion of what I mean by this extreme weather climate gap. Many of us recall just a few weeks ago, the remnants of Hurricane Ida made landfall in Louisiana, but then moved into the Northeast and we saw a secondary disaster occur. And this was a New York Times article, how the storm turned basement apartments into death traps, and you can see the distribution of who died in the New Jersey area from the remnants of Hurricane Ida. Undoubtedly, many of those that I have analyzed were people of color, marginalized communities or poor. And so I think the reality is climate change has produced a scenario where vulnerable communities and vulnerable populations don't even have to be on a floodplain large tract of land. But even in an urban space, when we see intense rain rates due to climate change falling on impervious surfaces that don't infiltrate very well and run off rapidly, and stormwater management systems that are designed for the 1970s rainstorms and not the 2021 rainstorms. Next slide.

So that's one example of this sort of marginalized community or poor community gap and vulnerability. Here's a more tangible one from close to home. This is some research that I am doing with colleagues here at the University of Georgia, where we're analyzing the urban heat island of cities like Atlanta. And what you clearly see here is the urban heat island that John Balbus actually mentioned. And what we're finding is due to historical practices such as redlining and so forth, discriminatory actions. A large segment of Atlanta's poorest population and also populations of color are disproportionately exposed to extreme heat. We have found that there are heat islands within the heat islands that are disproportionately associated with black and Hispanic communities. So this is some work that we'll be reporting. But the overlying or I guess underlying one, I should say, is that these communities represent the extreme weather climate gap. Next slide.

Again, I won't spend a good deal of time here. This is just how I frame much of the research that I've been doing in recent times. I'd like to frame it in terms of hazard, exposure, vulnerability and resilience using the hurricane example earlier from Ida. Ida is the hazard that various people of all socioeconomic backgrounds are exposed to that hazard. But there are only some people in that community that are vulnerable or have greater sensitivity. And then even of those, some have better resilience or the ability to sort of snap back or bounce back. So, for example, if Ida is approaching my home, I don't live in the coastal area, but if I did, I have the socioeconomic means to move to Atlanta for a few days and stay in a hotel or I have adequate insurance on my home or I have adequate health care should I sustain an injury. That's what we mean by resilience. Next slide.

This is a paper that colleagues and I published last year in Natural Hazards. It took those components that I just discussed and we tried to project what we believe the most vulnerable counties in the United States are in the year 2040 from the perspective of climate. The next slide. We looked at the various vulnerability. And so there you see, and again, this is using vulnerability metrics similar to those discussed in the previous session when I heard someone speaking about the CDC's vulnerability index. So you can clearly see that along the southern tier of the United States and into the desert southwest and into Florida, our most climate vulnerable counties exist. Next slide.

So, this is where the weather climate gap comes in. The weather and climate gap is defined as a disproportionate sensitivity to extreme weather or climate events and a delay in the ability to bounce back. For example, as I just noted, black Americans are more likely to live in urban heat island. And what we're actually finding in our most recent research is they live in heat islands within heat islands that increase their socio-economic and health vulnerability as their hazard, certainly relevant to this discussion today. Next slide.

I worked at NASA for 12 years. I was a scientist at NASA's Goddard Space Flight Center before joining the faculty in 2006 at the University of Georgia. But it's not rocket science. This extreme weather climate gap is very much tied to this inequality in income. This is median household wealth by race and ethnicity in the United States projected out in the year 2024. And that significant gap that you see between those blue lines and the red and orange lines tell the story of why they are disproportionate health outcomes and health vulnerabilities and sensitivities when we see these extreme weather and climate events, such as floods, hurricanes or extreme heat. Next slide.

I won't spend a good bit of time here, but Bob Bullard, who many consider the godfather of the environmental justice movement, basically makes the point that zip code today is still the most potent predictor of an individual's health and well-being. And we've got to fix that. I mean, from a policy or what do we do about it standpoint? We have to fix that very sound principle that Bob Bullard often talks about if you see him speak or if you read any of his writings. Next slide.

So with that, I will draw to a close. I look forward to discussing some of the things that I believe we need to do to move forward in this regard in terms of both closing this extreme weather climate gap and also thinking about policy going forward.

LAURA HELMUTH:

Great, thanks so much to Marshall Shepherd for that excellent presentation and for the very dramatic examples currently and in the future of some of the health and safety risks from climate change. So, now I'd like to move to Michelle Bell, our next speaker, and I'll turn it over to her. Thanks so much.

DR. MICHELLE BELL:

Alright. Thank you so much. And thank you John and Marshall for this great presentations, I'm really honored to be on this panel and learn the insights of the panel, and I hope the audience as well. Next slide, please. So, this slide shows some categories of potential climate change impacts, many of which are already being felt today. And I find that much of the discussion on human health and climate change focuses on three key aspects that I've shown here, weather or even more specifically heat waves, infectious disease, such as increased habitat or behavior changes for mosquitoes that bring disease and increasingly discussions on wildfire smoke. But a point I wanna make sure is that the environmental system and our health are incredibly connected so that each of these other areas that are sometimes

discussed with respect to climate change separately from human health, in fact, could detrimentally impact human health as well. So just a few quick examples. Changes in agriculture could affect food scarcity, could affect nutrition. Resource constraints around water scarcity can contribute to conflict and so on. And so this means that the climate change impacts on human health is, in my view, far more severe than these individually highlighted components that are often discussed in the media. Next slide, please.

So, an example I want to use to illustrate this point is that of environmental migration or displacement, which also relates to some concepts in Dr. Shepherd's presentation. So in other words, who moves after an environmental disaster such as hurricanes or landslides? In this photo, these (UNKNOWN) are for landslides in Indonesia, and migration and the impacts of migration on health were studied by my former doctoral student, Kate Burrows. So, climate change is increasing the frequency and intensity of many different types of environmental disasters like hurricanes and landslides. In fact, we should stop calling them natural disasters, given the anthropogenic climate change component. But most studies in the past have many of these types of environmental disasters, like landslides, focus on the moving population and focus on issues of sanitation, nutrition and infectious disease and so on. But we also need to consider broader aspects of health. We need to consider mental health and well-being, and think about the social, cultural and economic systems that are impacted, like social cohesion and things like access to education, so educational opportunities. And further, we need to consider the health of the receiving communities as well as those that are moving. And so the reason I wanted to highlight an example of climate change health impacts that are, in my view, understudied is to try to focus on a broader picture of the public health burden from climate change. Next slide, please. In another example, we could think about is wildfire smoke under a changing climate. So, there's growing recognition that this is a critical issue, especially in light of the severe forest fires we've experienced in recent years in many parts of the world. And here I wanna highlight work by my former student, Lucia Woo, where we worked with the wildfire modeler, Loretta Mickley, at Harvard to estimate what air pollution levels would look like from smoke under a changing climate. So, if you look at the map of Alaska in the upper left, you see the percent increase in fine particulate matter from wildfire smoke under a changing climate. And now I ask you to compare that to the map in the upper right hand part of the slide that shows the residential patterns of Alaskan Native American tribes. And we see that if you overlay these data, some subpopulations are anticipated to be impacted more than others. But what have we even just look at the present day? So, if you look at the lower left, you see the wildfire smoke by month in the present day. In the Alaskan Athabascan tribe shows the top line in blue has higher levels of exposure from wildfire smoke in the present day. So the point I wanna emphasize here is that we anticipate increased wildfire smoke and associated environmental justice burden, but also this is not a new problem. This really demonstrates how climate change problems are very often exacerbations of existing environmental health problems and existing environmental health disparities that we already have in the present day. Next slide, please. A couple more clicks. Thanks. So next, I wanna discuss scientific denialism and conspiracy theories about science. So this is a photo of a car where I live in New Haven showing a bumper sticker supporting the concept that the world is flat. Lest you think this is a joke, which I did a couple of years ago, it's not a joke. There's a substantial population, especially in the US, that sincerely believe the earth is flat. So going against science that we've known to some extent for thousands of years. And if you go on Etsy today, you'll find over 4,000 flat Earth products, and if you go

on Amazon, you're gonna find over 100,000. So, when we talk about making science actionable for policy, we're often talking about training scientists and encouraging scientists to communicate, how to best communicate, how to best present our research findings. And this is really extremely important. But here's what I think is the elephant in the room. Scientific denialism is different from a lack of scientific literacy. Next slide, please. And so the COVID pandemic, just one more click, please. Thanks. The COVID pandemic has brought scientific denialism closer to home with real world public health catastrophes. And the same thing that is happening with the pandemic is happening with climate change, just a bit more in slow motion, but with the same catastrophic outcomes. And so in my opinion, we need to admit that it's not just an issue of getting scientists to communicate or a better graph to communicate that climate is real or scientists talking to the media or even stronger scientific analysis or another document showing that climate change scientists are consensus, but because all those are really, really important, but they address the lack of scientific literacy. And no matter how policy (UNKNOWN) our science becomes, we have a growing scientific denialism that is hindering the actual policy impacts of climate change science. So, I'm not sure what the solutions are to this issue, but I'm convinced it's more than science. And it involves social, cultural, mental health, economic and other interconnected systems that pit people against institutions of authority, including science. And this is impeding our effective policy. So, we need to remember that that we're in unique positions of both education and knowledge, and we can't and shouldn't expect the public to believe us just because we say so. So this disconnect between science and the general public really needs to be interwoven with efforts to address climate change policy, both for lack of scientific literacy, but also for scientific denialism. Last slide, please.

So, I wanna thank you very much for your time. And I look forward to our discussion and really appreciate having panels like this that really help try to connect science with real world solutions and bring science to bear on public health and well-being. Thank you.

LAURA HELMUTH:

Great, thank you so much to Michelle Bell, and thank you for bringing in the problem of science, denialism and the fact that it's literally deadly. Denying science has exacerbated the COVID pandemic death toll and also the toll of climate change. And thank you for bringing that into the discussion. Really important. And now I'd like to introduce our final speaker, Michael Mendez, and I'd like to add, in addition to his appointment at University of California, Irvine, he's also a Visiting Scientist at the National Center for Atmospheric Research (NCAR). And thanks so much, Michael Mendez for finishing off the presentation part of the session.

DR. MICHAEL MENDEZ:

Thank you. Good afternoon everyone. It's such a pleasure to be here on this important panel looking at the intersections of climate change, public health, public policy and, of course, environmental justice or equity.

(UNKNOWN), I really appreciated that. The previous speakers, in particular, Marshall, who focuses heavily and substantively on the equity dimension of extreme weather events or extreme climate events. I'm gonna be building off of that work. I'm looking at more of the case study approach of looking

at wildfires and particularly undocumented migrants. In California, you've heard we've had tremendous amounts of extreme wildfire events and oftentimes you hear of the economic toll that's happening to our agricultural industry, particularly our wine industry, which had a \$3.7 billion loss last year in terms of tainted grapes or tainted wine. That's when smoke is infused within the grape itself and it affects the taste and the odor of wine. But little is studied and understood about the workers, particularly farmworkers, undocumented Latino and indigenous migrants that are harvesting these wine grapes to protect them from smoke and ash. And little do we know about how this experience is affecting their lungs and tainting their lungs. So, in California, we are experiencing a major climate change crisis in the last several years. Millions of people have been impacted by multiple disasters; fires, blackouts, heat waves, drought, hazardous air quality and, of course, the ever present COVID-19 pandemic. These compounding of disasters have cascading health, social and economic impacts. And due to existing structural inequality, these impacts are disproportionately affecting low-income people of color. In essence, wildfires in California and the Southwest are not isolated disasters. They often compound with other hazards and co-morbidities, or what is called is endemic in the field of public health. So now, more than ever, it is crucial to understand how these events amplify existing inequalities and how to lessen the resulting harms, particularly in the context of extreme wildfire impacts to undocumented, Latino and indigenous migrants. Next slide. Given their social status, undocumented Latino and indigenous migrants are particularly vulnerable to disasters such as wildfires and require special consideration in disaster planning. They are disproportionately affected by racial discrimination, exploitation, economic hardships, less English and Spanish proficiency and fear of deportation and their everyday lives, their pre-disaster marginalized status. So, we start with the premise. If you really wanna tackle disaster risk reduction, it starts with the social integration of migrants before disasters. Understanding that these individuals have a pre-disaster marginalized status and existing inequalities would only be exasperated during a disaster.

(UNKNOWN), when a disaster like a wildfire hits its communities, they have a form of hyper-marginalization. Next slide, please. Our research in Santa Barbara Ventura and Sonoma County shows that undocumented migrants are often rendered invisible in the context of public policy because of systemic racism and cultural norms regarding U.S. citizenship and who is considered a worthy disaster victim. We presented these research findings at multiple policy briefings, both at the local, state and international levels, including the United Nations Migration Agency. And we really highlight that political choices are being made that prioritize some lives over others. Next slide. To put this in context, 18 of the 20 largest wildfires by acreage in California have occurred since the year 2000. And Sonoma County, one of our new research sites, an epicenter of wildfires and bastion of California's high end wine industry has suffered from multiple years of extreme wildfire. Events that have been ranked in the top five and top 20 for the most destructive and deadly wildfires in California history. Cumulatively, they have burned nearly one million acres, destroying over 12,000 structures and caused 34 deaths. While climate scientists expect wildfires to become more frequent and severe, it is important to explore how some people and communities are more affected by these events than others. Next slide. As Marshall mentioned in his presentation, such outcomes occurring during and after wildfires have major environmental justice implications. And that certain populations, due to their socioeconomic status, must live with a disproportionate share of environmental impacts and suffer the related public health and quality of life burdens. Moreover, in our research, we investigate how human identity such as gender, class, race, indigeneity, and immigration status intersect with wildfire disaster and systemic injustices. Next Slide.

Media outlets, governments and scholars across this country, however, have largely focused wildfire reports and research on the loss of coastal and hillside mansions and ecological systems, and impacts to wealthy homeowners and farmers. The Sonoma fires, however, not only destroyed expensive property and crops, but also endangered the health and livelihoods of thousands of undocumented migrants. California is home to an estimated 2.5 million undocumented migrants, many whom are farm workers or employed in service jobs such as housekeeping and landscaping. In Sonoma County, undocumented individuals are estimated to account for 8% of the population or 38,000 people. Next slide.

Governments in the region, in particular, overlook the needs of low-income indigenous migrant workers and their families. Sonoma County is home to a growing indigenous Mexican population, and it's estimated that over 12,000 indigenous people from southern Mexico live and work in Sonoma County. Concentrated in labor-intensive sectors such as (UNKNOWN) crops and wine grapes, indigenous migrants perform an increasing amount of the arduous labor, which contributes to the profitability and affordability of fresh fruits, vegetables and wine. In particular, indigenous Mexican people in Sonoma County are culturally and linguistically isolated. Many are illiterate. And some speak neither Spanish nor English, but only their native languages; Mixteco, Triqui, Maya and Chatino. And it's important to note that indigenous Mexican people are not Hispanic or Latino, but indigenous. They are often homogenized with the general Latino communities. Next slide. While disaster relief, this enormous fires have largely been praised as effective. Migrant workers were especially impacted from the fire due to the loss of employment, violations of occupational health and safety standards, the lack of evacuation information in their native languages, prohibition from assessing federal disaster relief services because of their immigration status and poor infrastructure and housing in migrant communities. Undocumented migrants' socioeconomic status is usually precarious, however, the wildfire disaster only intensified their already difficult situation. Next slide. And I wanna end on two key public health issues that are happening in terms of occupational health and safety. Oftentimes, these undocumented migrants are asked to safeguard the wine grapes and other crops from smoke and ash and asked to enter into mandatory evacuation zones that are considered hazardous to the general population without providing any public health testing or care because of their immigration status. In particular, of concern is fine particulate matter (PM2.5)

of wildfire smoke, which many of you know it's a toxic mix of heavy metals and other chemicals from burning structures and objects. And research has shown that this is actually more harmful than even vehicle exhaust. And then in California, annual mean PM2.5 exceedances has increased so far beyond as any other PM source of exceedances in the state. So, wildfire smoke is the main culprit of PM exceedances in California. And then finally, the harm due to wildfire smoke to farmworkers may be greater than previously thought, bolstering the argument for additional research and policies to help safeguard the most vulnerable and stigmatized populations. Next slide. And then finally, this idea of water, safe drinking access of water. So when a wildfire does hit a community, first of all, it knocks out power, which may affect the water quality and the community water systems. And oftentimes they'll send an advisory oil alert, which often in some of these communities are not translated into commonly spoken languages. But it's important to note that emerging research of the need to move away from "do not drink" to "do not use" orders. Because fire is causing other types of water contamination besides fecal from sewer contamination by heating up plastic pipes, which leach hazardous chemicals into water. It can also occur from damaged pressurized water system that suck smoke, benzene and other

pollutants into the water. So, this is (UNKNOWN) advisory that happened in Victoria County, which had...

MICHAEL MENDEZ:

The Thomas Fire. The area on red is the area that needed to have a boil alert and primarily low income Latino and indigenous immigrant communities. Courses were then translated into Spanish or native languages. But it's important to note there was no follow up and to see that there was benzene and other chemicals that work in the community water systems. And research has shown in other places like Sonoma that there had been 10 times acceptable level of benzene and other chemicals weeks and months after a wildfire occur. So, with that I just want to end and say thank you for this opportunity to talk to you a little bit about some of the most stigmatized and marginalized populations in our communities, the public health and policy implications of those and how we need to work together to have more holistic and equitable disaster and climate policies. Thank you.

LAURA HELMUTH:

Great. Thank you so much to Michael Méndez for that important presentation. And for that final thought that we need to work together at all levels and really be aware of who's the most vulnerable and that people who are in vulnerable, marginalized, sometimes stigmatized populations are already facing health disparities are the people who are suffering the most when there are climate emergencies. And as Michelle Bell said, we shouldn't be calling them natural disasters. They're not natural because of the anthropogenic component. And I just want to build on something that Michael said about the media not covering or disproportionately covering the impact of wildfires and other disasters on people who are wealthy, on celebrities, on wealthy farmers versus the farm workers. And as a member of the the media, I completely agree. And I think it's a big problem that the way we frame disasters in general is to focus on the people who are most easy to reach frankly. And the people in the most conspicuous places who already have the relatively more resources. And I think the framing that the media does around climate disasters could be a lot better and something we need to work on too. To start out our discussion, I kind of like to circle back to the beginning with John Balbus. And John, your office of climate change and health equity, you've got a big mission. You are covering basically everything. You probably did realize this but obviously from this presentation your mission also includes things like immigration policy. And how people who are undocumented are treated and cared for and protected in the case of emergencies. You got a big mission. It's just a few months out but would you like to kind of talk about how you're trying to integrate these multiple levels of analysis and investigation, infrastructure, investment? Where do you even start in the morning?

JOHN BALBUS:

Well, thank you for framing it that way. It's kind of a both end thing. So, on the one hand the Department of Health and Human Services is the largest grant making organization in the world. And there are people and resources whose job it is to work with all of the different populations from undocumented migrants to Native Americans in Alaska to impoverished people in our urban Rust Belt areas. And so we're a small office. We're a small group of very committed and eager individuals but we're only going to do it through the partnerships that we have. And that's why our process, our strategy is to work hand in hand with the different divisions of HHS and then with the regional offices whose purpose really is to implement in communities the policies and practices of headquarters. At the

same time it is a bit daunting and we will have to ensure that we're not neglecting populations that are not as front and center. And there's no easy answer to that part of it. But our approach is just to work in partnership with the department whose mission is to address the needs of all people in the United States.

LAURA HELMUTH:

Thank you. So, in the audience today we have members of the National Academy of Medicine, the other National Academies. We have a lot of policymakers, experts in public health, biomedicine. Is there anything, speaking to this audience. Is there anything people in the audience can do to help the work you're doing to participate? Any any requests you want to make? Well, you have the floor.

JOHN BALBUS:

So, along the lines of what I've just been saying that the solutions have to be pushed out. The solutions have to be at the community level and every National Academy member is also a member of a community. So, to the extent that members are engaged in academic pursuits and are working with very well resourced and capable universities. Helping to make those connections with the regional HHS offices and with the Regional Health Equity Councils and to be a resource to communities will be part of it. There's also a lot of research gaps that we need to close. And there is, for example, just this past week the Agency for Health Research and Quality, AHRQ released a request for information for research on Health Systems Research and Climate Change. That's a pretty new area. So, I think there's a lot of academic pursuits about how do we make our health systems work in this system. In this arena how do health systems contribute to community resilience, to community improvements in the social determinants of health. There's a lot of implementation and Innovation research for health systems that can be done. So, those are two ways. And I could talk more but I'll stop there.

