

**NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
BOARD OF SCIENTIFIC COUNSELORS (BSC)
September 24, 2019**

**THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION**

**NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
BOARD OF SCIENTIFIC COUNSELORS (BSC)**

SEVENTY-THIRD MEETING

BOARD OF SCIENTIFIC COUNSELORS

(BSC) MEETING

September 24, 2019

The verbatim transcript of the
Meeting of the Board of Scientific Counselors

Meeting held on September

24, 2019, 8:30 a.m.

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PARTICIPANTS

(alphabetically)

MICHAEL BEHM, PhD - BOARD MEMBER
TERRY BUNN, PhD - BOARD MEMBER
LOUIS ANTHONY COX, PhD - BOARD MEMBER
CRISTINA DEMIAN, MD - BOARD MEMBER
MARY DOYLE - BOARD MEMBER
ALBERTO GARCIA - DESIGNATED FEDERAL OFFICIAL
JESSICA GRAHAM, PhD - BOARD MEMBER
DR. HOWARD, MD - DIRECTOR
CHRIS LASZCZ-DAVIS - BOARD MEMBER
GRACE LEMASTERS, PhD - BOARD MEMBER
STEVEN LERMAN, MD - BOARD MEMBER
PATRICK MORRISON - BOARD MEMBER
CHARLES REDINGER, PhD - BOARD MEMBER
MARC SCHENKER, MD - BOARD MEMBER
RONALD STOUT, MD - BOARD MEMBER
JUDITH SU, PhD - BOARD MEMBER

MS. PAULINE BENJAMIN
MS. ANN BERRY
DR. LUENDA CHARLES
DR. AMIA DOWNES
DR. KENNY FENT
DR. CHRISTY FORRESTER
MS. MARYANN GARRAHAN
DR. BRETT GREEN
DR. PAULA GRUBB
DR. DAN HARTLEY
MR. ED JOHNSON
DR. MARGARET KITT
DR. PAUL MIDDENDORF
MS. ANGELA MORLEY
MS. EMILY NOVICKI
DR. JOHN PIACENTINO
MR. TIM PIZATELLA
DR. TIINA REPONEN
DR. ALLEN ROBISON
DR. ROGER ROSA
MS. JANICE SCOTT-BLANTON

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MS. CHRISTY SPRING
DR. SARA TAMERS
DR. BETH WHELAN

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WELCOME AND INTRODUCTION, MEETING LOGISTICS

MR. GARCIA: ...folks who make these meetings a reality. There is a lot of work that goes into this meeting, a lot of planning, and a lot of meetings to plan for this meeting. I'm thankful for all the support we get from the staff.

The first issue that I want to address is emergency exits. If we were to leave the building we would go out this door, to the right, and you'll see a set of stairs right before the cafeteria. We'll go down all the way to the street and then we'll walk towards the fire station. We're going to make a left right on the first station and then we're going to going to go a couple of blocks and there'll be a baseball field to your right. You should see some CDC people ready to coordinate our gathering if needed be.

We also wanted to remind you that this is a Federal Advisory Committee, the Board of Scientific Counselors, so we're subject to all the FACA rules so we'll run the meeting based on those rules.

We have to do a roll call to make sure that we have quorum, so we're going to do that here shortly. And when we do the roll call, I know that you guys filled your OGE 450s recently, but I'm going to ask you to say if you have any conflict of interest regarding the topics that we will address today and you should disclose so on the roll call.

The other thing that I want to mention is that we're doing recordings for the meeting, so everything that you say is going to be transcribed verbatim. That help us for the meeting minutes. If you don't mind, when you start speaking, say your name before you make a comment so the transcription service can pick up that it's you speaking.

I think that's all that I have. So why don't we start with the roll call? And I'll start with Charles.

DR. REDINGER: Thank you, Alberto. Charles Redinger, no conflicts.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis, potentially Cal/OSHA Standards Board.

DR. COX: Tony Cox or Louis Anthony Cox. So you see that it says, "Dr. Louis Cox," but if you call me Tony I'll respond. And I'm not aware of any conflicts.

DR. LEMASTERS: Grace LeMasters, no conflicts.

DR. BEHM: Mike Behm, no conflicts.

DR. DEMIAN: Cristina Demian. I have a grant from the State of New York for an occupational medicine clinic, if that is a conflict.

MR. MORRISON: Patrick Morrison, no conflicts.

DR. BUNN: Terry Bunn, no conflict.

DR. GRAHAM: Jessica Graham, no conflicts.

DR. LERMAN: Steve Lerman, no conflict.

DR. SU: Judith Su, I'm not aware of any conflicts.

DR. SCHENKER: Marc Schenker, no conflicts.

DR. STOUT: Ron Stout, no conflicts.

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MR. GARCIA: Okay, so we have one, two, three, four, five, six, seven, eight, nine, ten, eleven. So we have quorum, so we can go ahead and proceed. I'm just looking at the agenda. I don't think that we have anybody sign up for public comments, so when we get to that section we will ask again. But we might just move ahead to the next presentation. Dr. Howard and Dr. Kitt, nothing to open?

DR. HOWARD: No.

MR. GARCIA: All right, I'm going to pass it to Dr. Bunn then.

AGENDA, ANNOUNCEMENTS, AND APPROVAL OF MINUTES

DR. BUNN: All right. Well, welcome everyone, to the NIOSH Board of Scientific Counselors meeting this morning. I would like to welcome five new members to the Board today and if each of you could tell us a little bit about yourselves, we'll start with Dr. Graham.

DR. GRAHAM: Hi, I'm Jessica Graham. I am currently at Bristol-Myers Squibb working in occupational toxicology. Before BMS I worked at Colgate-Palmolive also in occupational toxicology. And then prior to that I worked as a chemical engineer in the EHS field.

DR. BUNN: All right, well welcome. Next we have Dr. Cox.

DR. COX: I'm a risk analyst. I'm the Editor-in-Chief of the journal *Risk Analysis* and the world's first PhD in risk analysis. And today, risk analysis includes epidemiological and toxicological and mechanistic methods. And I'm interested in pretty much most topics involving risk assessment, risk management, risk communication.

DR. BUNN: Well, welcome.

DR. COX: Thank you.

DR. BUNN: Our third new member is Dr. Demian.

DR. DEMIAN: Hello again, I'm Cristina Demian. I'm currently Rochester New York faculty at the University of Rochester, Department of Environmental Medicine. And I'm a clinician. I'm an occupational medicine physician currently running a very small occupational medicine clinic that has been for 32 years now funded by the Department of Health of the State of New York to provide occupational health services for a spectrum of underserved targets, if you will. Previously I spent 10 years in Morgantown, West Virginia, doing public health, occupational medicine. So I gravitated a little bit around that NIOSH location.

DR. BUNN: Oh, wonderful.

DR. DEMIAN: I recognize some of you.

DR. BUNN: Yes, well, welcome.

DR. DEMIAN: I'm excited to be here.

DR. BUNN: Our fourth new member is Mr. Morrison.

MR. MORRISON: Good morning. Patrick Morrison, I'm with the International Association of Fire Fighters. We represent about 318,000 career firefighters around the U.S. and Canada. My position there is I'm Assistant to the General President for Health,

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Safety and Medicine. And I've been doing that for the last 17 years. And we have really focused and worked a lot with NIOSH over those years on a lot of the projects. Dr. Howard has been gracious to even speak at some of our conferences to let us know what we're doing. Really excited about the cancer registry that is going on and I want to applaud NIOSH for moving that forward and we really look at that being something in the future that is really going to help us look at the cancers in the fire zones. Prior to that I was a career firefighter myself just across the river in Fairfax County Fire and Rescue. So it took me as long to get here as those from Cincinnati.

DR. BUNN: Well, welcome Patrick. We're so glad to have so many industry representatives joining the Board. And Dr. Su, our last new member.

DR. SU: I'm Judith Su. I'm an Assistant Professor in Biomedical Engineering in Optical Sciences at the University of Arizona. My research specializes in building very sensitive optical sensors for biological and chemical sensing, so for biomedical diagnostics or chemical threat sensing.

DR. BUNN: All right, well, welcome Dr. Su. Next, I don't know if everyone has had a chance to review the minutes from our last meeting which occurred on May 30th. Is there any discussion, any corrections that need to be made? Okay, could I have a motion to approve the minutes?