LAURA HELMUTH:

Great, thanks a lot. And I just want to repeat, if anyone in the audience has questions. Anything you'd like the panel members to discuss. Please feel free to put those into the chat box. We're here to talk about what's on your minds as well. And also to the panelists, if you'd like to ask one another things we can keep this kind of free ranging. So, I'd like to turn it over to Marshall Shepherd. Again thank you so much for the research you're presenting on urban heat islands on the effect of flooding and how it's disproportionate and where it's focused. And also you mentioned that the infrastructure we have now a lot of it was built in the 60s and 70s. It's really not up to code for 2021 for the future of climate related disasters. So, are you seeing any communities, any cities, any states starting to do a better job of building for climate resilience or finding ways to protect people to improve communication, emergency disaster response? Are there any areas of hope that you'd like to highlight or that you think could be addressed as something that people could be doing right now?

MARSHALL SHEPHERD:

Yeah, I think there are a couple of things that I have seen recently that really are important developments. I think many cities increasingly have city resiliency offices or city resiliency officers. I think that's a step forward. I believe the City of Miami just did something very provocative. They have I believe the first ever heat officer. They have a person on staff that's dedicated to things related to heat, I believe at least one other city in the desert southwest is planning to announce one as well if they

haven't already. I'm privy to knowing that that's possibly coming. But I don't know if it's public yet. So, I think these types of things are encouraging. I do know that, for example, the infrastructure bills that are being discussed in Washington DC are very much climate bills. If you dig a little bit deeper into the many of those infrastructure bills there are things in there that not only sort of enable the new energy economy which is part of the climate discussion but this idea of hardening infrastructure. Or sort of revisiting infrastructure that was sort of designed or engineered for just a past climate that doesn't really exist anymore. And so I think the fact that jurisdictions from the local to national level are starting to talk about those things is important. I will close this set of remarks by noting though, and I'm adamant about this. We must not engineer or mitigate or adapt to climate change in a way that is falling on the backs of those already marginalized or disenfranchised. For example, one of the things I've seen in my in Florida, South Florida is many people now recognize the threat of sea level rise. And are moving away from their 5, 6, 7 figure condos in the coastal areas and moving in on the higher ground. But guess what, some of that higher ground is in communities typically populated by people of color or poor communities. So, we have this climate gentrification going on. And so any policies going forward to deal with sort of inequities and climate change, infrastructure issues, economic disparities and so forth, they must be done in an equitable way.

LAURA HELMUTH:

Great, thank you so much. And that's really important to hear that some places are taking it seriously. Are starting to plan not for future. I should say are starting to plan for the present. That's great. And I hope people will know and help advocate for climate resilient, infrastructure and planning in their own communities. In their own geographic communities. And some of the things you were saying about climate migration and climate gentrification relate directly to what Michelle Bell was telling us about who gets to move after an environmental disaster. And Michelle, for you are you seeing any policies that can help people who need to get out of dangerous areas do so and build back in a more equitable and safer way? Are there any things you'd like to highlight in that space that you think are policies that can or should be adopted?

MICHELLE BELL:

I don't know if I have any specific examples that I want to highlight. I do want to echo what Marshall was saying about how it is sometimes a bit, I don't want to use the word easy. But it is sometimes an action that looks like it's a good thing but may actually be on the backs of people that are the most vulnerable in the present day with the growing health disparities. And I think that there have been some work in migration is that in relation to environmental disasters that look at the benefit of moving people in group. So, if you move a community in group what does that mean for social cohesion? And there's been some research showing that that might be helpful. And there's been some research showing that that doesn't actually address the issue of social cohesion. So, I think that. Well, I'm answering a different question than the one you asked. I don't really have an example of specific policies. But I do think that our research and our policies should really look at these issues quite broadly. So, using example of migration that you brought up. Looking at not just issues of public health with respect to infectious disease and sanitation and even economics. But also looking at social cohesion. Looking at mental health and wellbeing. Looking at issues of self-esteem and agency within this populations. And looking at the receiving communities as well as the migrating communities as well. And sometimes in this work we see it almost U-shaped distribution of who's moving. So, the richer populations that were living in the

mansions they can afford to move. And then you have the poorest people who can't afford to stay. But then you have some people who are left that are really harmed. So, it's not always obvious to me anyway how the distribution of impacts is coming out. And so we need to think carefully about these complex systems.

LAURA HELMUTH:

Yeah, that's great. Thank you. And thank you so much for bringing in the mental health aspects of disasters and of migration and of all the consequences of climate change. That's a really important part of the citizen specifically in our remit today. But that should be part of every conversation about climate change and policy and how to mitigate the problems and help people survive and thrive. So, thank you for that. And so we have a few questions from the audience. And one of them is directed specifically at Michael Méndez. And the question is. There's a worry that farm workers will soon only be able to work at night of the bright lights because of the accelerated heating especially in the California Central Valley. And the question would like to know, could you speak a bit further on this and the impact of the effects of climate change on agricultural workers and potentially on food production? So, I'll turn that over to you. Thank you.

MICHAEL MENDEZ:

Excellent question. That's actually already happening. And is really dependent on the type of crop that's been harvested. And our two research sites looked at the central coast of California which is Santa Barbara, Ventura Counties which we published in that geoforum article. And then our new project which is funded by the National Science Foundation looks at Sonoma County. And wine grapes in particular have always been harvested at night. So, you have a situation where there's extreme heat. So, in California we never look at disasters. Well, generally we try not to look at disasters as isolated events. We understand and confronted the compounding of disasters with cascading health, social and economic effects. So, when these wildfires hit in places like Sonoma you have extreme weather events or depending on time of season, extreme cold events that are happening. And these individual and then adding to the layer of smoke that makes the sky dark and cloudy and hard to breathe if it's during the day or if it's at night. So, you had situations where these undocumented migrants were going to emergency shelters if they were going there at all. Some were afraid to even go to emergency shelter for fear of deportation. And we had situations where farm owners and employers and supervisors would come in caravans and pick these people, these individuals up at night from the shelters and take them back to the farms to harvest the crops to the wine grapes to protect them from smoke and ash. Sometimes with little occupational health and safety standards such as N95 masks, goggles were on field sanitation. So, that's currently happening that night. So, imagine a disaster like a wildfire, extreme wildfire happening. Individually you're scared, there's levels of trauma. This has been happening multiple years. And then you're picking them up from the emergency shelter and then taking them out there. Not providing them with the proper health care post exposure monitoring let alone on access to federal disaster relief funds or health insurance. So, that's just an intensity of the situation. It's currently happening. And as the person that posed the question, it may happen. That situation may happen throughout California, Oregon, Washington and the Southwest. So, these issues are that the federal government has engaged in terms of intentionally not providing the resources for these individuals that are essential workers that are being asked to enter into mandatory evacuation zones and not provide them with the proper social, economic and health care benefits is a key importance. And I just like to

end. If anyone wants to learn a little bit more about this issue. I presented the David endowed lecture last week at the National Academies and it should be available online soon. But yes, this is an emerging issue and agricultural workers are being impacted in multiple ways by multiple disasters that are happening all at once.

LAURA HELMUTH:

Yeah, thank you so much. And today we're talking about policies. Policies that can address climate change and human health. And it seems like what you just mentioned there are like four or five levers that are fundamentally policy levers like enforcing OSHA regulations and making them relevant in disaster funds. Deportation policy, would you like to follow up on any of that?

MICHAEL MENDEZ:

Yeah, in terms of Cal/OSHA which is our State Office of Occupational Health and Safety. There's only 26 build investigators in the entire state of California that actually speaks Spanish. None that we know that speak any Indigenous Mexican languages. And when the Thomas Fire occurred in Ventura, Santa Barbara County's on the regional Cal/OSHA office actually closed down its regional office because it was too dangerous for their field investigators. But yet the people that they were regulating, the farm workers were still out there harvesting the crops. So, more funding and robust funding both at the state and federal level for occupational health and safety. Stronger smoke and work safety standards are needed for these individuals. California was the first in the nation to adopt a wildfire smoke occupational safety standard when the air quality reaches 1.5 index. Employers are required to be provided N95 masks. We still see that that's unenforced throughout the state, Some employers are not giving that to their employees, employees that is. And then we even seen sort of employment intersectional standpoint in the early years of this wildfire. When volunteers community base migrant rights organizations were handing out N95 masks from their own budget. They were giving them to the employers. The blades were chasing them off of their farms for trespassing or when they would accept it N95 mask they would only give it to male farm workers. So, the implication there that we analyze is that they viewed male farm workers more essential than the female farm workers. So, occupational health and safety they statewide as with federal disaster relief fund for these essential workers hazard pay. Proper air quality monitoring. Pre and post exposure to wildfire events. And those are just a few that I could go on but of course we have other questions.

LAURA HELMUTH:

Really good start. It's really important start. And thank you for those specific examples. It's specific policy levers that could make things less terrible. And I'd like to bring in. So, in the comments, Marshall Shepherd mentioned the need for funds and this builds on what Michelle Bell was talking about that we need to help people escape dangerous situations. And Marshall, do you want to build on what you mentioned in the chat that this is a policy issue too is providing funds so that people can evacuate when there is a disaster.

MARSHALL SHEPHERD:

Yeah. And I know that everyone that can't probably see that, what I mentioned in the chat. So, I put it there to call out because I did want to mention it. So, again with Hurricane Ida recently there was criticism because the mayor and various stakeholders in Gulf Coast, Louisiana and so forth said they

didn't have time to call for mandatory evacuations. I think the hurricane sort of did something in meteorology we call rapid intensification. So, people maybe went to bed to a cat two storm and woke up to a cat four or so storm. This is the era that we're in. We are in an era of rapidly intensifying hurricanes of explosively spreading wildfires, floods like we saw in the northeast. And so we need a new playbook. I mean I'm challenging policymakers, medical providers and audience. We need a new playbook. Because the sort of two day threshold or window for example, that policymakers need to call for a three day window it is to call for emergency evacuations or for contra flow on the interstates. That's probably not going to be good enough anymore in this era of hurricanes. I used to be very critical of people that decided to stay when there was a Cat 4 Cat by a hurricane approaching their city and our forecasts are quite good these days. So, we have a pretty good sense of where they're going within three to four days or even five days really. I used to be critical. And there are some people that carelessly stay. But there are a lot of people in these jurisdictions that stay rigid because they just can't leave. They can't afford to go get a hotel for a week or they don't have the means or transportation to hop on it and evacuate to Houston or Dallas. And so this is an idea that has been percolating more in my mind as I've watched what we've done in COVID. We are providing funds, we're providing stimulus checks and so forth for people to have some resiliency against the pandemic. I think we very much need such mechanisms in this new era of extreme weather.

LAURA HELMUTH:

That's great. Yeah. Thank you so much. Really important point. So, we have a couple more questions for the audience. But I we'd like to follow up on that. And for Marshall or Michelle, for John or for Michael. Are there other lessons from the COVID pandemic that you think can illuminate how to address the climate disaster? And this could be at any scale. So, yeah. And Marshall just mentioned some of the things that are being done for emergency response. And are there other examples. I mean COVID kind of changed how we think about a lot of things. And also made it clear that a global disaster requires creative global responses whether it's a pandemic or the global climate emergency. So, are there other kind of COVID related lessons any of you would like to share?

MARSHALL SHEPHERD:

I'll quickly jump in and then let my colleague finish since I just spoke. I think COVID illustrate something that we've been saying as climate scientists for decades now. Experts like John Balbus and all of you in the health community knew a virus of this magnitude was coming. You've been warming up it probably for years to decades. And yet was the planning adequate? I don't know. We've been warning about the climate crisis for decades. And what we're seeing happening is happening at the scale of what we warn and in some cases happening faster. And so the lesson to me is that we need immediate action. We don't need more reports, panel reports, IPC. Those are things that we have to have as a part of what we do as scientists but we know what needs to be done, we need to act.

MICHAEL MENDEZ:

Sure, thank you for that Marshall. I like to argue similarly but I'll like flip it around actually like to add that the wildfire disaster actually informed our COVID-19 pandemic response on the ground level here in California during many years of interviews. And last several years advocates have really acknowledged that these extreme wildfire events have been happening for the last five years and disproportionately impacting undocumented migrant communities create a de facto public health experts or disaster

experts within our nonprofit sector and migrant rights groups. These individuals when there was no official government response for these disasters became de facto experts and service providers. And that had been going on for years. And that while the COVID-19 pandemic has been a horrendous to the farm worker community they all comment that it would have been far worse had it not been for those years of building social infrastructure of identifying these hard to reach populations or populations that are rendered invisible by political choices that state, local and federal government are making not to provide disaster relief resources and services before disaster hits. So, many of them commented that has provided the inroads to creating this infrastructure from a testing to occupational health and safety, social distancing and of course finally, to vaccine rollout. So, these are all interconnected things and one issue that has really come up in terms of the linkage between COVID on these other compounding disasters again is that mental health. Individuals are living in these communities year after year all while these disaster company, disasters, these synthetics are happening. And there's a sense of disaster fatigue constantly be on edge in dread that the next wildfire season, the next pandemic is happening while these individuals are still dealing with the other issues. Social, economic and health issues and their everyday lives. So, these disasters and these events are all interconnected. And there are some learning processes. Unfortunately they all happen because there was really no official government response during some of these initial disasters.

JOHN BALBUS:

I just saw for a couple of perspectives it's a lot of on the one hand, on the other hand kind of lessons from COVID. In November of 2019 there was a rating and I'm blanking on who it was whether it was World Bank or World Economic Forum of Countries Preparedness for Pandemics in the United States was ranked at the very top of the list. And then COVID in February of 2020. And I think that we learned that having a plan is essential but it's not enough. And that the way that we assess our preparedness needs to be a little more nuanced, a little more sophisticated. And in this case ensuring that the plan that's held is in a file in a government office is tested, is practiced and is kind of bought into by the populations and that that will be the ones that need to be helped. And the kind of a related lesson is, on the plus side I think the COVID pandemic showed the incredible power of the health sector of the United States to mobilize in the face of a severe threat. That some of the provision of a vaccine and the timeframe that was done is pretty remarkable. And yet at the same time as Michelle's talk really pointed out. Even having the scientific and technical solution to the problem isn't enough. And it has to be accepted and it has to be something that we overcome the denialism and I think with climate change we're seeing a threat that is on a similar magnitude but not on a similar timescale. And it's cognitively very difficult I think for a lot of people to think that we need to do as much for climate change as we had to do to mobilize our health sector for COVID. And at the same time we have to overcome the denialism against this reality that is impairing our ability to mobilize the resources to address it.

MICHELLE BELL:

Yeah, I'd like to add one more point building on some of the comments that my colleagues have said on Michael's point of the interconnectivity between existing climate change issues and social disparities. I think that the the COVID-19 pandemic has shown us that we have a strong disconnect between science solutions and science action. But we also have this incredible ability to mobilize. So, much of the discussions about COVID-19 correctly were on disparities and are in and just continue to be on disparities and who is impacted by COVID-19 that which sub populations have the highest mortality rate

and so on. And relate so much to issues of health care and access to information and a lot of other issues. And so I think that this connectivity between social and economic and cultural systems with science, with policy and with solutions was really highlighted in the COVID-19 pandemic. And it's something we need to keep in mind for climate change as well.

LAURA HELMUTH:

And these are great points. Thank you all so much. So, I'd like to shift the conversation a bit based on one of the questions that came in which makes really important point. The way that we will get long term action is by recruiting more people to be studying working on these issues. And so the question is, how can we support and recruit frankly early career scientists and physicians who are interested in working on the intersection of climate and health and in particular any advice about funding, about career development. Do you want to issue a recruiting call to tell people this is really important work and they should come join you all.

MICHAEL MENDEZ:

As the partly the only early career scholar I'm assuming on this call, definitely the funding for more integrated social science perspectives. As I mentioned earlier at the National Science Foundation has really been supportive of this research as well as endcard, the National Center for Atmospheric Research and really bringing together scientific practices and disciplines together with sort of that qualitative ethnographic policy action of the social sciences and working together to really focus on issues that are often understudied either because they're controversial, such as undocumented migrants. Or not always seen as a valid area of study. So, I do think having more programs for early career scholars that provides them with more independent and more longer term funding is of key importance. And then also, I think as scholars too in the research that I do. I take from a very co-production as framework that I co-author the disaster studies research with the communities that I am studying. They are co-authors. They helping the research design, the data collection and the corresponding solutions and of course, the policy briefings. And providing that sort of empowerment instead of the extracted research process is quite important particularly when you're studying a very marginalized, not only marginalized but very stigmatized exploited population. I think providing that true principle environmental justice giving them a platform to speak for themselves is quite important as well.

MARSHALL SHEPHERD:

And I would jump in and add. One of the things I've really been advocating for here at the University of Georgia and broadly in the ivory tower in general is we need to fundamentally reshape how we train professional development stance point scholars. Here in the academy we do a really good job of teaching graduate students how to write dissertations and master's theses and present at conferences and write papers for journalists. And that's fine. They'll get 400 reads or maybe 100 citations or 50. We need to train them how to engage in the public policy space and how to write op eds and speak to the media and have media training and those things. I fundamentally believe we need to have what's called an end to end scientists approach. We've got to sort of move beyond the inertia of the current model for what an academic scholar looks like. And I mean, I think this sort of popularizer myth is dead. That prehistoric thinking that scientists are stakeholders that engage beyond the ivory tower are somehow less serious as scientists or not as adequate as scientists are. I think that has to go. I think we have to incentivize tenure and promotion structure so that young scholars and students and even young

assistant professors don't think doing all of that is extra stuff but actually a part of the engagement of scholarship. So, that's something that I would advise.

JOHN BALBUS:

I think scholarship is important but if we're pivoting to action policy and solutions that are distributed throughout all communities it has to go beyond research. It has to go beyond professors and early career researchers and I think they'll move for the funding moves and is the funding increases in this area that will generate more scholarship. But we also have to educate all health professionals and in fact all people in this country but we're the National Academy of Medicine and the new action collaborative on decarbonizing the health sector is looking at just that. We have to put all health professionals. Not just doctors, not just nurses but all people working in hospitals to work on the solution space. It's not just an academic exercise it has to be an occupational exercise.

LAURA HELMUTH:

Great. Thank you all so much. So, we have time for maybe one more question. And this is maybe something for the audience to kind of help them do their next steps. If anybody wants to pursue more understanding of the issues we've been talking about. And the question is, this is from the audience. Can you name an organization or locality that you admire for its approach to the problem of climate and inequity? Are there any lessons learned from groups, entities, individuals that people in the audience could emulate or endorse or help spread around the world? So, if there's any program, any people, any organization you want to give a shout out to before we end that might be kind of a hopeful launching point for people to go move from this discussion.

MARSHALL SHEPHERD:

Yeah, I would mention the Institute for Sustainable Communities because I sit on their board. They're an organization that really thinks carefully about sort of equity and climate change and health and socio-economic well being and so forth not just here in the US but around the world. I've become very impressed with them as I've been able to sort of learn more as I've served on their board now for a little over a year. So, that's the Institute for Sustainable Communities or ISC.

MICHAEL MENDEZ:

Like that, there's various community based organizations I work with. One that comes to mind is (INAUDIBLE) community organizing project that again has become de facto climate experts. De facto disaster service providers and experts themselves. And they really, them and other community based groups really understand that, yes the scientific assessments and scientific studies are much needed. But none of them will ever be implemented without some exercise of political power. So, the need to link science into our policy action is quite important. And having a public advocacy campaign focused on local state and federal elected and appointed officials is quite key to ensuring that we have social change.

LAURA HELMUTH:

Great, thank you so much. Any other organizations if it was to give a shout out to for for the audience to look into? Alright. These are great questions. So, want to thank everybody in the audience for coming, for joining us, for thinking about these important issues, for submitting your questions. Thank you so

much to our panelists. To John Balbus, Marshall Shepherd, Michelle Bell and Michael Mendez. Thanks for the research you're doing. And thank you so much for joining us today and sharing your insights about how to improve policy and climate equity. And I think we're going to break now. I think I'll turn it over to Sue Curry maybe to do the next announcement of where the conversation will go from here.

SUE CURRY:

Great. Thank you so much, Laura. And let's see. We have John on the thing. But eventually I'll show up on camera. Oh, can people hear me?

LAURA HELMUTH:

Yeah, you sound good.

SUE CURRY:

OK. Thanks. So, I want to thank panel two for just a remarkably, insightful, informative and stimulating set of remarks and discussion on how policy can address climate change, impacts on health and I'd like to invite people to join me in thanking this panel.

### **Panel 3: Lessons from Compounding Health Crises: The Future is Now**

SUE CURRY:

I am delighted to introduce our third panel of the scientific program and this panel lessons from compounding health crises the future is now will be moderated by Alan Weil. Alan is the editor-in-chief of Health Affairs, the nation's leading health policy journal. He is an elected member of the National Academy of Medicine and recently completed a term as an appointed member of the Medicaid and Chip Payment and Access Commission (INAUDIBLE). He is a trustee of the Consumer Health Foundation in Washington, DC, and directs the Aspen Institute's Health Strategy Group. He was the executive director of the National Academy for State Health Policy directed the Urban Institute's Assessing the New Federalism Project held a cabinet position as executive director of the Colorado Department of Health Care Policy and Financing, the state's Medicaid agency, and was assistant general counsel in the Massachusetts Department of Medical Security, while earned his bachelor's degree from the University of California at Berkeley, a master's degree from Harvard's Kennedy School of Government and a JD from Harvard Law School. Over to you Alan.

ALAN R. WEIL:

Thank you so much, Sue. It's a pleasure to have the opportunity to moderate today's panel. Now if you are with us this morning, you heard a panel focused on two complex, multifaceted policy topics COVID 19 and climate change. In this session, we're going to build on those topics looking more broadly at this notion of compounding health crises, of which unfortunately there are quite a few. When I think about what we published in Health Affairs, I'm struck by how many challenges we face, how multidimensional they are. But I'm also struck by the commonalities across them with respect to some of the issues they raise and the approaches required to address them in this session. I'm hoping to keep focus on those commonalities, so we're not overwhelmed by the detail. If I look back at the journal, for example, back in February of this year, we published a series of papers from the National Academy of Medicine called Vital Directions, looking at future policy needs for the country. What were some of the topics in those

vital directions papers? There was infectious disease threats, which also looked at the topic of antimicrobial resistance. There was a focus on optimizing health and well-being for women and children, one for actualizing better health and health care for older adults. All of these are multi-dimensional, they are complex, and they're problems that will grow in the future, particularly if we don't try to tackle them now. Or I could open up the October issue, the one we just published a couple of weeks ago, which was focused entirely on perinatal mental health, or think about the broader topic of maternal mortality. These are complex topics that require multi-dimensional solutions. When I think about what are the themes behind not just COVID and climate, but some of the other topics I've raised, a half dozen of them come to mind and I'll toss them out to get us started. And then you'll hear much more detail from our panelists. First of all, none of these are just pure health policy topics, they bring in what some have called social determinants of health. They bring in social policy, economic policy, environmental policy. You can't solve any of these problems focusing exclusively on health policy. They all have intergovernmental aspects. They require federal, state, and local approaches and many of them require global health institutions to make progress as well. They have an interplay between clinical medicine and health policy. We need research, we need innovation, we need clinical solutions. But we also have to address the context in which those investments or research findings or clinical practices occur. If we're going to really make the progress we need, they're all highly inequitable in the burden that they impose. Even as we try to solve the problem, we run the risk of addressing and moving up the average while we increase the distribution between those who do best and those who do worse. That's not a solution at all. We need to focus on solutions that simultaneously improve and narrow the gaps that we have. They all have complex time horizons. They may seem immediate or they may seem quite distant, but they change over time in our ability to assess risk and risk and how and challenges how they change over time is something that our brains aren't particularly good at. And we have to figure out how to look at complex time horizons if we're going to tackle these. And they all need to build their solutions from local diagnoses, local solutions, local strengths, local voices up to state, national, global or else we're just going to continue to adopt sort of top-down approaches that have historically proven themselves not particularly effective, particularly when it comes to the social aspects of these kinds of topics. I'm not going to tell you that at the end of our 75 minutes, we're going to have solved the multi-dimensional, complex emerging issues that our country faces. But hopefully, you'll have some insight from practical experience from our panelists about approaches that make it more likely that we will succeed as we address them in that. In this time, you're going to hear from four panelists. I'll go ahead and give you the introductions of them all at the outset and then they can speak in turn, you'll hear from Ana Diez Roux who's the (INAUDIBLE)

dean and Distinguished University Professor of epidemiology at Drexel University School of Public Health. You'll hear from Emily Brunson, associate professor in the Department of Anthropology at Texas State University. Ed Maibach is next. He's a university professor at George Mason University and the director of the George Mason Center for Climate Change Communication And Umair Shah, who's the Washington State Secretary of Health, former executive director, and local health authority for Harris County Public Health. State and local public health experience. Each of them will speak to their experience and their approach. And then we'll have some time for questions, including those that come in from the audience. I'll turn it over first to you on at you Ana.

ANA V. DIEZ ROUX:

Thank you, Alan, and thank you for the opportunity to participate, this has been a wonderful seminar. I really enjoyed the previous two panels. I look forward to the conversation in this one. I've organized my remarks on the lessons from compounding health crises into five key points that I'd like to make, five key lessons that I perceive that we can learn from both of these crises that we are facing. The first is the value and indeed the need for a population and a systems perspective, both in understanding these crises and also in figuring out what we should do about them. And this is, of course, very obvious has been made very obvious by COVID because it is an infectious disease. And of course, the dynamics of systems are critical to understanding disease transmission and the evolution of a pandemic. But systems thinking and the systems approach is also critically important in the case of a climate crisis where we see dynamics that have to do, for example, with overconsumption by some causing exposures in others or in the concept of co-benefits, for example, that Michelle Bell was talking about earlier, where a good environmental policy has health co-benefits and where things like reducing automobile transportation, reducing consumption of processed food simultaneously have reinforcing environmental and health benefits. And we can only understand that if we think systemically. And this means that in many ways, we need to rethink the ways in which we do science and train junior scientists so that they can draw from interdisciplinarity and from multiple methods that we need in order to really understand the functioning of these systems and what we can do effectively to nudge them in a direction that is health-promoting and that protects our planet.

A second lesson, I think, which has come across very clearly in the presentations that we heard today has to do with the critical role of pre-existing inequities in understanding the full impact of these crises and also enacting to prevent their adverse health impacts. And of course, these inequities, as we have heard today, are driven by structural and systemic factors that have to do with racism, with inequalities inherent in our economic system and have been very clearly illustrated with COVID and also are being clearly illustrated in terms of the health impacts of climate change. As we heard in the panel earlier today, also in terms of who was exposed, how that how pre-existing social and economic inequities and racism interact with exposures and ability of populations to adapt, etc... And so these dimensions critical dimensions for inequality include, of course, race income, neighborhoods also work. And I particularly want to call out work because I think COVID in particular has highlighted the role of work conditions and the work environment in health, which is something that we often don't give enough importance to. And of course, understanding the critical role of pre-existing inequities and in, both of these crises is very important in terms of understanding what we should be doing but also understanding the potential implications of what we do. Ensuring that that the strategies that the policies that we put in place to deal with, for example, climate change, don't have the consequence of increasing inequities. And I think this is something that was mentioned earlier today by Marshall Shepherd. And necessitates by definition if we're going to understand the full impact of inequities and grapple with them, we need to go outside of the biomedical world, obviously, and bring in other disciplines, other actors, etc... The third lesson has to do with recognizing and grappling with and taking seriously the interrelated nature of mental and physical health. We have seen this clearly illustrated with COVID, with the consequences of natural disasters. And so thinking about how we simultaneously address mental and physical health consequences and how they reinforce each other is also important.

A fourth lesson has to do with the role of science, and there are multiple dimensions to this, so I'm going to spend just a little bit more time on this. But first, of course, and this builds on the first lesson about systems, and systems approaches thinking systemically, is the need for science that is interdisciplinary, that relies on multiple methods, as I was saying. But that also includes scientists from diverse backgrounds who can bring different perspectives, different lived experiences to change the questions that we ask, challenge the conclusions that we draw, and help us think differently about the implications and the actions that are possible and necessary. A second element of terms of the lessons for the role of science, which also came out today quite a bit, I think has to do with the need for an infrastructure and systems for collaborative science that allow us to respond effectively to these global challenges. And I think we have seen illustrated with COVID that even in the United States, the country, possibly with the premier health and public health research infrastructure of the world, we face many, many challenges in responding in a way that allowed us to draw scientific conclusions quickly, even about what was happening, why it was happening and what we could do about it. And so I think this, you know, generating evidence quit the kind of evidence that we need to be able to act quickly and in a coordinated fashion. And then so I think thinking about how we can create data systems, networks, flexible platforms, collaborations that allow us to really bring together all the expertise that we have is really important because I think, clearly the system that we have with individual investigators, individual institutions competing with each other. Did not serve us well in responding quickly to COVID, at least in my view.

Another element of the role of science, I think that has emerged has to do with how science interfaces with policy and what is the connection between or should be the connection between science and policy. Of course, science can help us identify technological solutions. Of course, science can help us evaluate the effects of treatments or policies, and those things are very important and we need to do them better and as has been mentioned today as well. But I want to highlight a couple of two other contributions of science, which I think, in my view, really emerged during COVID and are also important to the climate crisis. One has to do with the value of a precise and accurate description and why because I think science has the power to make visible what is hidden, and I think that is a very important role of science that we sometimes forget about. And the other element has to do with science influencing policy through what Carol Weiss, who is also a sociologist who has a really nice article from many years ago about the interface between science and social policy. She calls it the enlightenment role of science, which is really about science, creating narratives and stories, causal stories, true causal stories about why things happen about the causes, and that has immediate implications for what we should do about it. And I think this sort of causal framing is really important, particularly for such, for big problems like climate and pandemics, where the policy implications are not simple. They are complex and they probably involve big systems changes. And so for this creating, changing the paradigm, changing the way in which the public perceives causes and what we as a society should be doing falls under the enlightenment role of science for policy, which I think is really, really important. And sometimes in our efforts to be very focused and provide scientific evidence for a particular policy which may be very important, we forget about this big picture framing role science, which in my view, is probably the most significant way in which science can influence what we do as a society.

ALAN R. WEIL:

I'm going to bring the other speakers in so that we can have a conversation here. OK?

ANA V. DIEZ ROUX:

OK.

ALAN R. WEIL:

Thank you. Next up is Emily Brunson, Emily, over to you.

EMILY K BRUNSON:

Thank you, it's a pleasure to be with everyone today. Picking up where Anna was leading to addressing global issues, especially global issues that are multifaceted, like COVID 19. Like climate change, it requires a particular approach that science itself, we need to broaden as Dr. Eric Landry was talking earlier and to think about having greater diversity at the table, this is diversity in terms of gender, race, ethnicity, age, country of origin. But it's also looking at having multiple multiple disciplines at the table as an anthropologist who often works in the public health and medical sphere. I often come at looking at these issues from a different perspective, and today I'm going to be highlighting work that I've been doing with Community X, which is a national coalition of social scientists, public health experts, vaccine experts, and community advocates. And we've been working for the past year to bring together to broaden COVID 19 vaccination coverage within black, indigenous, and people of color or (UNKNOWN) communities, and also to strengthen the control these communities have over the trajectories of their own health and wellness moving forward. Why is this important? The technology development of vaccines was an amazing scientific accomplishment, but unless people are willing to take those vaccines, the technology means nothing. How do we where do we go from here or what do we do when we're involved in complex questions and issues and there are people involved? I'd like to share three particular insights from my own work that are cross-cutting. They definitely apply to vaccination uptake, but they also apply to other issues like climate change. The first point that I'd like to make is that messaging alone is not enough.

There's been a big focus on messaging, particularly with the vaccination campaign, and the underlying assumption of this is that the right information or the right messenger is the answer. It's a nice approach. It's simple and straightforward, but unfortunately, the reality is more complex. Let me give you a few examples of this. Early on in the vaccine rollout, the Maryland governor claimed that black persons living in Prince George's county were refusing vaccination. This had consequences within those communities, how they were perceived their own trust and in their government and in this public health measure. But the reality was is that black people in this particular area were not refusing vaccines. What was going on is the vaccines were being used and the vaccine appointments were being taken up by wealthy white people from neighboring counties who were able to navigate the online registration system, travel to the vaccination sites in Prince Georges County, and then wait in line for hours to be able to get vaccines. The issue was displacements. It wasn't hesitancy or resistance. In all of our sites that we worked in, and we worked in seven sites across the US. Respondents also reported access issues. They understood about vaccines. They wanted to get vaccines. They knew where the vaccine clinics would be and when they were open, but they didn't have money to be able to travel to vaccination sites or there was no mass transportation in rural areas, so they were unable to go. Some

people had jobs and there were vaccination sites that were opening during the weekday or on weekends when they had to be at work, or they lacked access to child care or elder care to be able to go themselves without dragging know children and elderly parents who didn't travel well to the vaccination sites as well or they had limited or no internet access to make online vaccination appointments. And so addressing access issues and recognizing those, our presence goes beyond messaging. Relatedly, trust was an issue that came up in Idaho. For example, our team found that the uptake of vaccination within the Hispanic community was particularly low. What was going on is that there were ID checks at vaccination sites. They weren't necessary. It was just something that they had decided to do, and this had gotten out within the community and the situation felt unsafe for migrants. For members of the community who had people here illegally in the US that were members of their family and sometimes even citizens who just wanted to avoid scrutiny over their citizenship. And so what had to happen is this way of providing vaccines had to change, and there also had to be an advertising campaign that went out and explained that ID checks would not happen and that made things more comfortable and allowed vaccine uptake to occur in that area. In other sites, including our states in Alabama, Prince George's County, Maryland, and Virginia, Tuskegee was often referenced by black community members. This was really a mechanism for mistreatment by the medical system in Prince George's County, one of the respondents said, you know, why are you speaking of the health care system so concerned with us now? Where were you when we needed help with type two diabetes, heart disease, and access to care? And so the response then to you need to get vaccination was also to quote, respondents in that area was hell, no. You don't have our best interests at heart, and these issues of trust are also there more complex than a simple messaging campaign can address. Finally, in relation to this, the concerns that we found vary significantly from person to person, and also they changed over time. You could have a message that that really worked at the beginning of the vaccination campaign that did not work three months later. A case in point, the Johnson and Johnson vaccine pause, for example, because some vaccinated participants actually become hesitant and unhappy that they had received that vaccine and they were suggesting that they would plan to refuse booster doses in the future. And so this has there's a different messaging and you need to be able to move with where the community is moving. What we found is that in addition to messaging needs to happen. From my second point is the community level or hyper-local engagement is critical. It's very essential to understand what's going on locally, including access difficulties, lack of trust and where that's coming from. Concerns that they might have that are specific to the vaccine, to the disease, to the health care system, and how to address all of these. As I said in Idaho, making material in Spanish, I'm clarifying the issue was the way to address that particular access issue. In Prince George's County, locally, our community team has worked on taking shots to the shots, so they've been working with barbers and hairstylists as community health care workers to both address local issues from a trusted standpoint. But then having these personal one on one conversations, being able to offer vaccines and locations that people could go to, that they go to regularly. This type of approach, by having things at the community level or hyper-local, it's not an easy lift, but it is necessary and especially necessary to chip away at that quote. Well, finally, the other message that we found that I'd like to apply to this issue and other global issues like climate change is that funding and continuous funding is necessary. Part of the reason that the vaccine rollout did not go as planned is because the appropriate community and public health resources were not in place at the beginning of the pandemic. There was a lack of community and public health workers, and particularly in problematically little or no prior engagement with minority communities. Hence, the question from our respondents in Prince George's County, why do you care about us now? Because you haven't up till

now? In order to sustain the gains made and to continue and to move forward in a better way, we need to figure out how we can have consistent funding for these efforts. Thank you.

ALAN R. WEIL:

Thank you, Emily. I'll turn it over now, Ed.

EDWARD MAIBACH:

Thank you, Alan. And I had actually set up, I've been thinking a lot lately about the similarities and differences between the COVID pandemic and climate change and the challenges they may pose to us as health professionals. I'm going to skip over all of that and dive right in and build on Emily's really wonderful comments. And I guess I'd like to start by acknowledging the obvious, which is we are living through a culture war in America. A lot of other countries are having culture wars, too. I think ours is particularly pronounced. I actually think there may be multiple culture wars going on simultaneously in the US. And one of the victims of the culture war, unfortunately, is evidence-based, decision making, evidence-based understanding of the issues because other in a culture war, other priorities take precedence. Identity, I'll just say identity is the most fundamental of those. The fact you know, our societal response to climate change has been enormously complicated by the culture wars. Our response, obviously to the COVID pandemic has been enormously complicated by the culture wars.

But just because we are living in interesting times, as they say, doesn't mean we can afford to ignore the fundamentals of how we know what we know are the attributes of effectively engaging to advance public health. I would contend sort of to build on Emily's comments. I would contend that we have 50 years of evidence supporting the fact that public health communication campaigns that succeed and in fact, all public communication campaigns that succeed feature simple, clear messages repeated often by a variety of trusted voices. And each of those three elements are incredibly important, simple, clear messages, message repetition, the trusted voices. And Emily has already started to build on some of those fleshing out some of those themes.

And I would contend that we haven't necessarily the culture war has made it very difficult for us to come together behind simple, clear messages repeated often by a variety of trusted voices on both of these public health challenges. I would also contend that the non-scientific voices, the voices that want to hold sway with regard to public opinion, they're actually doing a better job. They've got simpler messages. They've got much more message repetition, and they are mobilizing the trusted voices. And keep in mind, as Emily pointed out. Trust is entirely context-dependent like who I trust may be different than who you trust. And so who that the trusted voices will typically win the day. They might not necessarily be science-based, trusted voices. To build on Emily's next point is that that's the evidence-based approach to sharing what we know in the COVID pandemic. What we knew evolved rapidly, right? What we know about climate change. It's a pretty mature science. It evolves slowly, not rapidly. Most of what we talk about today is pretty well understood. The same was not true during the pandemic that was rapidly emerging, evolving science.

But once we've done the best job we can of sharing what we know so that people understand what's going on. And as Honest said, you know, the value of one value of science is the ability to offer a good, precise, accurate description of what's going on. And I agree with you entirely. I think that is one of the most fundamental, fundamentally important roles that science plays in society. But once we do that, if there aren't actions that people should be taking to protect themselves, to protect their family members, to protect other members of their community, we know that there are actions that we, the people who control the resources, can take. That makes it more likely that people will take those actions. I like to simplify that with the following heuristic people are we should stop trying to change people, which is often what we try to use our public health response to do changing people. We should put more of our effort into changing the actions that we're recommending to make those actions easier, more fun, and more popular. Like to speak, to just unpack each of those three just momentarily by easier. I mean, to build on Emily's points. The things that we recommend people to do aren't necessarily easy. They have there are all kinds of barriers that stop that make it difficult for people or governments or other institutions to take those actions. If we can use our resources to understand those barriers and to try to reduce those barriers, it becomes more likely that individuals or other decision makers will move forward in embracing the recommendations that we put forward. Fun has to do with the notion of benefits. We in public health we may have a certain set of benefits that that are our motivation for making those recommendations. They are public health benefits, public health, and wellbeing benefits. But those might not be the most compelling benefits to the decision-makers that we're trying to reach out to and encourage them to take a different action. It helps when we bring in more of an anthropological perspective to understand what benefits are most important to them. And one of those benefits comes, frankly, I think comes directly back to how we do better in operating in an environment characterized by a culture war. Respect. Respect is a really important benefit that everybody values, and when we don't demonstrate that value, we don't tend to get very far. And then finally, how do we make things popular that aren't necessarily popular already actually feel like we've done a pretty darn good job in responding to the COVID pandemic of making behavior that was completely non-normative, mask-wearing much more normal in a short period of time and making behavior that has become unfortunately societally contested and that is vaccinating ourselves and our children. And I think we've done a pretty good job of making that popular, there are whole sort of social science teaches us there are a whole bag of tricks, if you will. A whole set of strategies that will help us move from non normative behaviors to cultivate them and make them more not normative until such time that they become truly normative, at which point their own momentum carries carries us along. Let me come back to one final thought again. Building up the notion of the way we share what we know is simple, clear messages repeated often by a variety of trusted voices. A former Ph.D. student of mine and colleague and dear friend JT Thacker at Massey University in New Zealand in the midst of the COVID pandemic, he added something to what I call my evidence based formula for effective public communication. And he added the notion of simple, clear messages repeated often with compassion and kindness by a variety of trusted voices. I think that compassion and kindness is an incredibly important precondition for effectively sharing what we know and getting helping other people consider whether or not what we are sharing with them has relevance when we don't bring that when we don't put our compassion and kindness forward when we tend to give more of, when we tend to be disrespecting in any way, shape or form. And there are so many ways in which we can be disrespectful. People tune us out. That's what clicks in their identity-based processing as opposed to their evidence-based processing. So with regard to both COVID and climate change, the area in which I'm spending a lot more of my time thinking and

trying to operate is by finding ways to make sure that the compassion and kindness response is integral with our efforts to share what we know based on evidence.