PARTICIPANT: Approved.

PARTICIPANT: I second.

DR. BUNN: Okay, a second?

PARTICIPANT: A second.

DR. BUNN: All right, thank you. All right, well, we have a real exciting agenda today. I'm very pleased with the presentations that we'll be listening to this morning. Our first one will be on evaluation, NIOSH's evaluation of its programs and their approach. I'm particularly interested in the modified contribution analysis that is being utilized by NIOSH in their evaluation of their programs. Our second presentation will be on the prevention of workplace violence which actually was at the request of the Board over the last couple of meetings, so very excited to hear that presentation as well. And our last new presentation for this time will be on the immunological effects of subchronic fungal exposure, which is actually a new topic for me to listen about—

PARTICIPANT: For all of us, for all of us.

DR. BUNN: Okay, all right, so all of us. So very excited to hear about that presentation as well. So now I'd like to turn it over to Dr. Howard.

DIRECTOR'S OPENING REMARKS

DR. HOWARD: Oh, thanks Terry. And I want to thank all the new members for volunteering, or being volunteered, I'm not exactly sure of the category. But thank you very much for joining the group. But, unfortunately, we do have to say goodbye to a few people in the group. As you know, the membership is approved by the

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Department of Health and Human Services for a specific time period. How they determine how many years people serve is beyond me, but they are limited. And so today we have four folks that I want to recognize for their contributions over the last few years that we're saying goodbye to. First is Michael Behm. I want to think you very much for participating and I have this lovely parting gift for you. And our next honoree for service is Charles Redinger. Charles, thank you very much.

DR. REDINGER: Yes, thank you Dr. Howard.

DR. HOWARD: And I'll stick at this end of the table. And our third is Chris, who seems like she just got here. But thank you very much and we appreciate your service.

MS. LASZCZ-DAVIS: Thank you very much.

DR. HOWARD: Thank you, thank you. And our last one is Ron Stout. We want to thank Ron for his service, appreciate the time commitment. Thank you very much. Appreciate your time, take care.

DR. STOUT: Thank you.

DR. HOWARD: So I think the updates that I'm going to give are in your book. And the way we do this, for the new members, is we—I shouldn't say "we"—Alberto collects the information from each of the divisions throughout NIOSH and puts that information in this 13-page talking points that you have in your book. I'm not going to go through 13 pages, okay, but they sort of collect the information that is new, interesting, that we want to share with you guys, into the remarks. So I'm just going to highlight a few things. Because we have such a wonderful agenda, I don't want to cut down upon the presentation time. And we have something that I do want to tell you about at the end that may take some time.

So just to update you on the budget for 2020, which is cooking on the Hill. The House has probably been a little busier than the Senate in this regard. The House mark, which indicates the budget allocation for various agencies, for NIOSH is \$346.3 million. This is a \$10 million increase above the FY19 funding level of \$336.3 and clearly \$156.3 million above the President's proposed budget of \$190 million. As you know, presidents of either party, their proposed budgets usually are not given that much weight by the House or the Senate so it's not surprising. So we were pleased with that increase on the House side.

And as you see there, they have \$2 million for the Education and Research Centers, \$2 million for the Ag, Forestry, and Fishing Program, \$2 million for the Total Worker Health Centers, and an increase of \$600,000 for the Firefighter Cancer Registry, an increase of \$400,000 for the Mesothelioma Registry and Tissue Bank, and \$3 million for other Occupational Safety and Health Research. And that was in May, so they were very busy earlier in the year. Just on the 18th of this month, the Senate came through with a mark of \$338.5. Now, that's \$2.5 million above the FY19 and the increase, that \$2.5 million, is explained by \$1 million for Mining Research—an increase of \$1 million for Mining Research—and

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\$1.5 million for the Firefighter Cancer Registry. So that is less than the House mark. As you know, if the Senate passes that, then the differences are made up in a conference committee and they go through all their various political machinations to determine what the final is. Now, as some of you've read in the newspaper, the House passed a continuing resolution until November 21st. As you know, the federal budget expires on the 30th of September which is, what, next Monday. And so they anticipate they will not be able to get agreement on a federal budget by next Monday. The Senate I think later this week will probably pass the CR that will push everything to November 21st. The funding then from October 1st to November 21st remains at the 2019 level. And then we'll see what happens the week before Thanksgiving. It's always interesting this time of year. So that's pretty much it for the budget issues. Anybody have any specific questions about the budget issues before I go on? Okay. A couple of things have been percolating for us as a part of the larger CDC and NIOSH. And I do want to mention a couple of those. But before I do, I do want to mention a couple staff changes at NIOSH that some of you may be interested in.

We have a new Division Director for the Spokane Mining Research Division. Doug Johns, who previously was the Deputy Director of the Respiratory Health Division in Morgantown, will be I believe starting at the end of the month.

PARTICIPANT:
DR. HOWARD:

First of October.

First of October as the Division Director for Spokane. The other change that we're in the process of working through is Dr. Terri Schnorr, who many of you know, has announced her retirement after 37 years of federal service. And she is the Director of the new Division of Field Studies and Engineering in Cincinnati, formerly DSHEFS, part of DSHEFS. And she's announced her retirement at the end of the year, so we're in the process of adjusting to that reality and going through the various selection issues.

The two issues I wanted to mention that are ones that CDC and the Department are involved in—and we are too peripherally—is, one, the Ebola outbreak in the Democratic Republic of the Congo which involves areas in the eastern Congo bordering Uganda and Rwanda in that area; an outbreak of over 3,000 cases. As you know, we went through a similar outbreak in West Africa a few years ago, so this is in Central Africa with over 2,000 deaths so far. We participate in that issue largely from the occupational safety and health perspective, trying to protect the responders and the public health workers who are working in that area.

The other issue that I wanted to mention, which we did put a blurb on Page 2, is the vaping issue which is, as you've all read in the newspaper, is a fairly emerging issue. The last number of cases that I heard was about 530 cases based on the CDC case definition with, I believe, 7 fatalities. I think that was the last number I heard.

PARTICIPANT:

Is this contaminated marijuana—

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DR. HOWARD: We'll get into that in a minute, but I just wanted to go through the statistics first. It's a substantial issue now. Health departments are going through their files to try to figure out whether—as you know, in many of these outbreaks—whether there were earlier cases that fit the case definition that were not counted. So that is happening right now.

To your question, there's a couple of papers that have been published. One in the *Journal of Clinical Investigation*, which is a mice study exposure study, and the other in the *New England Journal of Medicine*. The symptoms that individuals have are largely pulmonary with tachycardia, nausea, diarrhea too, and various types of pulmonary pathology associated with it, alveolitis and some develop ARDS, Acute Respiratory Distress Syndrome and have difficulty oxygenating the lung. Some of these studies have shown lipid deposits. As you know, some of the vehicles that are used in the vaping apparatus are oils, lipids, and, for instance, vitamin E; which, for those of you of the toxicology persuasion, you know that there's a lot of data about ingesting vitamin E, but there's not a whole lot of tox data about inhaling vitamin E.

So this is a new area for the FDA and for CDC, the Office of Smoking and Health, as well as our own Respiratory Health Division are involved in a multi-governmental response. Today, actually, the CDC Deputy Director, Anne Schuchat, is testifying in Congress on this issue. So it's a big one, one that doesn't involve workers per se, but one that certainly involves workers in terms of their Total Worker Health paradigm of an activity that they are engaged in. The age distribution is very young in the 17-to-30 age group. There's a couple MMWR articles that are on this issue, so if you want to investigate a little more about what CDC's doing, you can turn to those. And I think two of those are referenced here. And I'd be happy to give you the reference to the New England Journal article and the JCI article. Any questions on Ebola or vaping?

DR. BUNN: Michael?

DR. BEHM: Mike Behm. I believe at the last meeting I had told a little story about how I had just visited a manufacturer of some of these and so it was just some of the conditions—and, again, it was a small sample size, but I think it would be interesting to maybe a Health Hazard Evaluation or some type of an investigation for these smaller employers, which this particular one grew from a size of three people in four years is now at sixty and is growing and growing and growing. So this is—as I guess under the guise of new and emerging technologies or new and emerging health issues, I believe the work health and safety issue is certainly one that we should keep in mind.