ALAN R. WEIL:

Thank you, Ed. And now I'll turn it over to you, Umair.

UMAIR A. SHAH:

Well, thank you. This is always the challenge when you're the last speaker on an incredible panel. Ana and Emily, and thank you so much for your comments, your remarks, and I'm going to try not to be duplicative and hopefully add to what was mentioned. Alan, just to give a little bit of background to everybody. As you mentioned in the introduction, I am now the secretary of Health in the Great State of Washington, and I come here now after 25 of being in Texas and particularly on the front lines of multiple emergencies from from hurricanes to infectious disease, everything from Ebola, Zika, H1N1 and obviously the biggest that we've seen in recent memory COVID 19. And so those 25 years in Texas have taught me quite a bit and moving from this, this local level to a state level, moving from heat and humidity and hurricanes to, you know, where it's wet and mountains up in Washington. And also this real political dynamic of a red state so-called to a blue state. And then certainly the time that I arrived in the midst of all this was right. In fact, the week that I began my term in December was the week that vaccines arrived in the state of Washington. While everybody thinks of Washington as a very, let's say, progressive or very blue, you know, I will tell you that if you're familiar with Washington, which I'm learning quite a bit more, that when you think about one of the highest vaccinated counties in the country with Seattle King County, you go right across the mountains into central and eastern Washington, and we are facing many of the same issues, honestly, that we were facing in Texas. And it is this real. As Ed said, this culture war, this divide on how people see the world and really what is our contribution to that, whether we bring people together or we further alienate, that is one of the biggest challenges that we have. I did want to also make mention that this, what I see from a COVID standpoint, and this applies obviously to climate change and or a number of other types of emergencies and crises that we face that we have to really be thinking about whether this is going to be a transactional moment or a transformational moment. Is this a transactional moment where we are one and done, we finish, we completed, we ended a pandemic and we moved on and go to the next shiny object? Or is this a transformational moment where we look at the very things that Anna and Emily and others have described about this real concern about inequities and these long-standing systems that are a certain way? And how do we really approach this from the standpoint of, do we take this moment on or we simply let it slip through our fingers just as sand in an hourglass? And that is a real concern for a practitioner like myself, a physician or a medical provider, but also a public health practitioner who has faced all sorts of, as I mentioned, emergencies over the decades in Texas, but also very recently the storms, but also loss of power in the midst of what happened this past spring in Texas. While my family and friends and I were without power for a period of time, only to see in Washington that triple-digit heat and wildfires in the Pacific Northwest also being a situation that we were having to address. As you know, Governor Inslee in Washington has been a champion of climate change and that has been over the years. But at the same time... We have to recognize that this is, as Ed said, this culture war is something that we have to really be thinking about in a very robust way. I do believe that partnership is the way forward, whether it's the public health, health care partnership, whether it's public-private partnership and that in the midst of our vaccine efforts, I'll describe in a moment. Whether it's the global, federal, state, local, community

partnership, whether it's 50 states that are in essence at times competing with each other when there isn't a national strategy for everything from resources to different interpretations of guidance. and the science is a real challenge that we have. And the partnership with the very communities that don't always either understand or if they do, they don't always agree with our role in public health and even the science itself. And we have to be thinking about not just the message, but I agree with the comment about trusted messengers in a multimodal approach that we really need to be thinking about, how do we move forward ahead? Washington has been very fortunate. We've worked very hard to champion three cornerstone values at, for example, our state public health agency, which are equity, innovation, and engagement. Equity, innovation, and engagement. And from an equity lens, we have led with equity throughout, no matter who you are, where you live, what you look like, where you're from you should have access to vaccines in the state of Washington. At the same time, we have very much thought about how do we think about this from a standpoint of investing in the innovation space when you have the tech sector and this incredible, you know, the power of the private sector in the Pacific Northwest with Microsoft and Amazon and Costco and Starbucks. We brought them all to the table with a vaccine center, which is very much about public-private partnership. And so, while we have now vaccinated close to 80%, at least one dose of eligible population with one dose of vaccine or 70 plus percent with fully vaccinated state of Washington, you know, it was really interesting when we were doing mass vaccination sites previously, we went to our Starbucks partners and they said, "Gosh! if we could get a coffee or a latte in your hands, 20% more effectively, efficiently, how can we not help you also get vaccines in the arms of Washingtonians 20-30% more efficiently?" And that's the power of the public-private partnership in a robust way. The final two points that I would make are really around raising the visibility of public health, and I call this the three Vs that we have had this as I've testified in Congress, this invisibility crisis in public health well too long. We are far behind the scenes when we are in front people don't understand our role, what we bring to the table. And you fight that with what I call the three Vs, which is you raise the visibility. When you raise visibility, you have validation where there is this validation of what we are trying to do. And at the end of the day, it is also about working through together with this investment in public health. And so, visibility, validation is also about value. And when you show value, then people want to invest in pro-health resources or pro-health policies. But the biggest challenge that we have is that never thought we were gonna have this forth via virus. And even earlier in this past year or the last 18 months, we've been seeing violence. These five years have been really such an important piece of what we have had to really be focusing on. So there's importance of soft skills with engagement, social media, the culture war, and what I really like to champion is this concern that we have silos of excellence. That we are at the end of the day thinking about all sorts of challenges, but we do it in our own silo. And how do we come forth outside of that? And that's where the final point of investment. Investment in public health, whether it's the data systems, including social elements, to bring to the health system, disaggregation of data inclusive of that, but also investing in our workforce, the very behavioral health, the support when the public health and health care workforce have been vilified, especially during this latest delta surge. We have to be thinking not one in one time, not reactive funding and investment, but smart, strategic, scalable, and sustainable funding. That really allows us to be thinking about this from a standpoint of not just like 911, not just like Ebola, not just like Zika, that at the end of the day, the funding got to us, but it was well after the fact. We have to build the capacity and capabilities upfront in order to be able to be ready for the next crisis or when we layer crises upon each other. Thank you, Alan. That's all I've gotten. Look forward to the discussion.

ALAN R. WEIL:

OK. Thanks to all of you, you set out a tremendous amount of content, I want to try to pull some threads here together, but I want to begin with what feels like a little bit of a point of tension and maybe bring it to the surface and see if we can do something with it. And I appreciate the modifier on the critical list of compassion. I think at an individual transaction level that seems like not, I was gonna say an obvious, but certainly an important feature. But so much of what I heard from the other speakers were frankly an absence of compassion, not in message, but in reality of inequities and disparities and practices that are really quite actively hostile to people. And then we're supposed to be...then we're asking them to do something and you're suggesting we should do it with compassion. So, I guess maybe I'm not saying that quite right, but I'd like to sort of go into the question of how much of this is message and how much of this is reality? Or to put it differently, can a compassionate message really overcome what seems to be ingrained views based on reality that doesn't - people don't experience this very compassion? Emily, it looks like you wanna jump in here.

EMILY K. BRUNSON:

Look, Alan, I was gonna let Ed talk first, but if you don't mind, I'd like to jump in with this because I think we're talking about two issues that need to be teased apart a little bit. And messaging is important. And I want to underscore that that this definitely has a place, but messaging itself is inherently reactive. So there's a problem and you message about it. And really, what we're talking about here are some structural issues that are more longstanding that have cause, for example, some communities to lack trust in the entire health care system. And so, what needs to be done is we also need to address those systemic issues. And this isn't a communication issue. This is working with communities, understanding what's going on, why they feel the way they do, and working to address those issues making structural changes, for example, funding public health in an appropriate way that it really does serve the needs of the community, which has not been done for decades in the US. And so, we need to address those structural issues. And so, there's no way to message around the structural issues, that isn't compassionate in and of itself because the issues is still address. We have to address those and then also have effective messaging that deals with issues as they arise.

EDWARD MAIBACH:

So, I'll jump in next, if you don't mind. I think the compassion is really interesting in that compassion can be both what we say and compassion can be a more deep level of what we do, right? So, equity-focused policies, equity-focused public health programming, and health care provision is compassionate. But it might not feel compassionate to some people. Some people might actually perceive that some people do perceive that as threatening to them and their identity. And that, you know, that is a product of the culture wars. As Alan, you said, it's difficult to be compassionate, to remain compassionate and kind in the context when the public dialogue is becoming increasingly violent as Umair said. And that's true. I mean, to me, that's the most painful and awful thing that I've personally witnessed out of the COVID pandemic. How truly violent and scary, this public response has at times been not in every community, but in some communities to the very people that public polling tell us are the most trusted people in every community in America, and every community around the world are health professionals. Health professionals are one of the few classes of professionals that retain high degrees of public trust. And yet we see that despite that incredible asset, it can be quite fragile.

So, just in...one last thought, and Emily, I just wanted to build on something you said. I actually feel like yes, messaging can be reactive, but messaging can also be proactive. I feel pretty strongly that messaging is one of our greatest assets. A dear friend of mine, a very, very smart communication counselor, says that there's there's really only three rules of good public relations. Bear with me a moment I realize I've just framed myself into the public relations box. But the point is, he says, the three rules of good public relations are number one, do good things. Number two be seen doing good things. And number three, don't get number one and number two mixed up. And that's it's so amazing how often people and organizations get number one and number two mixed up. I don't think that in public health, we often fall into that trap, but coming back to my notion of compassion as being part of in part what we say and what more fundamentally what we do feel like good communication, good messaging about what we're doing, why we're doing it, what the evidence base for it is and why we think that's the best thing for all of us? That really is our most powerful platform on which to stand. It is a platform that is currently being challenged, sometimes violently. There's no denying that, but it is still our most powerful platform.

UMAIR A. SHAH:

Yes, Alan. The only thing I would add is that maybe when you're thinking about compassion, it's that we can't automatically catalog people and perspectives in buckets. We have to really be thinking about where people are coming from. And so, if there is a distrust of either a message or a messenger or even of science or the root cause, we have to really be thinking about what exactly is the reason for that. And when we automatically and I usually don't wanna use the word compassion in the same sense that Ed does here, but when we automatically decide that we do... When we automatically dismiss the alternative that is very dangerous as well. And that is part of where we are, is that at the end of the day when you think about it from either whether it's compassion or what I call true engagement, it's really about thinking about where people are coming from and trying to understand that. There is a lot about chaos theory that we also have to be thinking about is that we are in the midst of a global crisis. A severe global crisis, not a crisis like H1N1 was very mild, as we all know. But this is really a crisis that really at the end of the day is very much about how people behave certain ways when they are worried, when they're scared, when they don't fully understand all the facts, they're trying to do their best to get that information or they are targeted. And I use that word deliberately. They are targeted with misinformation that becomes a real challenge then for them to be able to turn around and think about wearing a mask or think about all sorts of other things that are out there that we are asking from a public health practice standpoint. So, I think there is a lot in here about compassion, but it's also understanding true engagement and how do we engage people and understand where they're coming from.

(CROSSTALKS).

ALAN R. WEIL:

Ana, do you wanna add to this? I have another question for you, if not this one?

ANA V. DIEZ ROUX:

Yeah, I mean, you know, compassion is important. It has a role to play. I mean, I think the big lessons from these two crises are the role of systems and structures. And that we need to address that and

addressing that means big changes. And so it's... And that means that we need to address this. And this is the fifth point that I was trying to get to at multiple levels, but certainly nationally and globally, because in the absence of a national or global response to both of these challenges, as we've seen, the local efforts can be important but are insufficient to really move the needle. And I think we have also seen and this is what COVID has shown us, that in situations of crisis, things can happen that we never thought could happen. So we saw payments to individuals, which reduced poverty by half in this country. We saw the CDC calling for an eviction moratorium. I mean, these are really important things that show how health is connected to other broader social phenomenon. And you know, we saw emissions drop dramatically when we had the lockdowns. And of course, these are all temporary short-term things that may not be sustainable for a number of reasons. But they do show that when we have a crisis and we work together, we can do things very differently, and perhaps we can figure out a way to live together differently. And I think this is the big lesson from COVID for climate change.

ALAN R. WEIL:

Let me keep going with some additional questions, I think you all have taken the topic of compassion and looked at it from a number of different dimensions. I note that Ana and Emily you both brought up the topic of work and the role it plays in people's ability to participate and respond to circumstances. I just wonder if again, you know, we tend to focus on health policy and maybe this goes on this last point, but where can we go to try to reduce the role that those kinds of differences play in the problems that we're discussing today?

Any reactions to that?

ANA V. DIEZ ROUX:

I'm not sure I totally. Could you repeat your question Alan?

ALAN R. WEIL:

Yeah. And so, you mentioned you were the first, I think, to bring in the role of the workplace and people's jobs as being a key source of inequity. And I just wonder, you know, what the barriers are there and what it might take to overcome some of them? I was just struck that two of you brought that up and here we are focused on health policy. But the fact that it came up twice made me think there's there's more here we should discuss.

ANA V. DIEZ ROUX:

Yeah, I mean, I was referring to the very important role that work has in shaping people's life circumstances. So, I think the pandemic illustrated, for example, how many people do not have sick leave, how many people cannot protect themselves at work or their workplace does not allow them to implement safety precautions. And so, I think, intervene and in the workplace and figuring out what we can do to improve conditions at work is critical to health to COVID and will also interface with climate, I'm sure. But work is structured by the economy. So yes, you can do health, education, and many things, but a lot of the challenges that we see have to do with occupational economic structures and the inequities that they create. And the kinds of jobs that people have. And the flexibility that those jobs give them. And this was, you know, dramatically illustrated by the pandemic.

ALAN R. WEIL:

... I'm curious. Go ahead, Emily.

EMILY K. BRUNSON:

Oh, I was just going to ditto Edi's comments, but it really is. When you get into this, there's a level of complexity and where people work in that in the US, really an identity for a lot of people is the job that they do. And we classify people and we think about people in terms of occupation. But it's also a point of information, a point of potentially intervention, just like schools are for children. And so, you know, it's really, I think, using the workplace and thinking about this, but really understanding communities and what's going on more locally. It's both a challenge and an opportunity that we have.

UMAIR A. SHAH:

It's also a point of risk, and I think that's the other piece that we have to keep in mind in the midst of a pandemic. So, you know, while many can do virtual meetings and do their business in other ways. And there has been some incredible positive aspects of technology in virtual advancement that we would not have ever even thought we could do even two years ago. But there are many people that cannot utilize those, the front line individuals that have to be really in positions and situations where they continue to be at risk because they're trying to provide for their families. And that, I think, is a real challenge as well in the workforce. And yes, I agree and the protections, we also have to be thinking about how the risk is there and that you have to in essence, accentuate those protections because it's a real concern for all of us.

EDWARD MAIBACH:

This is an issue I think a lot about, I worry a lot about. I mean, we know that work, good work is a powerful social determinant of health. I personally know less about what good... What are the attributes of good work? But I'm fairly sure part of one of those attributes is meaning, giving people a sense of contributing to their community in a positive way, a place in their community that is respected. I don't know so much about the implications of having thought through the implications for a better response to COVID. But I have thought a lot about the implications for a better response to climate change. And you know, the nature of our economy is changing and it will continue to change, especially to the extent that we take climate change seriously. And when the workforce of the future is given the opportunity to find meaning in their contribution, I think that they will embrace that opportunity much more passionately than if the work they, that's the meaning of that work feels diminished as so much work seems to feel now.

ALAN R. WEIL:

I wanna pick up on a point about the need for national and global action, which I think is undeniable. And yet I also think about, Umair, you talked about equity and innovation. And I think some of the leading policies and action around climate change is actually occurring at the state and local level. And I often scratch my head at that. And I think on a global policy this complex, what difference can one city or one state make? And yet that's how the change occurs. So, I wonder if maybe you could talk about the role of state and local to the extent that wasn't, I suspect that was less of a discussion in your local role. But what is the thinking about states taking a lead on a long term global policy problem that

potentially some of the responses might make you, for example, less economically competitive relative to other states or sacrifices that the elected...that the population that elected your leadership might not withstand because they're asking people to sacrifice. I'm just curious how that, how we bring together the need for a national and global with the reality of so much leadership that state and local.

UMAIR A. SHAH:

Allan, that was to me, right?

ALAN R. WEIL:

I'd love to start with you. Yeah.

UMAIR A. SHAH:

OK, sure, thank you. You know, I do think leadership matters and you know, at the state local level, it is really important that you have good leadership that is appropriately focused on not just what is happening today, but is really what is the threat for tomorrow. I think one of the biggest challenges, when you look at climate change, is that very quickly. I remember this and...hearing this a few years back and I loved this concept that we had as either Americans or policymakers were really good at collecting the dots, but we're not so good at connecting the dots. And so, when we have this real, you know, triple-digit heat in the Pacific Northwest and wildfires or, you know, and storms that are, you know, that are going from the Gulf Coast all the way up to New York and beyond. And then, you know, you have power outages where the entire grid is knocked off. Again. Is that example that I talked about earlier in Texas? When you start thinking about those things and that we are not good to work with our very community members to explain how that is all interconnected. And so then, you know, people think that they're just random, you know, emergencies that just sort of happen out of the blue or just happen to happen and this occurred. And, you know, we didn't know that the ecosystem, maybe even food and you know, and even vectors are very interconnected to climate. So, I think it's really important that it's about leadership. But what you're also seeing is that those very leaders in states and localities are actually the ones who are facing what those emergencies, those calamities are that are occurring in their states and localities. And you know, there is an incredible responsibility in state and local government to be. We are mindful of having to protect our own, protect our community members, protect, for example, Washingtonians or previously Texans. We are responsible for that in the jurisdictional bounds of what we are. We are there for. And so, there is an incredible responsibility that goes with that, but it starts with leadership. But it's also recognizing that what's happening tomorrow is not so theoretical because it's actually happening today. And I think that's the biggest challenge is trying to do it. So, maybe that's once part of the genesis of why you're seeing state locals taking leadership when at times the, you know, this real conflict of left-right, red blue or however you want to characterize it makes it very difficult to have that real collective action at a federal or a national level.

ALAN R. WEIL:

Other thoughts on this topic?

EDWARD MAIBACH:

Yeah, I like that chime-in. I had the incredible privilege of having Albert Bender, a psychologist from Stanford, on my dissertation committee. He had been my mentor for the remainder of his life. He has

unfortunately recently left us. But one of Al's incredible insights into why we take action under some circumstances and we fail to take action under other circumstances has to do with our sense of what we can do. What we're capable of, at the individual level he called it self-efficacy, at the group level he called it collective efficacy. The research that I do with Anthony Leiserowitz at Yale and our team, you know, we've studied people's sense of collective efficacy to respond to climate change at their community level, at their state level, and at our nation, our national level. And what we see is a real falloff in the sense of collective efficacy that we can

SPEAKERDASH1:

that citizens like us who are similarly concerned can make a difference. So I, for one, understand exactly why we're seeing much more innovation in responding to climate change at the local and state level because that those actions are happening at a scale that people can relate to. It's much more concrete and they have a greater sense of collective efficacy that those are problems, that they have the wherewithal to work together to address.

ANA V. DIEZ ROUX:

I think, you know, one of the interesting things...one interesting parallel between these two crises is that in COVID, you know, it's pretty obvious that we can certainly do a lot of things locally, but we also need to vaccinate the whole country and indeed the whole world. Right? So there's this with climate, it's the same thing. So, we can certainly do things locally. But if we don't deal with global dependence on fossil fuels, automobile transportation, processed foods, we're not gonna fix this. This is the big lesson, I think, that we need to figure out how to grapple with these big systemic problems that span the globe. And if we don't figure out how to do that, if we don't figure out how we as scientists and also as citizens can contribute to that, then we are not gonna fix this.

That's the sad truth, from my perspective.

ALAN R. WEIL:

So, as we're coming to the end here, I wanna acknowledge that we're at a National Academy of Medicine meeting and the focus is science and now you started us off with a number of comments about the role of science. And Emily, you described a project that is a scientific endeavor. The theme of the day has included one of the key themes of the day has been equity. And I wonder if we could as we're finishing here, take a more pointed look at some of the comments that, Ana you start us off with the importance of interdisciplinary research, the importance of a diversity of perspectives, of different lived experiences, of asking different questions. I feel like those phrases are often spoken. I'm not sure they're always heard, and I think it may be fair to say I'm not sure they're always even believed. I would love it if some of you could to the audience we have gathered here, give some real concrete examples of the value in our ability to tackle complex problems that arises from a more inclusive approach to research. Whether it's, as you've noted, different questions asked, different methods used, different experiences brought in. I know I'm kind of putting you on the spot as we finish here, but I think moving from the general to the specific is very important. And if you have a concrete example of how that change is good for all of us, I think it would be great for people to hear.

EMILY K. BRUNSON:

So, I'll jump in if that's OK. And give one concrete example about decisions being made in terms of scientific endeavors without having disciplinary representation at the table. When the COVID 19 vaccine rollout was very beginning, there was a government movement to help support vaccine initiatives, and the name that was chosen for this initiative was Operation Warp Speed. I was in another meeting like this where one of the people who came up with that name said, "You know, who knew that that wouldn't be, go over well with the public?" And my answer to that was every single social scientist who's ever worked on this issue could have told you immediately. That was a terrible idea. People often will talk about it, and this is for all of us who work in vaccination from the social sector that you know, one of the main concerns people usually have with vaccines is, you know, I'm putting this in my body. And even with vaccines that have taken decades to develop, they're still concerned about this is new. We don't know the long-term side effects. And so, instead of Operation Warp Speed, which is a cool technology, as long as you're a Star Trek fan and not a Star Wars fan, you know it still was problematic and a better name would have been, you know, safe and secure or something to emphasize, you know, that we were going to do this safely. And so, you know, bringing other perspectives to the table, it can fix even small problems like this. I think, you know, when we get into race ethnicity, when we get into other types of representation, the problems can be more subtle. But I think it's critical that we're really looking and thinking about diversity from the get-go and making places at the table from the beginning to involve multiple voices and perspectives.

ALAN R. WEIL:

Thank you. Anyone else?

UMAIR A. SHAH:

Alan, I guess I would just add is that, as I mentioned about the back center, which was this public-private partnership with, you know, these major private sector partners in the state of Washington. While that was incredibly gratifying, important, and critical to our work, complementing that was our vaccine collaborative that we're really very much about when Emily talked about, which is really about stakeholders from the very communities that were disproportionately and have been disproportionately impacted throughout this pandemic. And to have those voices at the table and to really have the equity-related conversations and discussions. So, I think one of the real challenges that we have is that we oftentimes put things that tension, right? So, you either can vaccinate many and a number or fast or you can do equity, you can't... It's become an either-or and so very quickly we say we can't do both. And I would argue we can do both. And I think it's a similar thing with science that with the National Academy of Medicine, one of my challenges over the real years that I've worked with, actually some the entire academies has been real this tension that's been about science. And true science with really all those other aspects of how you translate that science to people who are very much at, not always with that kind of experience or education, but they have other kinds of experience and education. And how do we work to include them as part of those processes, which sometimes and oftentimes we do not spend enough time doing? So, I would just say that we can't...we start with science that should always be in our back pocket, but we can't end with science. It has to be markedly more than that. And that's what true engagement is about, especially using an equity lens.

ALAN R. WEIL:

Yeah, I believe I heard in the prior panel equity as a trade-off against something else and it made me a little uncomfortable. So, I appreciate you bringing that up. Ana do you want to jump in?

ANA V. DIEZ ROUX:

Yeah, I mean, I mean, there are many, many examples in health research where diverse perspectives can contribute to a better formulation of the question and understanding what factors are important to consider. One that comes immediately to mind are questions about health inequities. Questions about race differences. What kinds of things should we be thinking about? What about structural racism? What about discrimination? How do we conceptualize and document these things and understand their impacts? I mean, for that and many, many not just questions about race differences, but many, many questions in population health benefit from diverse perspectives. If... You know, there are also theoretical arguments, Scott Page, who is a complexity scientist, has a wonderful book where he documents how systems with diverse actors are more robust and more often get to solutions than systems that are composed of, that are homogeneous. So, so there are many, many, many examples of that. I just wanted to add one more thing I think related to something that Dr. Shah was saying. You know, I think we also have to remember that and we've seen this clearly in COVID that, you know, science can impact action, but there is a lot more out there than science that affects action, right? Ideology, values, political circumstance. And so, we're only one piece of the puzzle and we've seen this. I mean, we saw this, you know, the article in the New York Times today about how there are laws against certain public health actions, which are science-based. So, we can't be naive about that.

EDWARD MAIBACH:

There's a profession that is often missing from our interdisciplinary and or transdisciplinary efforts. And I think very much to our detriment. And that profession is people who do conflict analysis and resolution. In my own work, I've been blessed to have a very sophisticated conflict analysis and resolution expert on a team that we worked with over the past decade. We worked with the TV weathercasters community for the past decade. 10 years ago they were on the issue of climate change. They were, believe it or not, much less likely than the American public at large to even accept the realities of human-caused climate change. The most fundamental truths we have about climate change in the contemporary era. And we engaged with that community. We brought a lot of compassion and kindness to that engagement and very, very smartly, I think. We brought an expert in conflict analysis and resolution whose practice allowed us to identify the nature of the disrespect that was being perceived by members of the community on both sides of the issue. And to let the tension out of the room metaphorically, literally, and metaphorically speaking. And by deflating the tension or by ramping down the tension between the partisans on this issue, it allowed a much better conversation between the communication practitioners, TV weathercasters and the scientists, climate scientists who were identifying the fact that there actually is a reason why I love what you said about connecting the dots but not connecting the dots. TV weathercasters have a unique opportunity to help Americans and people around the world understand how the dots that they are perceiving are actually related to a fundamental underlying problem. So...

ALAN R. WEIL:

OK, we're gonna...

EDWARD MAIBACH:

Yeah, just but just one last pitch. Bringing conflict analysis and resolution into the science to society. Enterprise is incredibly helpful.

ALAN R. WEIL:

Well, I think that's a good place to bring us together. There are real conflicts, there are also real solutions and an opportunity to move forward. I am hopeful that as we reconvene over the years under the banner of the National Academies, that some of the lessons that we discuss today will make it easier for us to tackle some of those complex, multi-dimensional problems that there's no doubt we will face in the future. So, we're thanks to Ana V. Roux, Emily Brunson, Edward Maibach, and Umair Shah. It's been a great panel and I will turn it now back over to you, Craig. Thank you all.

VICTOR J. DZAU:

Actually, Alan, it's me that you're turning over, but thank you for a great job and all the panel three speakers' outstanding remarks. You know, we've learned so much from throughout the day, from COVID to climate change and many lessons learned as suddenly we heard about the importance of system strategy coordination. But we also really, importantly, that it's about the community, is about people, about equity and inclusion. Respect as you said, and of course, at the end of the day, so much is depending on leadership as well as citizenship. And in this context, first of all, let me have everyone at this meeting join me in thanking this panel. A round of applause.

(APPLAUSE).

### **Special Remarks**

VICTOR J DZAU:

So speaking of leadership, I have the honor of introducing a special guest speaker. Secretary Xavier Becerra. He will deliver closing remarks for this program. But I will tell you that under his leadership, really have we seen tremendous progress going forward and energy and trying to address the issues we talked about today. Secretary says the 25th, secretary of the Department of Health and Human Services, the first Latino to hold office in the history of the United States. As secretary, he will carry out President Biden's vision to build a healthy America and his work we're focus on ensuring that all Americans have house security and access to health care. You know, throughout his career, the secretary has made it his priority to ensure that Americans have access to affordable health care. They need to survive and thrive from his early days as a legal advocate, representing individuals with mental illness. To his role as attorney general of State of California. Secretary Becerra has served, 12 terms in Congress as a member of the US House of Representatives. And during his tenure, he was the first Latino to serve as a member of the powerful Committee on Ways and Means. He served as chairman of the party's his party's caucus as a ranking member of Ways and Means Subcommittee on Social Security, and ranking member of the Subcommittee on Health. You know, Secretary Becerra was born in Sacramento, Son of a working class parents, is a first in his family to receive a four year degree, earnings Bachelor of Arts in Economics from Stanford University. He earned his JD from Stanford Law School. His mother was born in (UNKNOWN) Mexico, and immigrated United States after marrying his father, a day laborer, turned construction worker. Mr Secretary, thank you so much for talking to us. You know, throughout the day's meeting, we've discussed the compounding health crises of pandemics, climate change and equity, focusing on crossing the policy and equity chasm. He has play a key role as a key government agency to address

these challenges. I hope you will focus your remarks today and your vision, and a plan for tackling this issue. So everyone, please join me for welcoming Secretary Becerra.

XAVIER BECERRA:

Dr Dzau thank you very much for the very generous introduction. And also thank you for your leadership at the National Academy of Medicine. I want to thank each and every one of you who has made this country so relied on around the world when it comes to medicine and science, a place that you can encounter that you can trust. So very important. And if it were not for our scientists and our professionals in health care who come together, especially through the National Academy of Medicine, I don't think we'd be as accomplished. So thank you for what you do, and for inviting me to say a few words. And you sure know how to score some points. Electing Dr Walensky CDC Director and Dr Murthy, our surgeon general, to serve on the area you know how to make a good intro into my remarks today. So I appreciate that very much. They are so very accomplished. They fit the mold of the people that you count on at an NAMM and NAMM would benefit dramatically by having them now serve as elected members. And so...

VICTOR J DZAU:

You have great taste that you appointed great people.

XAVIER BECERRA:

Amen. So I want to get into some of the vision and the goals that we have... I must start by saying that we meet today and what I consider an inflection point in our history. And whether it's talking about climate change, or whether it's talking about the subject as your pandemic COVID 19. It's it is a point in time where people will look back and see what we did and where we went. But more importantly, for this particular discussion, I want to say that at this particular time, at least, I believe science itself is under attack during the COVID 19 pandemic. During the entire debate on climate change. I think you all see what I'm saying, but take the pandemic. Americans have been exposed to a wide range of misinformation, about masks about social distancing, about treatments and about vaccines. We know that the misinformation and is led those who are misinformed, to be less likely to get vaccinated and more likely to risk contracting COVID 19. According to a recent poll, nearly half of people who say they don't trust the Centers for Disease Control and Prevention also say they're not likely to get vaccinated. A majority of unvaccinated adults actually believe the vaccine poses a bigger risk to them and their health. They're not getting vaccinated. In another poll, it showed that 95% of Americans believe misinformation is a real problem in this country, 95%. And yet, in that same poll, only 20% of Americans believe that they're spreading misinformation. By May of this year, two of every three unvaccinated adults had heard about these one COVID vaccine that and they either believed it, or wondered if it were true. And an analysis of millions of social media posts found that false news stories were 70 % more likely to be shared than true stories. Another study showed that even brief exposure to misinformation made people less likely to want to get a COVID vaccine. This is about more than numbers, though there are real grieving families behind these devastating statistics. After one man, an otherwise healthy 45 year old father from Washington state died of COVID 19. His children said we believe he was a victim of misinformation. This is a gentleman who would watch YouTube videos of conspiracy theories, people making millions of dollars off of spouting lies that ultimately may have impacted this man's death. One thing is clear lies can kill falsehoods carry consequences. This has been a long time in the making. I'm

sure I don't have to remind any of you of the so-called death panel mania that overtook discussions of the Affordable Care Act. I was in Congress at the time. And at one point nearly half of Americans said they believe the government would decide when to stop care for seniors. So I ask you in the decade plus since the ACA was passed, how many death panels have dictated your family's elder care. But it's out there. And it's not just health care. Climate change has been infected by this for years, and think about disaster preparedness in California, where we've seen communities burned to the ground from wildfires. Some have advocated ideas like breaking the forest floors, even though experts say that that misunderstands the science of wildfire. Or how about the idea of nuking hurricanes, which sounds like a bad science fiction movie to begin with. Misinformation was also rapid during the 2014 Ebola breakout, and persistent rumors continued even today about AIDS, HIV. And for decades that has undermined our efforts to reduce the infection rate of AIDS, HIV and aids in this country. If you separate fact from fear, or fact from fiction or fact from alternative facts, then the truth becomes pretty clear. Science can defend itself in a world of reason and evidence. But that's not always the world we live in today.

Now, of course, health misinformation is not new to US. We have a long history of fighting quackery, even at the highest levels of government. When Joseph Lister presented his theories in the late 1800 on anti sepsis at the world's fair. Doctors even laughed at him when President James Garfield was shot. Those who were actually caring for him, gave him an infection that was probably worse than the actual bullet wound he suffered, because they didn't believe in germs. Abraham Lincoln, he suffered from mercury poisoning. After taking what was called in those days, the blue pill like countless others at the time, he was led to believe in junk science. The difference of course is these examples are from a century and a half ago. Now we know a lot more. And yet we still have quacks pushing lies. But what but what we're seeing today isn't just an attack on science. Dr Dzau, each and every one of you. I submit to you that this is an attack on scientists on the very people who dedicate their lives to the facts and truth who study who practice, who hypothesis and test to get a better understanding of the way our world work or should work. This isn't the first time scientists themselves have been under the proverbial microscope. We're all familiar with the trials and tribulations of Galileo or Darwin, or Newton and others. But in many ways today's assault on scientists is different from those of yesteryear, when it was harder to prove that the Earth was round, or that gravity was real, or that planets revolved around the sun that humans evolved from primates today 's lies are tweeted and retweeted by the millions posted and shared by friends and family liked and subscribed to by anyone with a Wi-Fi connection. They've been Photoshop and deep fakes to look and hook their audience. They appeal to emotion, not reason. To the amygdala, not the cerebrum they prey on fear and anxiety. And they erode people's trust in the very reality before their eyes that people are dying every single day from this virus, even when we have safe and effective vaccines to stop it. that our Earth, our planet, Mother Earth is crumbling before and crying out to us to help save her. As we continue to pollute. They say a lie gets halfway around the world before the truth gets its chews on. Well, the lies are piling up. The reactions are getting serious, troubling and even violent and the truth is still stuck tying the shoelaces In this moment, our leaders, the public servants in office and women and men of science and medicine must decide science or lies medicine or myth back or fiction fight or flight. I choose fight. I want HHS to be a fighter. And HHS, we're working with our partners to spread the word about the importance of vaccination in school aged children and teachers. We have a public education campaign underway that involves lifting up the voices of some 14,000 trusted messengers in our communities throughout the country to remind

everyone vaccines are safe and effective. Under our action plans, we're in the process of requiring our entire federal staff to be fully vaccinated. We're also requiring that nearly 300,000 educators in head start programs be vaccinated as well. We've invested billions to scale up screening in schools and underserved populations and to expand mental health telehealth services for pediatric care. Because we know this pandemic has had devastating consequences on our kids mental health. We're also following through on President Biden's commitment to tackle our nation's climate crisis. And building on the work that I started when I was an attorney general in California to advance environmental justice. That's why in August, I was very proud to announce that HHS has established the Office of Climate Change and Health Equity. This is the first office of its kind at the national level to address climate change, and health equity. And I think, you know, as well as anyone and perhaps better than most, what it means to combine science, with the reality of especially our disenfranchised communities on the ground today, to work with them today to keep them from being the first and worst hit by climate change, as is always the case for disenfranchised communities. It is why we are here. It is why we want to apply our study, our rigor, our testing, so we can make progress on these things. That is what leadership grounded in fact and science looks like. Now, this is just a snapshot or efforts and as secretary, I haven't been content to simply view this work from our Humphrey building in Washington, DC over the past year, I've had a chance to travel to engage communities directly. I've met with parents and teens in Georgia. I visited with tribal leaders in Seattle. Farm workers in the Central Valley of California. I met with faith leaders in Oklahoma. Families in Dallas health care workers in hospitals in New Orleans. And with surge response teams in Las Vegas, Nevada. I've seen firsthand the dedication of our front line workers, the compassion of our medical professionals, and the resilience of our people. They're counting on us to fight this misinformation head on. They're counting on us to fight lies and save lives. Dr Dzau to you and everyone at the National Academy of Science and Industry, the National Academy of Medicine, I say to you that when we combine science with our fervent hope for a better future, we're going to not just save lives, We're going to add prosperity to those in the future. And so I hope you will continue to join with those who want to fight lies, and put the truth out there. Together, we can make sure science wins today. I am thrilled that you invited me to be here, I hope that we will find that we are able to partner with you in the future because our work is too important to not come together. So thank you very much for the invitation.

VICTOR J DZAU:

Thank you.

SUE CURRY:

Well, I want to thank secretary Becerra, we are tremendously honored that you joined us today to provide remarks to conclude our scientific program. And let me ask you all to join me in thanking the secretary.

Thank you.

So we're going to be turning to the final session of the annual meeting now. And I just want to before we move to the president's forum, really thank everybody. It takes a village to put this kind of program

together, and we just had a remarkable team. I want to thank the staff at the National Academy. I think we've heard that, we have a lot of challenges, but I hope that on the plus side, we also heard the engagement of the scientific enterprise in learning more, enhancing what we know, but doing it in a way that gets us from what we know to what we do in an equitable and effective way.

### **President's Forum:**

SUE CURRY:

So I'm going to turn to the final session of our annual meeting, it's the president's forum which will be led and moderated by Victor Dzau, the president of the National Academy of Medicine. So over to you, Victor.

VICTOR DZAU:

Thank you. Thank you Sue for, and the planning committee for really an outstanding program throughout the day. And, of course, thank you (UNKNOWN) for joining us for those closing remarks. So as you can hear today, we've been talking about pandemics, climate change and the many many health crises that we (INAUDIBLE) are facing. This last session as a transition, the president forum is focused on climate change, human health and equity. Now, we've been discussing this morning. I also said in some detail this morning and my press remarks about the grand challenge that we're launching. I will say a few words about this, but let me just simply say that how honored we are to have secretary, to have Gina McCarthy honorable, the White House National Climate Advisor to kick off this exciting forum. Gina McCarthy is the first national climate adviser, the president's chief adviser on domestic climate policy, and leads the White House Office of Domestic Climate Policy Focus on mobilizing a whole of government approach to tackling the climate crisis, creating good paying union jobs and securing environmental justice. Previously, she has served as the 13th administrator of the Environmental Protection Agency, and then as president CEO of the Natural Resources Defense Council. As one of the nation's most trusted and (INAUDIBLE) voices on climate issues, she's had been at the forefront of environmental and public health progress in a variety of leading roles for over three decades. So, throughout her career, she has advised five administration on environmental matters. She has served as commissioner of the Connecticut Department of Environmental Protection prior to being appointed by President Obama to head the EPA office. And, of course, as EPA administrator, she'd pursue innovative global collaborations with United Nations, the WHO, and the global efforts to address pollution. Importantly, I have just found her so accessible, so supportive, and I think everybody will say, wow, she gets it. I mean, she's worked on all these areas, but I think she also (INAUDIBLE) greatly on human impact. And that's why we want her to speak to us today. So, please join me in welcoming Gina McCarthy.