DR. HOWARD: Sure. And we're certainly open to that. Most of the cases have involved vaping with THC, THC and nicotine, or nicotine per se. The smaller number of cases are the nicotine per se, so there are a lot of manufacturers out there and small shops that are adding all sorts of things. So that's the sorting out that has to happen.

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- DR. KITT: Yes, Margaret?
I just wanted to add—this is Margaret Kitt—that we do have a couple of HHEs that were done within the last several years and they can be found on our website under the HHE program. When this first started, to pop into the news we forwarded those HHE reports on to CDC to show them what we had done historically, but we do have a few. We'd like to do more, obviously, in the area that...
- DR. BEHM: The interesting thing from, that prompted this manufacturer to reach out to try to do something, I guess, was that their supplier was looking at the supply chain and environment, safety, and health. So there's some positive slice, there was that.
- DR. HOWARD: The only other thing I want to mention on the vaping issue is that on September 19th, Dr. Redfield, the CDC Director, as some of you heard in the news, issued a call for refraining from using e-cigarette or vaping products until this situation could be resolved and understood better. I just want to point that out too.
- PARTICIPANT: Marc had a question.
- DR. HOWARD: Yes, Marc?
- DR. SCHENKER: Yes, Marc Schenker. I have been thinking about a couple associations with the workplace that don't immediately come to mind. One is vaping, the other is the opioid crisis. And I think that we need to keep our minds open to the association with work, even facilitating or intervening even though they're not classic occupational hazards or toxins. So it is a time of change in the workplace and substance abuse is a part of that or a consideration.
- DR. HOWARD: Exactly. And last year we decided that the Total Worker Health office would spearhead our initiative on opioids and so we have actually—where is Christy? There she is. We have just revamped our opioid website on our site with all of our—did you want to mention, Christy, a little bit about our website on opioid initiative?
- MS. SPRING: Sure, Christy Spring, Associate Director, Communication. NIOSH has developed a series of webpages to highlight resources and information we have about the intersection of opioids and work. I'm happy to give Alberto the web link so that he can send it to everybody so you can find it. We've predominantly been providing data that we have seen either from our own researchers or from researchers looking at workplace safety and health issue here about industries that are at risk, as well as research projects underway, and have been highlighting toolkits and products that are being developed both by NIOSH, our funded partners, and other stakeholders in the occupational safety and health arena to further share resources for workplaces that might be dealing with this. We have most recently put up a toolkit to help for emergency response workers who may encounter opioid or illicit drugs in the process of a response and how they can stay safe. In addition, we have a number of fact sheets including Medication-Assisted Treatment, the use of naloxone in the workplace, again, with the focus of trying to

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provide resources for both employers and workers on constructive steps they can take towards addressing the opioid crisis in their own workplaces.

DR. BUNN: Thank you, Christy.

DR. HOWARD: So any other questions on that issue before I turn to another topic? Okay, all right. I wanted to mention a new initiative that we just started, our Future of Work Initiative. As you know, some of you who look at the literature will see lots of organizations, consultancies, national and international organizations, governmental organizations, private sector, et cetera, that feature Future of Work issues. And there's a bunch of them, obviously. And so we decided that we needed to collect all of the stuff that we're doing under Future of Work umbrella. And so Dr. Sara Tamers is our Future of Work coordinator in our new Division of Science Integration in Cincinnati. And so we're falling in there, both our nanotechnology work, our advanced manufacturing work, issues related to nonstandard work arrangements, sensor—we have a center for Direct Reading and Sensors—our work in ergonomics and exoskeletons, and our artificial intelligence issues. All of those we're trying to collect and I believe that we have a topic page on our website that's developing. I don't think it's—is it up yet?

DR. TAMERS: It is up. It's a single page at this point to describe how NIOSH is defining Future of Work. And then the anticipation is that page will expand over the next couple of months.

DR. HOWARD: Okay. We are going to add issues to that as they develop to give people an idea of what we're doing in that area. I wanted to thank Sarah for her work. Sarah Felknor, our Associate Director for Research Integration, also is involved in Future of Work activities and we recently had speakers on this issue to help us understand the science of foresight, how you actually look to the future. There's evidently a methodology that's associated with that as opposed to a crystal-ball effect science developing in that area, so it's interesting to me. And the two authors of a book on foresighting from Houston, Texas, are presenting or have presented to CDC. So that's going to be an interesting issue.

I wanted to bring to your attention a very important publication entitled "The NIOSH Occupational Banding Process for Chemical Management." This has been something that we've been really pleased to join with the American Industrial Hygiene Association, the American Society of Safety Professionals and others to bring to fruition after a lot of work. And that is something that I wanted to make sure that you knew was out. For researchers that look at the Quality of Worklife survey, of which there are many, as Paula knows, and that the fifth wave of data collected in 2018 is now available from the General Social Survey website, is that correct?

DR. GRUBB: Yes.

DR. HOWARD: The other thing I wanted to mention in this large number of updates is on Page 6, the peracetic acid project. One of the things that happens is people come to us

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with issues that they're struggling with and the folks that work in poultry manufacturing—"processing" I guess is the right word, it's not manufacturing, "processing"—peracetic acid is often used as an antiseptic and it has a lot of presence in the EPA world, the issue of the exposures in occupational settings was brought to our attention, how to measure that—as you know, it's an irritant. So we have an initiative going on that involves both the Health Effects Laboratory Division from the basic science standpoint, as well as efforts by the risk assessment branch in the Division of Science Integration to look at the whole peracetic acid issue. As you know, it's the junction between both us looking at it and the use of it which is controlled by the Food Safety and Inspection Service, FSIS, of the Department of Agriculture. So it's yet another connection that we have with another activity that the Government does. So I wanted to bring that your attention. And I think it could be, if people are interested in the committee, a nice topic to be able to talk about for—

PARTICIPANT: Yes, I agree.

DR. HOWARD: —multiple different perspectives of various divisions that are doing work. Christy has kindly provided us on Page 11 with some social presence statistics. That used to be social media, but now it's social presence.

MS. SPRING: Yes. We're very 21st century.

DR. HOWARD: We're very 21st century. So you can see the statistics here. And I just wanted to draw your attention to our blog where we have really broken through the 500 level there onto 1,000 blogs. And one of the things that I always mention, especially to the committee is that we like to invite people who would join us or another NIOSH author or themselves to participate in the science blogs. So if you are interested in a topic that relates to occupational safety and health and want to blog, it's—the blogs are very short, only three or four paragraphs. We always do a blog if the authors of a NIOSH paper is published because that's one way that people who do not read the literature every day can find an article of interest. So my recent blog, I wrote an article on artificial intelligence so I wrote a blog on that to let people know about it because people don't often have the time to read that literature.

I also wanted to point out and congratulate Christy on launching the *Research Rounds* newsletter, which has really had a significant uptake. People really enjoyed reading a very short presentation of what's new in terms of research findings. So I think we're doing very well in the social presence area.

Before I get to the last issue, I'll ask does anybody have any questions about anything they saw in the talking points now or later on, you can certainly send an email and we can get you more information. Charles?

DR. REDINGER: Thank you. Charles Redinger. Dr. Howard, a quick question. Back to the Future of Work, it was unclear whether the workshop that was mentioned—and I think how you just languaged it, it's happened or it's going to happen.

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DR. HOWARD: Yes, and I don't know—

PARTICIPANT: It was earlier this week—

DR. HOWARD: This week.

PARTICIPANT: Or end of last week.

DR. REDINGER: It must have been trend—yes, because it made us—my—I wasn't clear—

DR. HOWARD: Andy Hines and Bishop. I think Andy is the one who presented. They wrote the book on —

PARTICIPANT: At CDC?

DR. HOWARD: At CDC, yes.

DR. REDINGER: Great, thank you. And the second thing is just high five, shout out, and just hurrah on that banding document.

DR. HOWARD: Oh, yes.

DR. REDINGER: I mean that has been—so Dr. Lentz gave a great presentation at the last meeting. This has been a process for maybe a decade—

DR. HOWARD: A long process.

DR. REDINGER: If not longer—

DR. HOWARD: A long process.

DR. REDINGER: That certainly, within the industrial hygiene field, we've been looking at this issue for decades on how to handle exposure issues and decisions in chemical exposure management when there isn't some sort of OEL. And it's a great document, a lot of good work has gone into it. And just, again, high five.