GINA MCCARTHY:

Well, first of all, thank you, Dr (UNKNOWN). It's wonderful to see you again. And I'm really excited to have a chance to be with all of you at the National Academy of Medicine. You know, I can tell from all of your agenda that you're really tackling some of the most pressing health challenges that our communities and frankly, our world is changing. And I'm so excited that Secretary Becerra helped to spearhead a lot of work that's going on at HHS with John Bell (UNKNOWN) and all of his crew. And how

exciting it is to see that President Biden's National Climate task force is really integrating climate into the work of all of our efforts across the administration. It's no longer about what EPA does or DOI does to protect our planet, it's about what all of us are doing to protect our common wealth and our health. So it's really important that we have all of you engaged in this issue. You know, the climate crisis, as we all know, is a public health crisis because the planet just doesn't care if it becomes uninhabitable, we care if it becomes uninhabitable. And so thank you for the opportunity to just say a few words. And I wanna start by saying that President Biden has understood for quite some time that the issue of climate change is a code red from you humanity. It is about protecting our public health right here and right now, and this happens to be the decisive decade for climate action. You know, we saw last summer and this far that the stakes are incredibly high. People across the West and the Midwest, they're breathing in dangerous wildfire smoke that then shoots all the way across the country. And so many people have been exposed to scorching heat waves. Communities along our Gulf Coast and look at the eastern seaboard, they're getting hit hard by hurricanes, losing powers in their homes and even in their hospitals. You know, homes who were getting flooded, lives were lost, and contaminated water was making people sick. And it's not just extreme weather events that we're having to deal with these days because climate change is actually jeopardizing our food and our water supplies, and our supplies of products all across the country. And it's bringing disease- carrying insects into new areas, and it's taking a toll, as we all know, on our mental health. So the challenges we face are enormous. But working at the intersect of climate and health is also an incredibly important opportunity that we need to grab, because as we make progress on climate solutions, we're also going to alleviate longstanding health problems. Just think about it. By moving to 100% clean energy, we're going to improve our air quality immensely, especially for the fenceline communities that have been most burdened by pollution. And by advancing to electric vehicles and cleaning up our transportation sector, we will be able to prevent tens of thousands of asthma attacks every single year. And through building electrification and energy efficiency, we're gonna create healthier living environments and improve our indoor air quality. What is wrong with this new picture? Everything is, in fact, right. You know, we're working right now with Congress to deliver on those climate and health benefits. For example, the bipartisan infrastructure deal would replace old diesel buses with clean zero emissions. We're talking about plugging abandoned oil and gas wells that are currently spewing methane and leaking toxic substances. And the build back better agenda would create a civilian climate core, which is really exciting because it's gonna put a new generation of Americans to work, conserving our land and waters, improving access to green spaces, and making our communities more resilient. So as we seize these opportunities and many more, we're going to be advancing improvements and benefits for people's health all across the country. And ,in fact, the world if we can manage it when we get to (INAUDIBLE) in a few weeks. And we're going to also be making sure that at the same time, we are focused on advancing environmental justice for all those communities that have been most burdened by pollution, as well as racial and economic inequalities. It's time for them not just to get their fair share, but get most of the share of the benefits that are coming along. You know, we're implementing a Justice 40 initiative to ensure that disadvantaged communities receive at least 40% of the overall benefits from federal investments. And we're paying attention to disparities and climate impacts because we know that the impacts fall harder on communities of color and low income households. You know, that's why Secretary Becerra at HHS established his new Office of Climate Change and Health Equity. And I'm enormously proud of the work that he's doing because we need to better understand those disparities if we expect to be able to address them. We need to build back with resilience. We need to reduce our emissions even from the health care sector itself, which I

know you are fully committed to doing and I am so proud of your work. So, I really wanna thank you all for everything you're doing. We're working hard on heat, we're working hard on resiliency, we're working hard to make sure that we're protecting our HHS facilities, getting grant money out there, working with CDC and NIH because this is an all hands on deck moment. This is the decisive decade. We either move now or we don't make it happen for the people that we care about. So let's get excited about this. Let's work together. Let's demand change the way we need it. Thanks so much.

VICTOR DZAU:

Wow, thank you. What an energizing inspirational talk. Just wanna give you a clap, I mean (CLAPS).

GINA MCCARTHY:

Thank you.

(CROSSTALK) you guys.

VICTOR DZAU:

Well, thank you. There's 100 people out there clapping that you can't see. But we are so energized. And you're so right, we are committed. The reason that we want you to speak to us and as Secretary Becerra and (INAUDIBLE) Eric Lander is to work along with you to also to tell you how committed we are to this. As you know, we wanna do our share. This is the biomedical health community. We know that we should be sounding alarm on the public health aspect and human aspect and equity aspect of things. We also know that as a trusted advisor, we should be in fact telling the public about the public health crisis that it is. And we need communicators. And we also have a duty to advocate for how to be a center of climate planning and policy. And finally, as you pointed out, you know, we should hold ourselves accountable because the US health sector emits 8.5% of all of greenhouse emission US, and that's a huge number. And what we're promising to do, as you know, as we have launched this action collaborative along with Dr Rachel Levine, is to say we'll bring together the public and private sectors. And we're gonna start measuring and start setting goals to work together along with you and the administration to reach that target that we all want to. So thank you.

GINA MCCARTHY:

Thank you, doctor. It was great to be here with you, I applaud everything you're doing.

VICTOR DZAU:

Thank you. And it was great to see you.

GINA MCCARTHY:

You too.

VICTOR DZAU:

Thank you. So that actually is a perfect segue way for the president's forum because probably what we want to talk about is what can we do as National Academy of Medicine not only in NAM, but in fact, how to mobilize the entire community of health, researchers, you name it, in our own community. And we recognize that this is not an easy task, but we wanna do this together. So, you heard me say it earlier

this morning, we have several strategic goals. One is to communicate. Second is two systems transformation and work with systems across and related to health sectors that includes food, nutrition, energy and others. And third is to activate ourselves to take action. And fourth is to look at research innovation to see how we can transform the system. And so today I brought the key leaders in the US health sector. It's actually more than that, it's global health sector together, to see how can we do this together under the NAM grand challenge? I should first say that health sector is diverse, range from hospitals, to health systems, to health care supply chain, infrastructure, medical research and many others. And so we have to bring together these sectors to work together through public and private partnership, to reduce carbon emission, and then show resilience and sustainability in the long run. If we do right, as Gina McCarthy and Secretary Becerra said, our efforts would translate not only to reducing Carbon emission and minimizing climate change, but also better care and outcomes for patients, low cost, and greater health equity. So, what we have today is six esteemed panelists who are leaders in the field, and they share with you how they think about addressing these challenges. So I would like to do the following, I would first like to introduce them. And as I introduce them, I would like them to say a few words about how they see the whole issue. So let me do the following. Let me first introduce them. First, I'd like to introduce Dr Rachel Levine, the Assistant Secretary for Health, Department of Health and Human Services. As you heard, she also oversees the new office in HHS and climate change and health equity. Next, we hear from Greg Adams, the chair and CEO of Kaiser Foundation Health plan and hospitals. And they have really achieved amazing stuff. We'll also hear from Dr Michelle McMurry Heath, the president and CEO of BIO which is Biotechnology Innovation, which has about 1,000 biotechnology companies working together and really interested in this issue. We'll hear from Donald Berwick, President Emeritus of the Institute of Healthcare Improvement and former administrator of CMS. We all know, Don. We'll hear later from Renee Salas, the Yerby fellow in the Center of Climate, Health and Global Environment at Harvard and a practicing emergency physician in Department of Emergency Medicine at the MGH. And we'll hear from Howard Frumkin, Professor Emeritus at University, in Washington School of Public Health and now the senior vice president with the Trust of Public Land. Now, here's what I'd like to do. I'd like to ask them all this question, and I will therefore turn a different order ask people to answer this my question. So the question is, given your expertise and, you know, and what you work in, how do you see the health sector and related sectors poised to address the climate impacts on health? And what are the key mechanism or partnership you could yield, that could yield a healthier, more equitable and more resilient society? And second question will be, how's your organization working in this area? So let me turn to Dr Rachel Levine, the assistant Secretary of Health. Rachel.

RACHEL LEVINE:

Well, good afternoon. Thank you, Dr Dzau for bringing us all together today to talk about this urgent health issue. As we've already heard today, climate change is a threat to our health. It is clearly a threat to our health right now, and that threat will only increase if we fail to act urgently. One of the newest examples can be found with COVID 19. We have seen how extreme weather stoked by climate change has added to the health threats of COVID 19, shutting down testing and vaccination sites. Now, as has been outlined, President Biden is working across the government and every sector, every agency and all of government approach, to take swift and necessary actions to tackle the climate change emergency. On day one, (INAUDIBLE) commitment to rejoin the Paris Agreement, and he also took executive actions to ensure that we tackle the climate change at home and abroad, creating jobs, and strengthening the

economy. Now, we are mobilizing on transformation changes that are critical to the 1.5 degree Celsius limit on the global average temperature rise within reach. We're transforming energy systems, revitalizing the transport sector, and promoting innovation to clean technologies. And this whole of government approach closely aligns with the National Academy of Medicine's work to develop a comprehensive and long term roadmap for transforming systems such as the health care systems. We have a focus on human health, wellbeing and equity. All of these collective actions by the administration and the private sector has to work together and have important implications on the social determinants of health, and we have to make sure that no one is left behind. We have to provide urgent support for vulnerable communities made even more so by the climate crisis. Now, you've heard from Secretary Becerra, supporting environmental justice and climate resilience are priorities of HHS, the priorities of my office. And we are working hard to address climate change and its impact on health, including partnering with you and the National Academy of Medicine and the Action Collaborative on the decarbonization of the US health sector to reduce greenhouse gases in the health care sector. So as has been mentioned, we have launched our new Office of Climate Change and Health Equity. This office will have three main areas of work. The first is to build on the resilience of communities to the health impacts of climate change, especially those communities facing more than their fair share of the climate change burdens. We wanna work with all of our regional offices to help tailor solutions to each region. The second is partnering with you and the nation's hospitals and health systems to reduce the greenhouse gas emissions and make them more resilient to the effects of climate change. You just mentioned that the US health sector accounts for roughly 8.5% of US carbon emissions, and that's in the United States. In the global health sector, accounts for about 4.5% of global carbon emissions. So this effort is critical. The last area we will do is focus on harnessing the long term recovery and infrastructure initiatives to combine climate resilience with health equity. It's absolutely critical. So we have joined with 20 other federal agencies in releasing a climate adaptation and resilience plan. HHS plan provides a roadmap for ensuring that all parts of the department address the protection and health of all people, especially those most vulnerable. It also ensures continuity of operations for HHS facilities in the phase of extreme weather events and fosters healthy greenhouse gas reduction and resilience efforts. So, you know, this is just beginning, our work is just beginning. But it is absolutely critical as has been mentioned by Gina McCarthy, extremely enthusiastically. The time is now. And we will not be successful without working together across government, public-private partnerships, across stakeholder groups, across whatever divides us to address this critical issue and ensure that future generations have a place to call home. Thank you.

VICTOR DZAU:

Wow, thank you very much. And (INAUDIBLE) I wanna thank you for your leadership. We've been working with your team. Earlier, we (INAUDIBLE) from John Valves as well. And ,of course, you got a great team. We're working closely with them on this collaborative. And I wanna thank you for being a co-chair of the collaborative, that's true public-private partnership. The other two co-chairs, as you know, is Sir Andrew Witty from United and also George Barrett from the CEO of, former CEO of the Cardinal Health. We just published a paper together in general medicine, call to action. So, thank you. We wanna work closely with you to make a difference. Let me turn to Greg Adams. Greg, you've done so much already in your institution. Give us your thoughts for the next five minutes.

GREG ADAMS:

Thanks, and I'll try and keep it in five minutes. So one, Regina and Dr Levine have said a lot about where we are and the risks that we've got. So I'm gonna not try and repeat that. But we believe strongly, as the nation's largest integrated delivery system, that climate change is the greatest global threat that we face in the 21st century. Our mission is to provide high quality, affordable health care and to improve the health of the individual and the members we serve and our communities. And so when we look at this, it is a really, how do I say it? It's a serious kind of oxygen issue for us. And one of the things that I would say is my predecessor, Bernard Tyson, really championed this for the organization. And Bernard grew up understanding health care inequities. He grew up understanding issues of housing and, you know, issues of pollution, et cetera. And so his commitment was really about not only our living out our mission, but our really being committed to change and to really create health in the communities where we take care of, or serve some 66 million people. When we think of this issue, we see it as it's linked to disparities, as others have said. But we, when we think of health, we believe every health care system, every health care organization, every health care association, is really, you know, owning and being committed to that vision of health. And if we are committed to that vision of health, then we have to understand the connection to, of climate change to improving the health of our communities. So as we've looked at our organization, as we look at what we did with COVID and what we saw with COVID, we saw that the people that were most impacted, that had the most harm, were those that were poor people of color and the less disadvantaged. The health care sectors understanding of its core mission must acknowledge and address the contribution that we're also making to this issue, that we're contributing to the issue. So you mentioned earlier about the 10% of carbon that the health care system was (INAUDIBLE). So 20 years ago, with Bernard as our leader, we made a commitment that we would get to being neutral in terms of carbon. And it was an amazing experience. I remember I was not the CEO, but I was sitting outside and looking at it, and I remember that our champion championing this, and I remember the struggle our financial people had. I remember the struggles our Treasury people had. And one, there was this clear vision that this is where we're going and this is why we're going now. And two, we brought in, and I'll never forget it, an individual as our chief.

GREG:

Officer of energy. So we brought in someone that was not owning and working this off the side of the desk, but their full-time job was to help our organization look at where we were and how we could get to where we wanted to be over the next 20 years. That was in 2012. He engaged with finance. They engaged with our Treasury Department. They looked at our capital process from a long term perspective, and they were able to show the organization that that vision was really a good business vision. It was good for our business. And so what we were able to do was to really change the organization's thinking so that it understood that if we invested now in energy, if we invested now in eliminating waste, then the outcome of that, and if we invested in sustainable energy, we invested in solar, invested in wind, the outcome of that would be essentially us being better financially 15-20 years out. I was on the phone yesterday with our national facility services individual who actually led this process, who was able to say, today, when we look at our buildings, we look at our energy consumption, we look at how we built them in terms of lead, platinum and gold buildings that we're at a place where we are neutral or better in terms of the cost of operating our buildings. So one of the things I want to say is, you know, from a health care perspective, we want to do the right thing for our members and our communities, we want them to be helped. So we've got to step out and leave. But from a business perspective, there is a good business plan here. We can look at this and see that we're able to actually

operate our organizations more cost-effectively. Quickly. Two other things. One, we have to go, but that's about going upstream and doing the right thing so that we actually are able to change or at least mitigate the trajectory here. But I think the other thing we have to do is we have to understand kind of the systemic issues in our communities that are contributing to many of the challenges that we have with equity, many of the challenges that we have with people of color and others being impacted differently by climate change and how it connects in terms of health. So we have to also be prepared there. I mean, since 2017, we've had in our Santa Rosa community two Nash, two wildfires, one that resulted in our hospital being threatened and being on standby for closure. The other one where we actually had to close the hospital for a substantial period of time. Community without hospitals. And we've got to think about how do we build that resiliency in our communities, how do we partner and how do we really create a way for us to lead our communities through this as we really own what we need to do upstream?

VICTOR:

Thank you. Thank you so much. Well, certainly, Greg, you're leading the way. But the good news is that our grandchildren now have the participation of many, many hospitals now with that leadership. They've got a long way to go. And you've demonstrated that it's doable, right? And so we have, in fact, Rick Pollack, the president of the American Hospital Association, five thousand hospitals. We have Jim Madara as part of a collaborative, who's is president of AMA. With all the physicians, we have Perry Malone from the nursing community leadership. And of course, we have so many others, all now ready to go and learn from you and work together to achieve this. Also, health care without harm, which already been working in this area. So, thank you. That actually leads to this question for Don Berwick because, you know, I mean, you pointed out that you did have a business case. You have pointed out it takes investment. And now, you know, hospitals in the midst of Covid say, one more, really? So, Don is actually leading a group on metrics policy incentives to think about how we can make it easier and make it doable for systems to work together. So, Don, over to you.

DONALD:

Thanks, Victor, I'm so excited by this meeting, by your leadership and listening to the enthusiasm from Dr. Levine and Gina McCarthy, (INAUDIBLE) and all. I mean, we've really got a stack of cards here for success. Victor, thank you so much for that and for inviting me to join. We don't talk about the urgency anymore. We know the urgency. We understand health care's a significant footprint in this field. We can see the accelerating effects of climate change, and we know that in not just as healthcare of that climate but climate affects health in ways that are just stunningly important now declared by WHO, the number one health threat on the planet. So we're ready to go. But there's a problem, and I think we are not going to solve this unless we look at the obstacles with real clear eyes. And honestly, as I see this, this is a kind of classic problem of the comments that Garrett Hardin wrote about. No one organization, not even one industry like health care makes a massive difference that will be this positive. By the bystander role is available. People that argue it's not my problem or I just would contribute a little bit, even Greg Adams Kaiser did nothing. It's only a small loss. That's the nature of a common problem. Any one agent can put their sheep on the commons and help destroy the commons. It's supposed to be unsolvable problem. We also have the problem of competing priorities. Executives today in health care are worried about the pandemic are worried about workforce demoralization, worried about equity, of course, they're worried about money. And they're losing a lot of sleep. And not a lot of think about climate

change in their organizations, I'd say. And to adapt takes changes. Greg talked about what it took at KP to come together and kind of wake up and understand both the business case and the technical models. This also has another property, which is that it's not a fast emergency, which we're not bad at reacting to when things go wrong, you know, the child's caught in the mind, we get the child out. This is a slow emergency. It's accelerating but it's still capable right now of being ignored by people. They just don't realize the frog is getting boiled. So we have a real problem here. So, that's where I think the work you've established here, the voice and leadership of the NAM and the real deeds that are now going to make a difference are absolutely needed. We know from the work of the Nobel Elinor Ostrom, who I deeply admire. Nobel Prize winner, the first woman to win the prize, Nobel Prize in economics, who died, unfortunately shortly after that. But she she proved in her work. She won the Nobel Prize for proving that the problem of the commons is not inevitable. It's possible for communities to solve the problem when they all come together, and she's actually laid out the principles for doing that. Principles like understanding that there is a commons, defining the boundaries, coming up with metrics, tracking things, developing platforms for participatory decision-making, sanctions for people who are defectors from the group's decision to actually make a difference. So we kind of know what to do. Now, can the National Academy with the collective you pull together, Victor, do what's needed. Some of that is hard edge stuff. We're going to have to look at the regulatory and policy environment. We may want to consider conditions participation in Medicare too. To name one, that would be highly controversial. There would be financing issues, both, the business case that Greg talked about, but also maybe linking this to the area of quality and value-based purchasing that we're getting into a health care. That would be a change, a hard change or controversial change, but that hard-edge stuff, we need to deal with all together as a collective saying, it's time to get serious, as Gina said. There are certainly supportive steps we can take. I think clear metrics will be one of them. If we knew for every single facility in this country what its fossil fuel use is, what its carbon footprint is, we stand a chance of making progress, but if we don't measure it, we're not going to make progress. I think the academy has another wonderful role here, as does the collaborative, which is skill-building. I think there are plenty of willing people out there who would like to know what to do, but they don't know what to do yet. And Victor, you and your colleagues, our colleagues can arrange to build skills and knowledge just as you have in so many other fields, including my field, quality of care. The key here is to get started. The academy can and has and will work with clarity, with force, with confidence and bringing science to bear and trust and for, you know, getting people together to do something that only can be done together. Anybody can just be a bystander, but nobody should. And that's the case we're going to be making. Thanks for your leadership. I'm really looking forward to the next to tackling this.

VICTOR:

Thank you, Don, and I certainly feel that incentives matter. I mean, after all, in the profit world, there is this, you know, this tax credit that you can get. Now, what would we do in the nonprofit world? This is where I believe that Rachel Levine and of course, people like Andrew Witty from United and Others can think about what can we do to incentivize the hospitals who are facing challenging systems. I believe also, giving more grants for people to work on this issue, right? There's so many different tools that can be used. But I think one thing we've learned, of course, is that, you know, the hospitals and the practices can do this alone. A very big part of the health sector is the private sector, the biotechnology, the device, the pharma supply chain, which actually accounts for a big part of the mission of the sector. So, we're so pleased that Michelle McMurry is with us because I think what's unique about our collaborative

is the fact we have her. We have many others for all joining from the private sector because they all want, they believe in this, they believe in ESP, corporate social responsibility. So, I want to ask Michelle, how do you see this? Because after all, you know, you have the most amazing biotechnology companies with you. Are they ready to join all of us to say let's set some goals together? Let's measure things together, and let's really try to make a difference. Michelle.