DR. HOWARD: Well, thank you. I haven't been following it regularly and in detail, but I have this vague memory of the British coming out with the cautious, and then the criticism about whether that was valid. And then ten years of working on something new and then all of a sudden, now, it seems that we've hit a very sweet spot.

DR. REDINGER: That's great.

DR. HOWARD: Well, and I want to thank you, Chris, and anybody else who's a member of AIHA for the support that AIHA has given us, not just the rah-rah support but actually working with us. I think that has really been very important too.

Okay, any other questions before—

PARTICIPANT: I have other questions.

DR. HOWARD: Yes, go ahead.

PARTICIPANT: Have there been any workshops on utilizing the NIOSH banding document or are there plans to have any workshops to help people—

DR. HOWARD: Good question, good question. And I don't know whether Paul Schulte is on the telephone this morning? No, but we could find an answer for you.

PARTICIPANT: We are thinking about submitting some abstracts to the World Congress, which will be in Toronto next year for the occupational exposure banding, but I don't know about a workshop per se.

PARTICIPANT: That's great because when we read through the documents, sometimes questions come up as to—

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DR. HOWARD: Sure, sure, yes, yes—

PARTICIPANT: —how best to utilize—

DR. HOWARD: I mean I would think off the bat that it would be great if AIHA—because they have the practitioners that will come. And I know that I've done a couple webinars with AIHA and that usually is the most effective because then people don't have to travel. They sit at their computers. So, Chris, maybe you can take that back.

MS. LASZCZ-DAVIS: Well, in fact, we do have PDCs at the Atlanta 2020 AIHce. We in fact had the most recent Minneapolis conference as well. But that is a select audience too. I think to broaden it, we need to look at some other venues and some other stakeholder groups to your point.

DR. MIDDENDORF: And NIOSH, the OEB working group is working with AIHA to develop a number of webinars, trainings, opportunities.

MS. LASZCZ-DAVIS: Great.

[Technical issue.]

DR. HOWARD: I don't think your conversation's getting picked up, but that was Paul Middendorf speaking with Chris about the AIHA interaction.

DR. BUNN: I just have one question/comment for the group. Terry Bunn. I was wondering, Dr. Howard mentioned the occupational exposures to peracetic acid and was wondering if that would be a topic area of interest for one of the future Board of Scientific Counselors meetings.

DR. MIDDENDORF: Sure. I'm working with FSIS, so I'm interested in that.

DR. HOWARD: Paul, that would be a great contribution. We always are interested in their thinking about this issue.

DR. BUNN: All right—

DR. HOWARD: They're actually in the building—no, I think they're in the building on the other side of us.

DR. BUNN: All right, thank you.

DR. HOWARD: Okay, sure. Oh, so the last issue is a little different than the normal. And so for new members, we don't do this very often, but often we ask the BSC to form a subcommittee of members to look at a specific issue. And today I think you have—Alberto is giving you a copy of a two-page which is entitled "Charge to the Board of Scientific Counselors." And attached to that is a very-tiny-font PDF of a blog that the Congress passed recently.

So the law is the Firefighter Cancer Registry Act of 2018, which Patrick's already mentioned, that requires the Secretary of the Department of Health and Human Services acting through the Director of the Centers for Disease Control and Prevention. And that delegation to NIOSH from the Secretary through the CDC Director is pending approval. We expect it very soon.

The requirement in the Act is that the Secretary develop and maintain a voluntary registry of firefighters—which is referred to in the Act as the Firefighter Registry—to collect relevant health and occupational information of such firefighters for

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purposes of determining cancer incidents. And the Act itself is an attachment. So if we need to reference that, you need to read that, it's not that long, it's attached. So I would charge the BSC through the chair to develop a subcommittee with two co-chairs from the BSC at large. And we've graciously asked Patrick, being an expert in this area, and Grace, if they would be kindly happy to co-chair and invite any of the other members that might be interested in this issue to provide input to the BSC periodically, perhaps at each of our meetings, to tell us what's going on with the subcommittee that would then assist the BSC in advising the Director. So that's how it would work. It goes to the subcommittee to the BSC and then to the Director about our efforts to establish and operate the NIOSH Firefighter Registry. Now, if you read the Act itself in Section 2, it requires a number of issues that the Secretary look at a number of issues. And they're spread in Subsection 2(d)(1)(a)(b) and (c)(d), as well as in Section (b), (3)(a)(b)(c)(d). So there are eight areas there in the statute that are important for us interest he folks that are doing the cancer registry to pay attention to and for the subcommittee to help us. Now, what's interesting a subcommittee of the FACAs, we've been advised by counsel that we are able to add to that subcommittee individuals who may have expertise in these various areas that are not actually members of the BSC. So we hope that the co-chairs working with the contact person, who is Kenny Fent, who, as some of the members remember, gave a presentation on the Registry at our last meeting. And Kenny will be the staff contact, as well as Dr. Beth Whelan who's also on the telephone today and can help us discuss this, would be able to staff the subcommittee.

The subcommittee we hope could meet face to face depending on budget, of course, which is always a limitation, but certainly at least once a year meeting face to face and teleconference and videoconference capabilities that we all do now more than ever because travel is so challenging. But that would be certainly at the discretion of the subcommittee co-chairs and based on the availability of funds.

So it's a little different than we normally do, but we think that that may be the best way to do it. As you know, redundancies in FACAs is not exactly a positive thing. The government is trying to reduce the number of FACAs, Federal Advisory Committees that are in the government. We think that you as the BSC are eminently qualified to participate and help us in this area. So I would just see whether Kenny or Beth, who are on the telephone, have anything more to add to what I just said.

DR. WHELAN: Hi, this is Beth. I don't have anything to add, thank you.

DR. HOWARD: Okay.

DR. FENT: Hi, this is Kenny. I don't have anything to add either. That was a nice overview, Dr. Howard.

DR. HOWARD: Thank you, thank you. So I'll turn it back to you, Terry, if you want to discuss, add

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- questions, or anything that the committee may have for this activity.
- DR. BUNN: Yes, yes. To start the discussion of this new subcommittee, which I've been on the Board for about five or six years now, and this is the first time we've ever had a subcommittee during my tenure, anyway, so it maybe is the first time ever for this type of subcommittee—
- DR. HOWARD: We've had subcommittees before. Narrow topics and BSC members only. This is the first time that we're looking at something that's broader, that's based on a statute, that is more ongoing and involves external participants/experts that would help the BSC subcommittee and the Committee as a whole help us really get this registry off the ground. As you know, Beth and Kenny have done presentations. There's a lot—as you know, Patrick—a lot of interest in the firefighter community. We want it to be as collaborative as possible and to have an ability for the community to be able to see and participate so that the subcommittee meetings would be available by telephone, they would be announced in the Federal Register like our normal BSC meetings would be announced. People would know about them. There would be time for public comments, as we have in the BSC at large. So I think it would help all of us be able to move ahead with this important project.
- DR. BUNN: Thank you, Dr. Howard.
- DR. HOWARD: And I don't know whether Patrick or Grace have any other comments that they want to make on this.
- MR. MORRISON: No, thank you. I mean you said that people have been in the community for five years and on the subcommittee, I think I've been on here for five minutes.
- PARTICIPANT: Yes.
- MR. MORRISON: And I'm on the subcommittee. No, I really like the way this was laid out and especially I liked about some of the other nonmembers of this community that's going to be real important for the (BNU @ 0:46:18) sort of some different groups, different populations. This is going to be very much a collaborative effort with the entire fire service from career to volunteers, different organizations that we have to get that information. So I look forward to working on this and hopefully we can have good discussions but really look at this project and move this project along the way with the funding that we've already been appropriated for, so.
- DR. HOWARD: Thank you, Patrick. And I think the important issue here we need to mention, for those of you who aren't familiar with the Registry or the Act itself, this is a *voluntary* registry, okay? So we in the government can't run around the country to get names of everybody from—no, this is a *voluntary* effort. People have to come forward. So it's extremely important for the success of the Registry to be able to attract people to the Registry. That is a very important issue here.
- PARTICIPANT: I'm very pleased to be a part of this subcommittee. I think it's an extremely important activity that NIOSH is doing. And I think the voluntary nature, I mean most research studies are *voluntary* in nature anyway, and I think there's a lot of

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concern amongst the firefighters—Patrick would probably know better about the high cancer rates in firefighters. So I think that firefighters will be most pleased that there is this concern at the national level for a registry. So I'm happy to help in any way I can field it through the process.

PARTICIPANT: Thank you.

DR. BUNN: All right, so yes, and this is Terry. I totally agree that this is a very exciting opportunity, as Grace says, to be able to explore the diagnosis of cancer among firefighters and the registry, to be able to track those cancer cases. I would just like to know, based on our discussion here, if there are any members who are interested in being part of this subcommittee that we could—

DR. HOWARD: And, certainly, the meetings will be public.

DR. BUNN: Yes.

DR. HOWARD: So the members may not want to commit to being a named subcommittee member, but certainly all the members are invited to participate.

DR. LERMAN: Steve Lerman. I have some interest in this topic and I'd be happy to participate. I may also have some other non-BSC members to propose, but I'd want to speak to them first before that.

DR. BUNN: All right, thank you, thank you.

DR. HOWARD: And also on that issue, Steve, when you read the statute—and it's in Section...I think it's the 2(d) and (e). It's the consultation issue, it's (e). The Secretary shall consult with nonfederal experts in the firefighter registry established under this section, blah-blah-blah, and then it specifically mentions public health experts, epidemiologists, clinicians, active/retired firefighters. Those are the categories of folks from external that Beth and Kenny will be working with the co-chairs to be able to identify. So when you look at folks that are connected, if they fit into those categories—and I think there are seven or eight of them, state health agencies and state departments of Homeland Security is another one—those are the kinds of folks that we would want to be on the committee.

DR. LERMAN: The individuals I have in mind are epidemiologists who bring cohort studies—

DR. HOWARD: Registries, yes, exactly.

DR. BUNN: Excellent, excellent. Yes?

MS. DOYLE: Hi, Mary Doyle. I just had a question. Do we have any buy-in or support from AIFF for other associations of firefighters?

DR. HOWARD: Well—

PARTICIPANT: Yes.

DR. BUNN: Yes.

MR. MORRISON: I represent the International Association of Fire Fighters health and safety—

MS. DOYLE: Oh, I'm sorry, I came in late, I apologize.

MR. MORRISON: But, no, we do. This is by far one of the largest conversations right now in the fire service, this and behavioral health. And this really was a study that was done many, many years ago that we still utilize and is still alive today in a couple of

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areas. But that was the study that we studied Philadelphia, Chicago, and San Francisco, NIOSH did this. And that study really looked at and spotlighted that not only did we have an increase in cancers, but we really have to address what—you can say we have that increase, but what do we need to do about it.

PARTICIPANT:

Sure.

MR. MORRISON:

And I think here, this is establishment of this registry is really going to give the researchers that information to really help us to kind of backtrack this and go back to not just that we had diagnosed this, but where did those exposures come from and where was that genetic sort of makeup in that, and why did we have these increases in that? And one thing, just that mesothelioma, we didn't even realize that that was an issue with us because of the latency period of that but we have two times the rate of that. So that information is what we need to do to go back to protect the workers to say, okay, what do we need to do when we are in these environments? So we're not only behind this, we're just really excited that we've gotten to this stage so we can start to do this formally.

DR. BUNN:

Chris—

DR. FENT:

And this is Kenny. I'll just say that we've been working with different professional organizations to garner support. So for example, the National Volunteer Firefighters Council, the International Association of Wildland Fire, and other groups, and we are looking at trying to identify some representatives from those groups for this advisory committee.

DR. BUNN:

Chris?

MS. LASZCZ-DAVIS:

Chris Laszcz-Davis, just a few thoughts. Hailing from the state that just enacted the first emergency wildfire safety regulation, a lot of conversation within the state as to how that applies but moving towards permanent regulation as well, I do have some suggestions for people that both of you may want to consider to work with. A lot of them would be in the blocking and tackling phases of firefighting. Consideration that you might want to think about a bit in what we're finding as some real concerns with utility workers first responders, I mean they're not that far removed from the firefighters themselves in terms of exposure we're finding as these wildfires are being taken on. And another big exposure issue, the post-fire debris cleanup (inaudible @ 0:53:32) everything else comes into play, so I don't know whether or not that's part of your scope, but it's just something to think about in terms of peripheral issues.

DR. BUNN:

Thank you, Chris. Tony, you had a comment too before?

DR. COX:

No, I had a question which is to what extent does the voluntary nature of the registration introduce selection bias that'll be hard to deal with downstream?

DR. HOWARD:

We need an epidemiologist. Dr. Whalen, can you help?

DR. WHELAN:

Yes, and actually the team does have a lead epidemiologist, Miriam Siegel, who you all might remember also presented last at the last meeting. Yes, that is a concern. It's not how we typically design our studies. So we're having a lot of

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discussions about that and working on our protocol. Obviously, if we get a very high participation rate, the bias is minimized.

DR. COX: Right, right, that's right.

DR. WHELAN: So working on that.

DR. COX: But otherwise, it may be useful to think about the value of information that could come out of the study. If you have a small participation rate, that's going to substantially undermine the value of the information.

DR. HOWARD: See, these are the kind of issues that the subcommittee will have to wrestle with.

DR. BUNN: Right. All right, thank you Tony—

DR. COX: So I'm potentially interested in joining the subcommittee, but let me see what other offers are on the table first.

DR. BUNN: All right, thank you. And that's why I'm also interested in joining the subcommittee. So just a couple of other comments before we move on to our first presentation is that, just as a reminder, with the subcommittee, they would be giving a regular report to the Board of Scientific Counselors at all of our meetings, which is probably—we're currently running at two meetings a year for the Board of Scientific Counselors. And the subcommittee, as Dr. Howard said, is anticipated to meet either in person or through...what?

DR. HOWARD: Teleconference.

DR. BUNN: Yes, teleconference—

DR. HOWARD: Virtually.

DR. BUNN: For about two meetings per year probably.

DR. HOWARD: Well, it's up to them, but certainly the teleconferencing we can rely on our communication staff to help out with—face to face, of course, costs money so we have to work out the budget for them.

DR. BUNN: All right. Yes, Jessica?

DR. GRAHAM: And Jessica Graham, I'd also be interested in assisting the subcommittee as well.

DR. BUNN: All right, great, thank you. Any other comments or discussion? Yes, Mary?

MS. DOYLE: I would like to be on the subcommittee as well.

DR. BUNN: Okay, all right, thank you everyone. Alberto does tell me we have just a little bit of time within our schedule because I would like to—wasn't sure if there was enough time or not to do full introductions around the room, so if we could do just a very quick round of that so that the new members are introduced to all of the members, the Board of Scientific Counselors as well as our NIOSH colleagues that are joining us this morning. All right, Charles, we'll start with you.

DR. REDINGER: All right, Charles Redinger. Yes, I'm an industrial hygienist. And I work outside of Boston. I have a small company. And I've been very active in the American Industrial Hygiene Association. And I have a smile on my face seeing Tony here with SRA and Risk Analysis. That's a passion of mine how the risk issues play out in the occupational health and safety field.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis, going to be leaving this Board here right after this meeting.

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Charles and I have been professionally and very actively involved with IOHA, AIHA, ASSP, and ILO to some extent over many, many years. I started with the federal government back here in Washington, D.C. after grad school. Moved over to the West Coast for a regional DOE manager position, joined industry Kaiser Aluminum and Chemical Corporation for 25 years in their executive ranks, and then about 10 years ago set up my own environmental consulting firm. So have done environmental health and safety for many years. That's it.

DR. BUNN:

All right. Grace?

DR. LEMASTERS:

Oh, Grace LeMasters, Department of Environmental Health, University of Cincinnati College of Medicine. I'm an occupational environmental epidemiologist. I've done studies on several different exposures and groups including firefighters which I did in 2006, a meta-analysis of 32 studies looking at firefighters and cancer. So I think that's why I'm on this subcommittee is related to that particular study. But I also do research on fibers and other exposures.

DR. BEHM:

Mike Behm. I'm a professor of occupational safety at East Carolina University in the College of Engineering. And I've been on the NIOSH Prevention through Design council, currently on the NORA Construction Sector Council, and this is my last meeting of the Board of Scientific Counselors.

DR. BUNN:

Margaret?

DR. KITT:

Margaret Kitt, NIOSH Deputy Director and occupational medicine physician and I'm located in Morgantown, West Virginia.