MICHELLE:

So, of course, more than ready. And I've got to say what an amazing panel. Some days I think I could listen to Don Berwick all day long. But it's such an incredible conversation. And thank you, Dr Dzau, really appreciate you bringing this group together, and also for your commitment to think big and really make sure we make progress on the most consequential issues of our time, including climate change. So, climate change is clearly out in front. And how we respond to our warming and changing planet will determine the fate of our society, and not just where we live or how we live, but the quality of our lives. So, climate change is spurring rising temperatures in sea levels, but also greater threats to public health, and from back vector-borne diseases for example. Those threats are particularly dangerous for individuals and families, with the least ability to adapt on their own. And their plights, their fates must remain central to this work. So we won't make substantive progress unless we're willing to set lofty goals, and even as we take practical and purposeful steps to reach them. So bio-members are doing just that. We were attracted to this issue for quite some time. Bio includes not just biopharma companies, but also agricultural environment companies, some of which are producing some of the solutions that our health care sector will need to address this issue. And others who are just farther along this path. For example, our agriculture Brethren have been tackling some of these issues for some time, and we have lots we can learn from them. So, it's a thrill for me to lead a diverse and active organization like Bio, and it's a home to companies, big and small, working in all of these areas. And we really think there's a role for agriculture and nutrition, manufacturing and health care. So like other members of the collaboratory, bios, health care companies are committed to carbon reduction, with many of them making impactful reduction commitments and holding themselves to it. These companies are doing so to improve their environmental footprint, which generates a positive impact on people and on communities, and also helps them recruit talent, which, as we know in this day and age, is one of the most precious resources that a lot of our enterprises invest in. Biogen, one of our member companies, for example, last year launched their Healthy Climate Healthy Lives initiative to eliminate its fossil fuel emissions by 2040 and advance action on interconnected issues of climate, health and equity. The company's 2040 commitments include powering its facilities through renewable energy, establishing new green chemistry targets for all of the R&D that the company does, transitioning to electric vehicles and eliminating fossil fuel-derived plastics. And, you know, people may think about straws or our plastic plates, but for a biopharma company that also includes test tubes and plates and the containers that contain reagents. So, there's so many ways in which our companies can really help contribute to the goals we're discussing today. But for all of our companies, biotech centers and investors, they're all committed to sustainability and addressing the climate crisis through science. We want to develop solutions that are shared and scalable to solve these challenges. And in essence, we're really kind of like the tip of the spear that we are discussing today. We can leverage our deep knowledge about the mechanics of life at the molecular level, we're biotech, after all, to accelerate solutions that cure patients, protect our climate and nourish humanity. And our members are using the latest technologies like CRISPR and synthetic biology to transition us all away from carbon. So, let me give an example or

two. So, Join Bio is a joint venture between Bayer and the synthetic biology leader Ginkgo, and it uses biotechnology to reduce agricultural greenhouse gas emissions by designing nitrogen-fixing microbes, which reduce the need for critical synthetic fertilizers. Genomic (INAUDIBLE) uses renewable feedstocks, as well as engineered microbes and fermentation to make less carbon-intensive apparel, footwear and plastics. And they do it all with fewer toxic ingredients. So these are just a few of the examples at the amazing science that can help us along this path. And bios really playing an important role, supporting these companies through advocacy, collaboration and education. And it's part of our job to connect these agricultural and environment innovation leaders with broader health care, supply chains and delivery systems. So we want impactful ideas and products from one corner of our membership to strengthen and increase sustainability of our other members and members throughout health care. So to that end, this meeting and this broader effort are important reminders that the pandemic revealed the profound connection between all living things. And emerging zoonotic diseases like Covid-19 will become more prevalent as our climate changes and human populations migrate around the world. So, mitigating climate change is one of the most crucial steps we can take to improve and protect public health. So thank you so much, Dr Dzau, it's a pleasure for us to join you on this journey.

VICTOR:

Well, thank you. Thank you so much. And as I think about this, your leadership really counts when you're looking at large and small companies. It's not only large ones, because if you start the small ones thinking that way and being committed, then, of course, they will actually do the right thing as they get larger and larger. And what we're hoping, of course, through this collaboratory is to say let's have the private sector from bio to pharma to device supply chain and all your membership together to say we set goals together. And that, I think, is an effective way to get there. So, thank you. I should say that we have the CEO of the Supply Chain Alliance. We have CEO of Medtronic and many others, all joining this collaborative. So, I think that we have all the pieces together. But one of the really important issues, of course, is communication and education, particularly in health professionals. And you know, Renee, you have really, you're not only part of this working group but you have been leading a lot of efforts in this area. Tell us a little bit about what you're doing.

RENEE:

Well, thank you, Dr Dzau, for your phenomenal leadership. I am inspired and full of hope. And I know that will continue throughout this discussion and beyond. It is really an honor and privilege to be here with all of you and my esteemed panelists. So, yeah, I'm going to reflect on the enormous opportunity.

VICTOR:

Can I interrupt for a second? Congratulations. You have been selected as a member of NAM. We announced that today. Congratulations, well-deserved.

RENEE:

Thank you. Now, I'm deeply humbled, and it'll be one of the greatest privileges of my career to work with you and the rest of the academy on this effort. So, yeah. So, I think to that point, I mean, there's an enormous opportunity to engage in the increasingly activated 22 million health care workers in the United States, or 40% of all US workers. This largely and tapped legion exists in all corners of the country and are bonded like all of us here today in a common mission, and that's to improve health, prevent

harm and accelerate health equity. So, I'm going to highlight three key opportunities. First, connecting to our mission. Second, connecting or creating a new toolbox. And third is catalyzing transformative, mission-driven change. So first, for too long, climate change has seemed peripheral to clinical practice and disconnected from the day to day lives of those in the medical community. And that's been a driving underlying issue for us in our work, because climate change is not distant or unrelated, and it's fundamental to our mission. It's contributing, as we've discussed right now, to individual-level health harms, creating and worsening inequities, making clinical practice harder, disrupting health care delivery and threatening the delivery of high-quality care. So there's two patient examples that exemplify this. And their primary diagnoses may differ, but both patients share a common secondary diagnosis that is often missed, and that's climate change. Because secondary diagnoses are just conditions that make it harder to treat or prevent the primary. The first was an elderly man with a heat stroke whose wife called 911 because he was acting confused during a record-breaking heat wave here in Boston, and he was found to have a core temperature 106 degrees Fahrenheit. Now, a recent study found that more than a third of heat-related deaths in over 200 US cities were attributable to climate change. The second is a springtime asthma exacerbation on a 30-something-year-old female. This is a common thing we see. But climate change is responsible for about 50% of the observed trends of longer pollen seasons and 80% of higher pollen concentrations. So the diagnosis of climate change is there, even if we aren't always making it. Yet that this treatment of this diagnosis falls outside of our usual medical toolbox, which is why the second point is so important, and that's that health professionals across the spectrum, doctors to nurses, to social workers and across the practice spectrum, so from retired to practicing clinicians to trainees, we need a new toolbox to face this unprecedented challenge. And first and foremost, we have to communicate these connections because as we've discussed, evidence shows that health professionals are among the most trusted messengers to disseminate this. And we have a unique and unprecedented ability to put that human face on climate change. But we also have to help clinicians adapt their practice easily and seamlessly, guided by evidence to identify their most vulnerable patients and intervene. Notifications, for example, could be in the electronic medical record and can highlight patients who are at higher risk due to their home address, occupation, medical conditions or medications, and can prompt screening and interventions. And we have to create pathways to train the next generation of leaders. This brings me to my third and last point, and that's the fundamental need for transformational change, which includes unprecedented collaboration and coordination among the legion of health professionals across the US and the globe. Because we've seen with the Covid-19 pandemic that the health care sector can rapidly mobilize and adapt if there are sufficient motivation and necessity. So, we have to connect back to that mission with urgency, which we've already highlighted with clear objectives and sufficient resources. And we have to rapidly accelerate implementation on a scale that we have never seen before, because every fraction of warming has implications for health in our health care systems, and our mission mandates that we cannot rest until health is fully protected. So this means we have to get to the root cause, as we've discussed. But we don't stop at a 9% reduction in systolic blood pressure for hypertension. Similarly, our goal has to be a 100% reduction of greenhouse gas emissions even beyond our own footprint. And US health care efforts to decarbonize could be the first domino to fall, serving as that catalyst that accelerates wider transformative action, using, for example, its economic influence to push those vital levers within the electricity sector and the supply chain system. So, in conclusion, we are the sleeping giant and we are awakening. And the heart and soul of this medical community is and are the health care workers. And we are fundamentally woven together in this common mission and uniquely positioned to model the

urgent, unprecedented, transformative action that's required, creating sweeping change not only within our own walls, but always keeping our eye on that true goal that our mission mandates. Because, and this was what drives my work, is that if we don't do it, who will? And we are on the cusp, emboldened by this effort to convene here today, and we will achieve it together. Thank you.

VICTOR:

Thank you. Now, do we have energy and commitment or don't we have, right? It's amazing.

MICHELLE:

Victor, I'm going to start standing up and saying, Amen.

VICTOR:

Exactly it. Yeah. So, let me go to Howie, another newly elected NAM member. Congratulations, Howie. And you know, Howie, you've done so much in this space. And because I thought of you when I say, look, a really important part is innovation research where we need to go. But in your recent job in this trust for public land, you really, which is not in the health sector, but the plan is to look at three core elements, health, equity and climate action. So, you have demonstrated how important it is to think about across sectors. So, Howie, tell us a little bit about what you're doing and help us think about where we need to go in our research.

HOWARD:

Victor, thank you so much.

HOWARD FRUMKIN:

What a full an inspiring day this has been, thank you for your leadership and vision and what an honor it is to join your president's forum with this distinguished panel, especially, as you said, as a new member of the Academy. Thank you. All right. Let me start by addressing research and innovation, building on the many excellent points made by speakers during the course of today and in the case of research, building on a bookshelf full of research agendas published on climate and health. I'd argue that we need purpose driven research. Research designed to deliver the knowledge we need to enable us to do what we need to do as a civilization, a nation and the health profession to succeed at what can only be described as a rescue mission. So what do we need to do? I'm guessing all of our to do lists would look pretty similar. And what do we need to know in order to do it? I'd propose six categories of need to do and six categories of need to know. First, we need to anticipate and understand the health threats, the research question, how does climate change threaten health and who is most vulnerable? How is the nutritional value of foods changing, how are vector borne diseases spreading? How is young people's mental health being affected? This is the diagnosis. Second, we need to adapt to unavoidable health threats. Research question what protective strategies and practices work, especially for the most vulnerable? How much does tree canopy help cool urban heat islands? A question I'm helping to address the trust for public land. How to cope with episodes of wildfire smoke. How can relocation from coastal areas best and most equitably protect affected people and communities? Third, we need to decarbonize our entire economy, energy, transportation, agriculture, buildings and more. The research question, what are the healthiest ways to decarbonize? How do you design and build deep green buildings that deliver plenty of light, clean air, opportunities for physical activity and other human needs. How do we

ensure that wind turbines and biofuels don't inadvertently harm people's health? First, we need to drive ambitious mitigation targets, especially with Glasgow approaching. The research question, what are the health benefits and associated cost savings of decarbonizing? This is research at the interface of health and economics. How much money do we save by closing coal fired power plants, by increasing walking, cycling and transit use? That leads to the fifth we need to influence public and policymaker opinion, especially with key legislation now hanging in the balance. Research questions, what are the most effective communication strategies? What are the political and social barriers to change and how best to overcome them? This is social science and policy research blended with biomedical research. Perhaps the most pressing questions of all, given the urgency of the climate crisis, how do we frame climate action and ways to persuade skeptics? How do we effectively combat disinformation a topic throughout the course of today? How do we counter the undue influence of the fossil fuel industry? Sixth, we need to clean up our own house, as many have pointed out the research question. How do we decarbonize health care and safe, efficacious, cost effective and climate resilient fashion? This includes developing new materials and manufacturing processes and testing low carbon practices such as telemedicine. It also includes prevention research, since less demand on the health care system from fewer sick people reduces its carbon footprint in health services research to eliminate needless treatment, administrative waste and other avoidable contributors to our carbon footprint. Finally, as for innovation, we need to support innovative methods development, interoperable health and environmental data systems, modeling and forecasting techniques with big data analytics and AI health impact assessment techniques. Much of this, by the way, aligns very closely with the needs identified in (UNKNOWN) COVID 19 Working Group in the context of that crisis. We need greatly enhanced training and career pathways, careers in climate and health research need to be as well-supported and sustainable as careers in oncology or cardiology research. Because so much of this research links health with other domains, such as energy, agriculture and urban planning. We need innovative funding mechanisms that crush silos. We need NIH and NSF to team more effectively. We need NIH to co-sponsor research with such federal departments as agriculture and transportation, and we need private funders to fuse their health and environmental funding. Finally, we need bold institutional innovation. One example as Marshall Shepherd said earlier, we need promotion and tenure criteria that reward active engagement outside the ivory tower. Another example I and others have suggested an NIH National Institute of Climate Change and Health. If you don't like that idea, what are other ways to combine a clear sense of mission, expertise, creativity and nimbleness in the institutions that drive research on climate change and health? So all for effective research that tells us what we need to know wool for innovation to get us there in all, for the full-court press that every speaker has endorsed. Thank you, Victor.

VICTOR DZAU:

Thank you. And as you know, there are now more and more foundations interested in funding, research in the intersection of climate change and human health.

(UNKNOWN) one of our partners. Foundational sponsors is certainly working that. And we're going to bring more foundations into this space. At the same time, I believe there's an option for NSF and and NIH step up and I'm sure there's a lot of opportunity there as well. So thank you. So maybe I can go back to Dr. Levine and ask this question, is the Biden administration's as you heard from Gina McCarthy and yourself? It's all of government, all of society approach. Bring all the pieces together to make it work. Now, as you heard, it's a complex puzzle of all the pieces to fit together. So NSC goes to COP26 to say, let's commit US to these goals, which I think we all support. How do you advance see advancing this and

how in particular, can we work with you to advance some of those? I would say pretty complicated issues.

RACHEL LEVINE:

Well, thank you, Victor, for that question, so as has been noted, the Biden administration is firmly leading the call to action on climate change and in regards to climate change and health. HHS is really the model of interagency collaboration. So CDC and NIH have been leading partnerships with other agencies, such as NOAA and NASA, and working through the U.S. Global Change Research Program. What we're hoping for is this new office of Climate Change and Health Equity will really be the tip of the spear that we will have a focus within HHS and sort of bring it all together with the all of HHS approach to focus on climate change. HHS is a big organization. It's far reaching and so we need within our house to align all of our divisions to work in a collaborative, integrated fashion on climate resilience and mitigation and addressing the health effects of climate change. And so we are, you know, the office is small but mighty. It's only started in the last month, but we're already actively participating with federal interagency groups to provide that structure to expand the collaborations on those climate change and health issues I had mentioned. But we really want someone to partner with our regional offices. Our regional offices work really closely with other federal agencies, but they also work with the state and the local health departments and other stakeholders in the, in those regions where we have to extend our whole government approach, you know, just to states and two cities as well. It's not enough for the federal government to say, OK, we really need to have collaboration with state and local health departments and state and local governments as well. In addition, my office actually is home to the Interagency Working Group to decrease risk of climate change to children, the elderly, people with disabilities and the vulnerable, as well as the bi annual Health Care Readiness Advisory Council. So, you know, we're going to be working across the agency and across the administration. And again, we have to have that that very important health equity lens because we know that the challenges of health equity and the depth of health disparities that are in our country. COVID 19 has shown us that like nothing else. And so it's going to be the same with climate change. So same communities are going to bear the brunt of climate induced risks. We've talked about extreme heat, poor air quality flooding, weather events, vector borne diseases. And so we have to ensure that health equity is front and center as we all work to reduce our carbon footprint.

VICTOR DZAU:

Thank you. Thank you very much. That sounds like a great plan. And so we're there to work alongside with you and to make it work. Now, point of view, you know, this question is to Greg, Don and Michelle, because I think we all agree that we can measure and of course, a famous person said, you can't improve what you don't measure. So the question of measurement comes up all the time. And you know, we need standards, what we measure. And to Greg, you know, you measure in your system, what do we need to measure across all hospital systems? And to Michelle, what do you measure across the industry and what are the needs for standardization? Is there actually people coming together to say, let's measure this and we agree with to measure and to Don the whole idea of scope one scope two scope three? And you've done so much in the past of measuring, you know, I keep thinking about quality like I used to be the hospital CEO and of course, every single board meeting, every single management meeting. We look at how we doing quality and safety, how do we get that to measure these things whereby we can say, let's be transparent and then we can be accountable. So anyone want to start first?

GREG ADAMS:

I'll offer, sure I'll offer a couple of thoughts. One, it was very important for us to have the vision and the goal and to be able to articulate that to the organization. Two, I talked about the work we get around a business plan being clear that we could get a return and we connected it to health. And then, as I would say, everyone or a large part of our organization was energized by this work and we connected it to health, we connected it issues of inequity. So, so people not only understood and understand the urgency, but they also understand how it really connects to what we're doing every day. But we measure by facility. I mean, where are we with kilowatts per square feet? Where are we with can a (UNKNOWN) use per square feet for gas? So I think having those metrics of being able to hold the organization accountable is important. The other thing is a plan, having a plan and being deliberate about how we're going to exercise and operationalize that plan. We are actually in the process of working through, you know, when and what should we set as a target for what will be net zero neutral and working it people are owning. It came to me two weeks ago, but when we looked at where we are and how we're preparing, the plant isn't solid enough. And so we have to be deliberate. We have to be focused. Now, when I think about health care as a whole, if you look at what we did and done and our colleagues, the issue is can we begin to look at the health care industry, create the goal, begin to identify the steps in the plan and began to identify what are we going to measure by hospital by, you know, pharmacy organization. I mean, there there are many sectors of health care. So I think having kind of this comprehensive coordinated plan as somebody mentioned for all of health care is important and I think it can be done. And I think people are at a place where, I, people are ready to own this and people are ready to leave. I think COVID taught us what we can do, and I don't think we should lose that momentum.

VICTOR DZAU:

Thank you, Michelle.

MICHELLE MCMURRY-HEATH:

Certainly happy to jump in. This is an area where I think we have no shortage of measurements. The question is just can we agree on which measurements are meaningful? And that's where the question of standards becomes very important. You know, we're all clear. You know, when Gregg was talking about being climate sensitive as being making good business sense, that is wonderful when you have very motivated leadership, but even for the leadership, that's less motivated. Having clear metrics that lets organizations capture the value of investing in preventing climate change is critically important. So people want to know exactly how much greenhouse gases they have they have prevented. They want to know that using biofuels has had an impact. They want to know that their actions result in something that they can measure be held accountable for and also get credit for when they've done a good job. And that's why I think the Action Collaboratory can be incredibly important to make sure we're all working from the same playbook.

VICTOR DZAU:

Yeah, I quite agree with you, I think if one of our planning meetings were heard very clearly from many of your colleagues, we ready if you can bring us together to standardize what we measure. I think that we'll be all ready to support this. I think that's really a very exciting. So Don, I mean, you know, you've

gone through this before many times. How do you think we can move this forward? I mean, it certainly is the. Hope of the collaborative that we won't come up with measurements and, you know, it should be co-design. You know, co-agreed upon what we can measure and be meaningful what we measure. But you know, nobody likes a proscriptive top down to say, thou shall do this, but still, we need to measure what matters. So Don, what do you think?

DONALD BERWICK:

Yeah. Of course, the the context right now is we realize we've overshot on measurement and output or too many metrics out there. So there's a very important part of the quality movement now is to get the metrics more under control. So we're kind of swimming upstream, but we need them. We have to have them. My guidelines would be three things simple outcome oriented. That is what we care about. And now so I would hope in the great work I'm doing with Liz Fowler. Liz Fowler is my co-chair of the of the policy, finance and metric subcommittee who set up and I'm thrilled to work with. I think CMI might actually have something to contribute here. But yeah, simple view now an outcome oriented, the outcomes I think we ought to be looking at are carbon and fuel and fossil fuels. I think that possibility use and I think I will certainly rely on we should rely on the wonderful work that many have done health care without harm and others to develop as a candidate said. But I'm going to be a little obnoxious, pushing our collaborative to settle on something that if we get them wrong at the start, will change in later. But without measures, or we're not going to make enough to make a kind of progress. On the quality front. If I can say one more, I think absolutely there is a real strong nexus between this endeavor and the right parts work for the next four decades, improving quality. Jody Sherman is one of the people you recruited into this effort has these points very eloquently. The opposite of quality is waste. That's what we teach in my field. When you're doing what mattersto people, that's quality. When you're doing what doesn't matter and doesn't help, that's waste. And so the whole quality movement needs to be oriented around not doing things that don't help. Waste of equipment, supplies, ideas, procedures. And we know the research shows there's a tremendous amount of waste in health care. So these align really, really well. And if we focus on the relationship between the improvement of quality and the reduction of the carbon footprint, we're going to find lots of possibilities here. So I find that I find that pretty exciting. And I believe that what Greg has said and which we're going to have to work hard to make the case for in the industry that actually given that linkage, when you work on improvement and carbon, you get decarbonization and cost reduction at the same time. I think that may be true. And if we can prove it, it'll really help.

VICTOR DZAU:

Yeah, we got to do that study, isn't it right? Look, you really just case the economics, I think is there. Nobody's quite done it yet, but it's like there's an issue in quality as well all the burnout. And you look at how much economic loss from people turning over and quitting the workforce. That's another business case. So there's so much that we can be doing.

(CROSSTALK) You know

GREG ADAMS:

You look at our numbers, I actually reviewed them and that our CFO wouldn't let me use them yet. But look at the process, look at the numbers because I do believe that that is real and I expect those savings

to increase over time. So I think there may be a methodology that we can share as we kind of take this on.