DR. BUNN:

And Terry Bunn, I am a professor at the University of Kentucky and Principal Investigator for the Kentucky Occupational Safety and Health Surveillance program, which is an umbrella grant that looks at occupational health indicators and we have a Fatality Assessment and Control Evaluation Program. I'm also the PI on a number of National Center for Injury Prevention and Control grants looking at the prevention of drug overdoses.

DR. LERMAN:

Steve Lerman. I'm an occupational environmental medicine physician. I spent 30 years with ExxonMobil, 20 of those in the medical department, 10 of those at ExxonMobil Biomedical Sciences, which is an organization of toxicologists, epidemiologists, environmental scientists and such. I retired a year and a half ago and I should mention I noticed in the roster it still says ExxonMobil Corporation by my name. I continue to be involved in an area I've been involved in for the past 15 years or so, which is fatigue risk management, workplace fatigue issues and safety issues resulting from that. But other than that, as I say, I am currently retired.

DR. BUNN:

Thank you. Marc?

DR. SCHENKER:

Marc Schenker. I'm a distinguished professor emeritus at University of California at Davis, occupational physician and epidemiologist. I was the founding director of one of the first two ag health and safety centers funded by NIOSH but have worked on a variety of studies. My agricultural worker studies have evolved into

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being immigrant workers health studies and also, more recently, climate change and heat stress being a major health hazard in outdoor workers and farm workers.

DR. BUNN: Thank you. Mary?

MS. DOYLE: Hi, I'm Mary Doyle and I'm the Deputy Director of the Johns Hopkins Education and Research Center that NIOSH supports. I have also been involved in the Los Alamos Former Workers Program, Medical Surveillance Program. I also run the CE program at the ERC and we do a lot of work with the professional associations trying to support their educational needs. We do a lot of webinars with these groups, hot topics, anything that's—so we have a very great mechanism that we can do webinars, record them and get CME and CE for the nurses and the docs and the OHs. That's about it.

DR. BUNN: Thank you. And Ron?

DR. STOUT: I'm Ron Stout. I currently provide leadership (inaudible @ 1:01:50) student health private foundation in the health and wellbeing space. Just recently retired from Procter & Gamble with 20 years of service as medical director, and before that spent 20 years or so between Active and Reserve Duty in the Air Force where I had the privilege of working occupational and preventive medicine, and working on things like the Air Force Health study, the dioxin exposure and others, and actually first met Grace there when she was doing some study of—was it firefighters in Utah?

DR. LEMASTERS: In the military?

DR. STOUT: Yes.

DR. LEMASTERS: No, it was people involved in fuel cell—

DR. STOUT: Fuel cell, that was it, yes.

DR. LEMASTERS: Exposure to benzene and other solvents.

DR. STOUT: My last meeting, thank you.

DR. BUNN: Thank you, Ron. Christy?

MS. SPRING: I'm Christine Spring, Associate Director for Communication and Research to Practice here at NIOSH based in the D.C. office.

DR. GREEN: My name's Brett Green. I'm a research biologist in the Allergy and Clinical Immunology Branch of the Health Effects Laboratory Division located in Morgantown, West Virginia.

DR. CHARLES: Hi, I'm Luenda Charles. I'm an epidemiologist in Morgantown and I'm on the (inaudible @ 1:02:59) office in D.C.

DR. HARTLEY: Hi, Dan Hartley, Division of Safety Research. I'm the epi and the Workplace Violence Prevention Coordinator, so I'll be presenting later today.

DR. GRUBB: Hi, I'm Paula Grubb. I'm a research psychologist in Cincinnati for the Division of Science Integration; specialize in work organization, psychosocial, workplace violence and, most recently, a project on opioids and providing educational materials for first responders.

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MR. JOHNSON: I'm Ed Johnson and I'm with the CDC Washington office and I take care of all the audio/visual technology here.

MS. GARRAHAN: Good morning, I'm Maryann Garrahan. I'm actually from the Department of Labor/OSHA. I'm detailed to NIOSH's Office of the Director.

MS. BENJAMIN: Pauline Benjamin, Committee Management Specialist. I'm based in Atlanta.

DR. ROSA: Good morning, Roger Rosa, Senior Scientist, Office of the Associate Director for Science in the Office of the Director here in D.C. Been with NIOSH since 1984.

DR. BUNN: Thank you.

DR. FORRESTER: Christy Forrester. I'm an epidemiologist and communication scientist here in D.C. in the Office of Communication and Research to Practice.

DR. BUNN: Thank you.

DR. DOWNES: Amia Downes. I work in the Office of Policy Planning and Evaluation in Atlanta.

MS. NOVICKI: Hi, I'm Emily Novicki. I work in the same office as Amia in Atlanta. I'm a Health Scientist and I'll be taking over as DFO next year.

DR. PIACENTINO: Good morning, John Piacentino. I'm the Associate Director for Science here in Washington, D.C.; training is occupational medicine and internal medicine.

DR. MIDDENDORF: Hi, I'm Paul Middendorf, the Deputy Associate Director for Science and I'm out of Atlanta. My background is environmental toxicology and industrial hygiene.

MS. SCOTT-BLANTON: Good morning, Janice Scott-Blanton. I'm a program analyst and the Associate Director for Science Office and I'm responsible for collecting the topics.

MS. MORLEY: Good morning. Angela Morley, Chair of the NIOSH Institutional Review Board based here in Washington, D.C.

DR. BUNN: And on the phone? Could you introduce yourselves?

DR. WHELAN: Hi, this is Beth Whelan. I'm Chief of the Field Research Branch in Cincinnati.

DR. FENT: Hi, this is Kenny Fent. I'm the team lead for the National Firefighter Registry.

MS. BERRY: Hi, this is Ann Berry. I'm a Senior Scientist in the SSU Director for Science Office located in Atlanta, Georgia.

MR. PIZATELLA: Tim Pizatella, Deputy Director of Division of Safety Research in Morgantown.

DR. REPONEN: Hi, this is Tiina Reponen, University of Cincinnati. I think I'm a new, incoming member. My term will start next year, so I'm just listening in the beginning of this meeting. I have other meetings later this afternoon. I am a professor in the Department of Environmental Health. I'm teaching industrial hygiene (inaudible @ 1:06:11). Also, I'm the Director of the Education (inaudible @ 1:06:14) here in Cincinnati.

DR. BUNN: Thank you.

DR. ROBISON: Allen Robison, NIOSH Office of Extramural Programs.

DR. BUNN: All right, thank you.

PARTICIPANT: (Inaudible @ 1:06:27) performance evaluation.

DR. BUNN: Thank you. All right, well, Paul reminded me I actually need to—would like to have a formal vote on the creation of this subcommittee for the firefighter registry. So if we could have a motion to create this subcommittee, that would be great.

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DR. COX: I so move.

DR. BUNN: All right, thank you Tony. Do I have a second for the motion?

DR. REDINGER: Second.

DR. BUNN: Charles, thank you very much. All right, so the subcommittee is formally created then. All right, so now we turn to our first presentation on the Evaluation Turning Point by—

PARTICIPANT: Terry, I think you need to take a vote.

DR. BUNN: Oh, I have to take a vote? Oh, let's take a vote, then, all right. I've never done this part before. All right, could I have a vote for all of those who are in favor of creating the subcommittee?

PARTICIPANT: Aye.

PARTICIPANT: Aye.

PARTICIPANT: All opposed?

DR. BUNN: Any opposed? All right, no that oppose it. All right, now we have the creation of the formal subcommittee. All right, thank you very much. Yes, so our first presentation is by Dr. Amia Downes on the Evaluation Turning Point. Thank you.

THE EVALUATION TURNING POINT

DR. DOWNES: Morning, everybody.

PARTICIPANTS: Morning.

DR. DOWNES: As Terry said, my name is Amia Downes and this morning I'll try to be a morning person. They always put me in the early-morning slot. That's because I'm unnaturally enthusiastic about evaluation. I hope it's going to rub off (inaudible @ 1:08:12).

So I'm happy to report, I think I was here about two years ago and I told you a little bit about this new evaluation theory that we were applying to do our program reviews. I'm happy to report that we've now completed five program reviews using this new evaluation theory. And out of a possible 10 points that our programs could receive, I am proud to say that all of our programs have scored at least an 8 out of 10 or above. We actually had one program that a 10 out of 10 on these reviews. So I'm really happy about that. We learned a lot not only about each individual program, but about evaluation at NIOSH and where we need to go. And there are some things that we learned about in terms of really building evaluation culture. And there are some things going on at the federal level that we really need to take note of as well that would push us more towards maybe taking a pause and introducing more evaluation into our culture at NIOSH. And so the title of this presentation is really this Evaluation Turning Point. So let me put some of this of what I'm saying into context.

So at the federal level, there was actually a legislation passed at the end of 2018, the Evidence-Based Policymaking Act. And this was a bipartisan effort that actually started all the way back in 2017 when Paul Ryan and Patty Murray came together, put together legislation that created a commission for evidence-based

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polymaking. And this commission came together and put together—I can't remember if it was 21 or 22 recommendations of how to really move forward evidence-based polymaking. And based on those recommendations, those two congressfolks came together again and developed another legislation which is actually this legislation, the Evidence-Based Polymaking Act, which was signed into law 2018.

And so there's three titles in this Act. The latter two titles really deal with sharing of data and the privacy and confidentiality issues around sharing data. But the first title really deals with evaluation. And the two things that we really took away from what was in that first title was they're really calling for the development of an evaluation plan for every cabinet-level department and the establishment of an evaluation officer at every—a chief evaluation officer at every cabinet-level department. And so when OMB recently came out with guidance about how to begin implementing this new act, I was actually struck by how specific and detailed that guidance was. And as I was reading it, the other thing that struck me is they're not only saying, well, these cabinet or these department levels should be doing this but we're encouraging operating division levels—which would be in this case CDC for us—but bureaus, divisions, and those lower-lying agencies and organizations which in our case could be us, to do something like this.

And at this time, we don't have an evaluation plan per se. We don't have an evaluation officer at this time. And we also—Christy actually sent me an article that came out of the *Government Exec* yesterday and it talked about, because this law actually talks about there needs to be an assessment around the government of where are we at because some, for example, like the Department of Labor where Maryann comes from, the Small Business Administration, and a couple of others are really ahead of the game in terms of having an evaluation plan, having an evaluation officer, carrying out these evaluation studies; whereas, others are not nearly as advanced. So we really need to take an assessment of where we are. And this *Government Exec* article talked about at the very foundation being maybe you should start with developing an evaluation policy at your agency and what does that look like? And so we at NIOSH don't have that either, so that's something that we could look at. So this is really kind of something that was created bipartisanly and so I don't think it would matter what administration will come into office next. I think this is going to keep going forward.

So when we looked around NIOSH at potentially what elements we could have involved in evaluation, obviously there's our office and we have an evaluation team but it's very small. And obviously we were involved in these programs' evaluations. We do a couple of internal evaluations. Emily, as you heard, is the NORA Program Portfolio Manager. We handle Healthy People out of our office. Our program performance one-pagers, I don't know if any of you are familiar with

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those. Those come from our office. So we have a lot of things that come out from just a couple people that deal with evaluative efforts. And then the Translation Research Program. Tom Cunningham out of the Division of Science Integration leads that effort. He also is the branch chief of a branch that works in that area. I think we could do a lot more to really integrate translation science into NIOSH. And as we go on, I'll tell you a little bit more about some of the feedback we got from these panels that indicate a need for that. Our Surveillance Program, obviously if you think about evaluation, surveillance could be used not only to set a baseline if you're looking at something quantitative, but also measuring an increase or decrease in some health or safety outcome that you're looking at on the end. So they could be a key to evaluation. And then the Center for Workers' Compensation Studies, as well as the last one, the Economic Analysis piece, which Rene Pana-Cryan's office here or we have a contract with RAND where they're looking at specific cases for us on contract, all of those things are important because when we go out to employers, they obviously want to know how some of these interventions in particular are going to affect their bottom line. Well, how does this affect workers' compensation claims, absenteeism, productivity? And so having that sort of data is very important. And then we also have people in our divisions, laboratories, and offices who their primary job might not be as a program evaluator, but they do have evaluative components to their projects. So they might be developing an intervention I think with—and Dan and his colleagues, when they're doing some of their intervention work, it could build an evaluation component in there to see if what they're doing is actually effective. So some of the things that we've started to do, obviously we've done the program reviews. We've implemented the modified Contribution Analysis Approach. We've completed five of these reviews. And we've tried to improve upon—with each year when we do these reviews, we've tried to apply what we've learned from the previous year. We've also started to develop a template. We are working with Christy Spring's office for impact stories. We really feel like we missed this opportunity after the National Academy Review, we have these large evidence packages, but we never really took anything out of those packages and put them in a more palatable communication format that we could give to somebody else, as opposed to maybe expecting that there is some human being that was going to flip through two to 300 pages of material to try to find some of that impact that might have been listed in there. So we're making a more intentional, proactive effort to do that after these reviews. We've also gone out and gone to our colleagues at the American Evaluation Association or the Eastern Evaluators Research Society and given presentations. We've also written an article to try to get feedback on what we're doing and making sure that it has credibility among our fellow evaluators and see if there are

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ways that we can improve our application of contribution analysis. And then we've most recently done an evaluation capacity-building survey in the Institute to see sort of where we are, what people think about evaluation, where do we need to start building?

And we've also done some formative research. With Maryann here, we've been to talk to colleagues at the Department of Labor. They have actually an office of the Chief Evaluation Officer and we've been able to talk to them about what—in the legislation, it's called an evaluation plan, but what it actually started as is a learn agenda and that was coined that term by DOL. So we've talked to them about that and what it looks like and how they use it. We've also looked at some things online from the Small Business Administration and from USAID, who are leaders in this area, to see what they're doing.

So when we finish these reviews—and we've finished four of them—we've actually finished five, but the fifth one we've only gotten a draft report. We're still waiting on that final report to make sure before we come out and say how many recommendations and what the score was. But of the four that we've completed and we have recommendations for, we have 47 recommendations from four reviews. And the recommendations sort of run the gamut. There are some that are straightforward and they're more process oriented. For example, doing something else online, making something, putting things, and going back in time and putting some methods documents, making them 508 compliant so we can go and put those on the Web. We have recommendations in areas that NIOSH traditionally hasn't done work, so we might not have the expertise to be able to complete those recommendations or address them adequately.

We have, in healthcare in particular, that program alone got 18 recommendations and they were very broad and scattered across many subpopulations within healthcare and also many subtopics within healthcare. So it was hard to really look at the program and say, you know, how can you adequately address all of these recommendations because it would take significantly more resources. And as Dr. Howard mentioned some of the budget, when you're in a resource-constrained environment—and I think that goes for most of the federal government—the outlook of trying to figure out how you would do something like that is very challenging, especially when healthcare is one of almost 40 other programs.

And then we get into recommendations that we may have received where the ability to implement them might be beyond our control. Not because they're in new areas, but because the command structure—for example, in our Emergency Preparedness and Response, the command structure is already set up and it might be outside of our mission, Number 1; but, Number 2, to try to insert ourselves in that command structure might be a little outside of our control and also beyond our mission.

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And then we also received recommendations just that weren't necessarily as helpful maybe as we were hoping in terms of, again, in this environment and when we talk about utilization focus recommendations or an evaluation, maybe we should stop doing this, or maybe only expand in this area, or maybe you've done enough on this end of the science spectrum and basic science and we need to do more on this end in intervention, or maybe vice versa. But we got a lot in one particular case of just hit the gas and keep doing everything you're doing. And so that didn't really help as much in planning for the future. That was great in validating what we had done, which I don't want to say anything negative about that because that was great, but going forward, that didn't necessarily help us as much from that perspective.

So as I mentioned, we were kind of at this point when we started looking at all those recommendations and trying to plot out a path forward. And we thought, well, just Evaluation 101, you don't want to set out to evaluate a program if they're not in a position to really use those results. So we didn't have a really formal or thought-out implementation process. As you know, we have an intramural competition. Is that how we're going to get some of this funded? How do we make some of these decisions about—with all these recommendations? And also on our end, how can we better set up the panels to give us recommendations that might be more helpful or might be more narrow or focused in what we're really looking for?

And we've tried some of that. In a most recent review with mining, we actually proposed questions to the panel. We gave them about two per topic that was in the evidence package that would be most helpful for us to hear and we actually received feedback that was more in line with what we were hoping. Do this, don't do that, maybe think about this. And that was really helpful to the program as they were thinking about things. So that's one thing that we are trying to do a better job of too.