VICTOR DZAU:

Well, this is one of the goals of our grand challenge collaborative is to really do the study as well, so people know there's a real case here to be made. And as Don said, the tools of how to do this right. Everybody saying, OK, I'm ready to do it. So what I need to do. But Greg, you raised another issue. You had a full time. I think you called it. I couldn't remember you call it, but I suppose the sustainability officer. I mean, do we need to actually elevate this position, just like with quality in hospitals and the systems whereby it's a focus on the individual to deliver, the results at the highest level.

And I think there's questions for everyone, I suppose.

GREG ADAMS:

I would say, I think the issue, if we truly believe that and we do mean we've heard anyone say that this is a health care issue. You know, it's actually a primary issue in addition to being secondary. I mean, when you see a entire city burned to the ground, a hospital evacuated and then you have the, you know, the emergency rooms and people meeting and seeking care as a result of all the respiratory issues. It is, you know, and you bring that together with equity and the issues that we've got with disparities that we bring all of these together. And and you look at COVID and how we got there and it points to really a crisis. And I think, you know, again, I said earlier, if you look at what we've been able to do with COVID. I mean, it's a symptom. And what we're really talking about is how do we get to the systemic the groundwater issues? And the only way we will get there is if the resources and the focus and the research, the data has got to be there and people have got to own this and they can't own it, as you know, on the side of their desk. They've got to own it. And we've got an elevated to the level of importance that aligns with the mission that I started with because we are not contributing to the health of our communities. We're not living into, you know, really maximizing the health of individuals unless we bring this together and own it and put the resources behind.

VICTOR DZAU:

Yeah.

DONALD BERWICK:

Is going to mean it's got to be in the boardrooms and the executive suites.

GREG ADAMS:

That's exactly right. Exactly right.

VICTOR DZAU:

So how we, I mean, we just talked about research, right? Research that's going to make a difference. Right. Research that is going to drive changes. So I'm thinking what you said earlier about, you know, the funding, the financing, et cetera. How do you bring together researchers from both the climate sector and the health sector together to say, yes, we need to collaborate, we need to bring convergence, we

need to bring different sciences together to really drive the change and then being able to measure impact and being able to take research into application.

Your muted.

HOWARD FRUMKIN:

You would think that by this point in the pandemic, we all would have learned to turn off our mute buttons (LAUGHTER). I guess they'd start early in the pipeline. Several people have mentioned Renee and others that we need to think about how we train people. Now, if I could tell a story when I was getting ready to go to medical school back just before the First World War. The courses I had to take were biology, chemistry, physics and math. My daughter, when she was getting ready to look at medical school, had to take the exact same courses, and she said to me, Dad, does it make any sense that that hasn't changed in a generation? Shouldn't we all have to be taking ecology, evolutionary biology, behavioral science? Aren't those things as important to understand health and context as the basic sciences? Well, there's some truth to that. So thinking about interprofessional education on a broad scale, training our health professionals, both practitioners and researchers to be, if not fluent, at least conversant in urban planning, in parks and green space and transportation and energy and ecology. This is really the new reality for medicine, so it's a transformation in the way entering and rising professionals think. Then we need leadership. And so I think we need mentorship and career pathways with funding, but also with models of the kinds of synthetic research that you asked about. So that young people can be as inspired by that kind of research as they are by existing (UNKNOWN) now. And we need host siloed funding. That means funding that doesn't stay categorical, but actually attempts to answer cross-cutting questions like Let me call out Robert Wood Johnson Foundation, Rich Besser for funding investments both in research and an application, how changes in community structure can both tackle the climate crisis and advance health. I call out Kaiser. So, Greg, congratulations. These are community benefit investments that actually look to the environment around hospitals to create healthier communities through physical infrastructure, something that probably ought to be much more common and would inspire health professionals to think in this synthetic way that we need. So I think from the beginning of the pipeline to the pathways available for career building to the funding available to support this research. There's a set of answers.

VICTOR DZAU:

Perfect segue way to Renee. She has that ambition now, Renee has tell me whether you're getting traction from the program directors and the deans from, you know, and this is all interprofessional training as well. So how do you going to try to move forward this issue? I would say the good news, as you know, is in our collaborative, we do have WMC and Many other educational organization is part of this. But talk to me about, how do you imagine us doing this an effective job?

RENEE N. SALAS:

Yeah, well, I was reflecting on the concept of measurement. And I think it's something that has really resonated with me because we think about vital signs, right? The things in a chart that are prominently displayed and as we gain increasing recognition of how climate change and air pollution and environmental racism and how these things impact the health of our patients, we have to elevate them.

And a key way to do that is education. So, the collaborative is enormously well-placed to be able to act on these key levers of action in order to educate and activate this enormous legion of health professionals around the US and the globe. Now, so many educators sort of get a little nervous when they think about they have to add an entire new area to their already packed health care curriculum in medical curriculum. But I challenge people that we're adding a climate lens to what people are already learning, and all that means is trying to view whatever it is that's being taught through how climate change is impacting that issue now, and how it's going to increasingly impact that in the future. So, that can just mean one or two problem based learning questions or one or two extra slides. So, as people begin from the ground level to understand the importance. And I'm seeing that now across the country, where there are grassroots education campaigns within hospitals and training programs, but the collaborative has the enormous ability to really mainstream that. And as we connect this to the mission, right, one of the resounding themes through this conversation is that this is at the heart of our mission. And as we educate people on that, that's how we are going to accelerate it to a tipping point and we will achieve everything we've set out to.

VICTOR DZAU:

That's a bold vision. And we're all charmed in for success. And let me speak to the audience. We're gonna open up for general questions. So, when you begin to think about what you want to ask, please start writing it down. We're gonna use the chat function. So, if you can put in your questions to the chat box. We'll be able to pick up those questions and ask the handlers to address some of the issues they wanna bring up. You know, as I hear this, you know, I just think that look why us? You know, how we will succeed? And I do come back to the sense that was said earlier, number one, I think it was at (UNKNOWN) who said in the earlier with a trusted profession, we should taking this on. You know, despite all the misinformation et cetera, I think doctors, nurses and health professionals are still most trusted. So, we should take this on to educate the public, to communicate and to call it as it is a public health crisis and equity crisis. So, that's really important. Second thing, as we doing this, we need to think about how to change systems and how we'd already talked about how many interaction. Also, Michelle did too and Rachel, into acting systems that we need to bring together. And I should point out that at the National Academies is not only NAM, we're working with our presidents in engineering and other sciences to see how we can collectively work on this together. We need to look at how to decarbonize and make the health system more resilient. I think if you look at representation in this room, you can see that we're all ready to say, what do we need to measure and how do we actually measure this? How do we hold ourselves accountable? And how do we begin to set goals? Doing what Greg and others have done successfully. And of course, that's where (INAUDIBLE) we talked about the need for incentive policy. And finally, of course, research and innovation. So, that's a grand challenge. And I think people know this and we've got the best people to work together. Is not gonna be a quick fix. It's gonna be co-design, collective solutions, collective action over time. As you heard, Greg, it took him long time to get to net zero and carbon neutral. Well, hopefully that we can mobilize the entire sector to move towards the same direction in a timely fashion. So, with that background, let me find out about questions from the audience. So, I might start with monitoring the chat. So, let me turn to my staff and see whether there are any questions coming from the general audience.

SPEAKER:

The first question that we have is the following, will reforming regulatory policies be in scope to facilitate change? Many health leaders point to regulatory barriers to reform. For example, they cannot make changes to their products or processes since regulators require single use products.

VICTOR DZAU:

Yeah, this is a question, Michelle, particularly your sector has brought up, right? We're ready to make changes in innovation and doing new product, new packaging. But the regulatory, shall we say, hurdle's high. And it's also very costly. Is there any way to incentivize this? I wonder, Rachel, if you can think about in HHS obviously, FDA and many other agencies are involved with this. Any thoughts on this?

RACHEL L. LEVINE:

So, yes, I think that we will need regulatory change. And I think that we'll need legislative changes as well in order to maximize our success. So, this has to be a public-private partnership. Each aspect can't do it alone and at HHS and other departments as well, we'll need to look at a lot of our regulations that are contributing to the problem. And then probably be able to pull those levers to be able to incentivize decarbonizing not only the health care sector, but other aspects of our economy, and then to incentivize that decarbonization. So, yes, I think that we're gonna have to have a really close look. And that includes, as you mentioned, CMS regulations. That would include FDA regulations. So, really across our departments and across the administration.

VICTOR DZAU:

Thank you. Michelle, can you share with us some of your experience in this? What do your members say?

MICHELLE MCMURRY:

Well, I think it's so amazing to have Dr Levine make that commitment 'cause it's really important. You know, one of the things that's gonna be critical is that we not just look at this as a US focused issue, but that we also use the US leadership to drive global regulatory harmonization. You know, I was responsible for a team that had to get medical products into 150 markets and sometimes navigating your way through all of those regulatory systems could take five to seven years. So, you imagine a change in manufacturing that then needs you to reapply for FDA approval or the analogous approval in other countries. And you're talking about incredible time and expense and most importantly, patients waiting on those innovations. And so this is an amazing opportunity for the US to step up and lead and push for a harmonized approach to a pragmatic solution.

VICTOR DZAU:

Thank you. Another question.

SPEAKER:

Next question, how can health systems and hospitals support its workforce to develop deep an organization changing climate resilience and expertise? How can this start even earlier in health, professional education and training?

VICTOR DZAU:

Seems to me, I should direct this question to Renee and also to Greg. Renee, you want to take this on?

RENEE N. SALAS:

Happy to. Yeah. I mean, I think first and foremost, to engaging people within the institution, bringing them to the table, bringing communities to the table. It is so important for, bring everyone in at the ground level, and so as we think about this transformational change, it's the grassroots cannot be stressed enough, at least from my perspective. And so being able to harness these individuals in order to motivate them and empower them to help develop that collective path forward. I mean, they can then go off and exponentially help to further incorporate education into earlier into training programs and sort of beyond. So, it's this activation army, so to speak, that is being created. And I think that is essential within institutions in order to, given the scope and the unprecedented nature that our response has to meet.

VICTOR DZAU:

Greg, what do you think?

GREG A. ADAMS:

I think well said. I would add to that, that you know, part of what we wanna do is to connect the dots for people and connect the dots for our employees and connect the dots for our communities. So, we're on a journey of looking at our quality outcomes through the lens of ethnicity and race. We're on a journey to look at how do we bring into kind of the care planning for our patients and our members. The social needs that they have and understand how they're impacting their health. And I think, you know, this issue of climate change and what it is doing environmentally, I think we've got to connect that to what we do. I mean, I mentioned in terms of our mission, but it is about you can't bring health to an individual or community without owning this. And so connecting the dots, helping people understand it in terms of it being a core part of how we're going to deliver care and how we're going to advocate going forward. So, (INAUDIBLE) I think Renee and then the education, but I do think there is something about all of these things going on. They're all big. They're all connected. And so are beginning to frame this in a way that people see, understand and really get that it is quarter of what we do.

VICTOR DZAU:

Well, is it an important (UNKNOWN), we talk about the equity issue that Rachel, you know, she's created this office for Climate and Health Equity, and she's talked about their plan of how to reach the community? But I think we all are part of the community, right? As been pointed out. And so how do we all work together? Rachel, help us think about how you would like us to work along with you. I mean, each one of us have a community, whether it is in the clinical care arena or whether it's in the research arena, et cetera. But more importantly, I think each one of us should also recognize the importance of working with marginalized communities. How can this collaborative be helpful to you?

RACHEL L. LEVINE:

Well, the clarity of this is absolutely critically important. This as I mentioned, you know, government's not gonna be able to just do this. This is gonna have to take an extensive public private partnership with the health care sector, with hospitals, with health systems, with the biotech companies, with education, as you are all mentioning. It's really not take us all working together for us to be successful. But I have to

emphasize, I think health equity has to crosscut everything that we do. And so, we're really trying to do that is really a priority of the secretary. Priority for my office as well, is that we want to look at every division at Health and Human Services with that health equity lens. So, that would include, you know, everything at CMS. I mean, looking at health equity, everything at FDA. NIH, they have a whole initiative in terms of health equity and so for this initiative, you know, there are populations that are already being far more impacted by climate change than others. So, take the heat emergencies that we saw in the southwest. We had heat emergencies in the northwest, you know, it was 105 degrees in Seattle. Well, if you are fortunate enough to have a great air conditioner in your home and in your apartment, then you're gonna be much less impacted than if you're just trying to open the window. And that's just a simple one. If you are in New Orleans and the Hurricane Ida hits, not everybody has the opportunity and the resources to be able to evacuate. They can't evacuate. They might have to stay. And we saw, certainly with Katrina and also somewhat with Ida, how different communities were more impacted than others. So, we have to bring this health equity lens. And I think that your collaborative to the National Academy Medicine is the perfect vehicle with which to initiate that and to carry that forward.

VICTOR DZAU:

So, our plan is to actually have equity working group and we plan to bring in lived experience. So, not only have we done a lot of work in this area in African medicine and equity addressing structural racism, but we wanna bring in lived experience. So, you have a voice and tell us about what we need to do in order to address some of the big disproportionate issues in the community. So, thank you really very much. Howard, any thoughts on this area or any related areas?

HOWARD FRUMKIN:

Well, on the education issue, Victor, I was just going to mention for those interested that there is a great compendium of educational materials at the Global Consortium on Climate and Health Education at Columbia's Mailman School of Public Health. So, those who would like to initiate educational efforts can find down lots of resources there if they'd like them.

VICTOR DZAU:

Yeah.

HOWARD FRUMKIN:

But also I mentioned the importance of encouraging activism and aspirational thinking in our young people. In so many institutions its students who push for the courses and the training in this area, we need to encourage that student energy. It's a powerful resource. Yeah. You know, it's been pointed out to us many times through our planning and particularly from Philip Pizzo and the co-chairs of the Grand Challenge, that inter-generation communication education's really important, right? And mobilize the younger people. So, that's also on our radar screen as well. Let's take another question from the audience.

SPEAKER:

Next question, we've heard about the critical need for quality metrics. Could you speak further to the gaps in current metrics and how the Action Collaborative is adjusting this. Further, Renee, could you perhaps speak further on the metrics agreed upon by The Lancet countdown project?

VICTOR DZAU:

OK, so let's start with Don first. Don, you're the most extreme person, the king of metrics. Think about how do you wanna answer this question?

DONALD M. BERWICK:

I won't agree to the title, but you know, in our 100,000 Lives campaign, which has immobilized 3,100 hospitals were

(INAUDIBLE) patient safety in 2004. Our motto was, I'm not just a numbers, soon is not a time. And I think we might want to import that motto here. We've got to get going. Time is wasting and time is not a number. It helps everyone to say, let's take that hill. You have to name the hill. It's not a control move. It's not a matter of beating up on people, it's just deciding what you're gonna do. And that will take the form in this collaborative of I think, as I said, earlier, specific metrics of carbon reduction, the specific metrics (INAUDIBLE) use at a minimum. I defer with other experts. A small number. It's inspiring to do that, and so I think we should treat it as an asset, not as a battering ram. I also want to emphasize really strongly that if we only use metrics, if we only use battering rams or incentive, we will miss the point. We'll miss two points. Point number one is, we'll miss the importance of supporting the industry through the industry's true knowledge. Like what do we do? OK, I'm with you now. Tell me what to do? And I really look forward to that part of this project.

VICTOR DZAU:

Yeah.

DONALD M. BERWICK:

The other is back to what Howard said. I think we're gonna strike oil for you this, right? I think the hard part will be in the boardrooms and the executive suites. But I think the workforce we want to do this, especially the young workforce. We've heard in the other work, you're doing, Victor, about the importance of the demoralization of the workforce right now. This crisis of confidence and buoyancy. I think out there there are millions of healthcare workers who want to help save the planet. I think a lot of them are youth and we need them. And I think what Howard said is absolutely (INAUDIBLE), if we treat it as just holding their feet to the fire of metrics as an incentive, we're missing the point. This is metrics as release a (INAUDIBLE), say, hey, everybody (INAUDIBLE) I think it's pretty exciting possibility.

VICTOR DZAU:

I think that's what Michelle is hearing from her workforce as well. I think there's so many young people entering the workforce and private sector who also want to look at mission of their business and how they do public good. So, I know that for sure. So, Renee, you we want a quick answer to that question.

RENEE N. SALAS:

Yeah, well, it's a wonderful plug, mark your calendars. The 2021 Lancet Countdown report is being released Wednesday at 6:30pm Eastern Standard Time, And The Lancet Countdown is a international research collaboration that tracks how climate change is harming health across the globe and how to put health central to our response and how mitigation have health co-benefits and how we need to frame our adaptation and resiliency. But it also looks at economic and policy and public engagement. So,

it's across that spectrum. And as has been brought up, I mean, right now, these indicators are really targeted globally at what can be measured because any indicator has to be able to represent the globe itself. And as we know, there are data limitations in certain aspects of the world.

VICTOR DZAU:

Yeah.

RENEE N. SALAS:

But there is enormous potential here in the US to create nationally tailored ones that act at these very levers that we're talking about.

VICTOR DZAU:

Well, I had just a fabulous time talking to all of you. Let me end with a lightning round, ask you each one to just say, name the one or two priorities you like to see the collaborative, the grand challenge accomplish and how can in fact, all of us work towards those? So, let me begin with you, Renee. So, you're still on the Zoom in my radar screen.

RENEE N. SALAS:

I reiterate that there is a coalition of the willing that is present right now that just needs a way to engage. So, activating this army of individuals across the United States that want to act because it is aligned with our mission. And that includes communicating optimally and ensuring that we are educating in a way that accelerates us towards the change we need. Thank you, Greg.

You are muted.

GREG A. ADAMS:

(INAUDIBLE) Howard, I didn't know. I think Don's comment about climbing the hill and how do we measure climbing the hill is really important. I think the second thing I would say is really kind of owning this and the kind of the connecting the dots in terms of equity, health care outcomes and our trusted voice being out there in a very visible and precise way. So, communication and measurements.

VICTOR DZAU:

Thank you, Howie.

HOWARD FRUMKIN:

I wanna close by talking about hope and despair. It's all too easy to succumb to despair when you think about climate change, and too many of our young people are doing that. But we need to be about propelling hope first because hope is good for health. So, if we care about health, we have to care about hope. Hopeful people are healthier, hopeless people are less healthy. Second, because hopeful people take action and we need action at a time like this. And finally, because there's a lot of empirical basis for hope, there's no evidence that we've lost this fight and there is a lot of good news out there.

Photovoltaic energy cheaper than ever, batteries more advanced than ever, young people more active

than ever. And Victor, leadership of people like you and the people you pull together is inspiring a lot of great work. I'm hopeful, I'm energized, and I think we should all work to feel that way and propel it in others.

VICTOR DZAU:

Thank you, Howie. And Don.

DONALD M. BERWICK:

I think for me, it would be unity. I think we should discover, I said in the meeting, a sense of inevitability. And change the sense of what's inside and what's outside the momentum of the industry. You have enough people in this coalition that if we really are able to come together with a single voice, it will be uncomfortable to be outside and changing that dynamic to me will be quite a success.

VICTOR DZAU:

Thank you. And, Rachel.

RACHEL L. LEVINE:

Well, thank you. I think it is the ability of this collaborative to catalyze this change and to pull together this public private partnership and bring the two sectors together to look at not only long term solutions but actually short term actionable opportunities that we have for our success that will then mobilize that for the future.

VICTOR DZAU:

Thank you. So, I want to thank the forum participants for really energizing and inspiring conversation. If you think about this afternoon, starting with Gina McCarthy, she was so energized, I think at one point she (INAUDIBLE) on the table to say we've got to get going has been said by all of you. The time is now. So, we're not waiting. This collaborative, this grand challenge and this collaborative has brought together already lots of people. We have to limit partnership and membership. But 50, 60 leaders all saying we're gonna work together, as Renee says, a coalition of the willing. But you know what? There's a lot of people willing. They just wanna know how. And in fact, as been said, the collaborative will be together, design together, think about solutions together to act. So, I am optimistic, like Howie. I do have hope. And this is why we're doing this. We do not see any (UNKNOWN) as the solution. We see everybody working together as a solution. And we're just happy to be a (UNKNOWN) and convener. I do want to thank the members who really many of them, really came to me to say, listen, you're not doing enough. And I appreciate that they actually point the direction, that we need do lot more on climate and we are. And we will be. So, thank you very much. And I want to thank Oliver tuning in in today's program. And let's give a round of applause to our speakers. So, the meeting recording will be posted online in coming weeks. For those who want to revisit these important discussions. Otherwise you had a long day and thank you all of you for being with us for the whole meeting and thank you.