So it really came down to where are we going? We're sort of at this crossroads and then out in the periphery we have this federal thing going on that we have to keep in mind. So we really need a plan going forward. Do we really want to continue to do these reviews without this solid vision? And what do we need to consider about this as we're moving forward? So as I said, we have this Evidence-Based Policymaking Act that we need to think about because at some point, it will affect us. Even if it doesn't directly right now, we want to be out in front of that.

We also needed to consider the NIOSH environment. And as you can imagine, when there's big change that happens when we are taking three divisions, bringing them down to two in Cincinnati like we had, and then we're in this resource-constrained environment just like everyone else in the federal government is, and we're struggling with hiring issues just like everyone else

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in the federal government is, it's just not a cheery, happy time. And that's probably an understatement, but I think that's just the feeling across the federal government. I don't think it's in any way specific to NIOSH. So we really have to think about who would want to do anything new or take on anything new at that point?

So we've thought about diffusion of innovations and that really tells us that we have to look for the innovators and the early adopters. We don't want to put anything else on anyone else's plate that could be perceived as 'you're just putting one more negative thing that I don't want to do on my plate.' So really looking for those innovators and early adopters that have some incentive or some motivation to work with us. And then we really wanted this to be a NIOSH plan and not something coming down from on high in the Office of the Director. So obviously our office and the Office of the Director might have a coordination role to try to make some of this happen, but we really want just equal participation among the various programs to help us get this done. Because if this is going to be a culture change, we really need everyone's input. But ultimately the goal is to prepare for more programs to go under review using contribution analysis, but being able to implement the recommendations that we receive.

So although there's mixed reviews about the Government Performance and Results Act, we actually want to make it useful. And then we got creative in order to make it useful. Right now, the current GPR measure actually talks about how we will review one program every year for so many years and they will score a 7 out of 10 or better. But we're actually going to change that to work for us and to support what we want to do. So we've actually proposed this measure, which involves us developing an evaluation capacity-building plan and trying to implement some of the previous evaluation recommendations that we've received. And so essentially what we would be doing in FY20 is developing that plan. And once we've developed it, we will bring it to the Board to take a look at, to review, and get your feedback on.

And then over the next five years we would work on implementing that plan. And every year we would bring our progress, we would write a very brief report, just a couple of pages, but we would really come and give a presentation to the Board so you can hear from us what we've been doing each year and we can get in real-time your feedback to implement that feedback over the next years as we moved on.

But for the GPR purposes, we would need you to assess our progress because they do like to have their numbers. So we would need you to give us a score on a scale of 1 to 6 and we would give you that information so you could do that for us. But that's kind of what we see in terms of going forward. We really want to take a pause from doing anymore program reviews and implement some of the things that we've heard back. So your next question is probably like, well, what exactly

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do you want to do in this plan? I'm going to skip that one. So as far as the capacity-building plan, there were four things that we've really—we've heard before some of them, but really through either developing the evidence packages, through talking to the panels or in their panels reports, we really heard loud and clear because they came up in every single report.

One is implementation science. We need to do more implementation science work. And I'll share this with you. This was actually from our friends at NIH and they're also—we're not the only ones struggling in this area. And them doing more biomedical research and us being a research organization, we're not the only ones struggling with this. There is a push to actually take more of our research, get it into practice, also measuring what the impact is of that research. So we're not the only ones struggling with this issue. But some of the things we heard—and implementation science can be a really broad term but, as I mentioned earlier, we're talking about translation science.

We had a lot about contribution analysis really relies on the fact that it's great if you get somebody to adopt a NIOSH output or a NIOSH productive, but it kind of relies on that productive or that output being evidence based. And because you're asking the panel essentially, well, is it likely that what NIOSH did in this area contributed to a reduction in—and you fill in the blank, whether it's some health outcome or some safety outcome. But it's harder for them to make that judgement if the intermediate outcome or if the adoption of said intervention wasn't evidence based. Sure, it might have been adopted, but if we haven't tested it for effectiveness, it's harder for them to make that call. And we seem to be very good at testing our technologies, our engineering controls, but what we've found for doing these reviews is there's opportunities for improvement when it comes to health communications and trainings in terms of effectiveness in evaluating the effectiveness of it.

And the other piece goes a step further. And we heard repeatedly that counting downloads, counting page views, counting subscribers was a nice reach metric. It's nice to know how many people you're reaching, but then what do they do with that? So I could download something and it could sit on my desk—which I'm guilty of. I have the best intent to read it, but it just sits there and ends up in the pile and I'm like, I'll get to it, and I never get to it. So you don't know what people do with it afterwards, so we need to focus more on are people actually using it? If they are, what are they doing with it? And then the long-term vision is how does that affect that end outcome? In what way does it affect any reduction? Does it cause it—what's the association there? So we heard a lot about that, so more focus on that implementation science is something that we really want to build into the culture.

Then around intermediate outcomes is more focus on collecting them and documenting them. We had a tough time—and I think this was one of the most

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painful things during the building of the evidence package is that historically—and we've tried to improve this over the last couple years, but when a researcher completes their project, they're done with that project and they move on to the next one. They don't necessarily go back if they find out their product or their output is being used by this association or this company and document it. So we were in situations where we were going through emails, Googling, contacting people that are retired from NIOSH to what they knew so we could actually go back and document that ten years, nine years, five years after the fact. And sometimes it was, "I went to this conference and so-and-so told me it happened," and that was five years ago and we had no documented way of showing that. And evaluation is a science so it's just kind of like peer review or doing a scientist study, you have to have evident of these things.

So I always use the example if we were ever to get a Freedom of Information Act request and we didn't have anything tangible to rely on if we were ever questioned about any of these things, it becomes more difficult to put those unsubstantiated things in an evidence package because then it just becomes a he-said, she-said. So we are really trying to substantiate those things so that's something culturally would be a change for NIOSH, but we really want to start doing that.

And then three is the implementation of the program review recommendations. This is something that we're trying to do to better help our panels in getting recommendations that are maybe a little bit more focused and we've been trying to do that over the last several reviews. But also putting a structure on our end in place together to really support them in going forward and being able to implement those recommendations. And then finally, as I mentioned earlier, the communication of those intermediate outcomes and evaluation findings, we can't just leave them—although now they're bulleted, they're bolded in these evidence packages. I can tell you I for one would not go through those evidence packages again if Margaret paid me \$100.

I mean there's a lot of stuff in there, but spending a year on them, yes, I don't know that I'd go through them but I wouldn't expect anyone at this table, unless there was a specific thing that you were trying to look for. So when we're talking about trying to target a policymaker and we want them to know something because we want them to take a specific action, I would never stake any money or anything on the fact that they're going to go through that evidence package to find it. So we need to find a way to get that information to them in a more proactive way.

So when I talked a little bit earlier about innovators and early adopters, and we looked across the programs that we had, this is sort of a list of programs that we came up with. And I would ignore the column about the DLOs. But looking at these programs, the Center for Motor Vehicles, they've been really proactive in evaluation under the supportive leadership of Dawn Castillo and Stephanie Pratt,

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Dave Fosbroke, Rosa, they've just been amazing and they've actually, under just their own desire to have actually done a small, internal evaluation. And I think it's actually been posted now on the Web, their findings. So they try to do a smaller version of a contribution analysis with the resources that they had. So there's some folks that we want to get involved in this evaluation capacity-building plan. And you can see the four columns on the right are the areas that align with the topics from the previous slides that we've kind of identified that these programs want to work most in. And there'll be some overlap with other programs and, in some cases, there won't be.

Also, the public safety, the firefighter group in particular, there's a lot going on with the firefighter investigation program and a lot going on with NPPTL that would enable us to really look because they're so intervention oriented that it's really ripe to start looking at those intermediate outcomes and examining them for evaluation. And then mining has just completed their review, but they're really excited about evaluation and, in fact, with the new miner health program that they're looking at creating, one of their cores is actually evaluation. One of their three cores is evaluation. And they also have a Human Factors Branch that really has some good examples of translation and implementation sciences, as I mentioned.

Our Emergency Preparedness and Response program, a lot of energy there to really start promoting their program. Oil and Gas Extraction, they've done a lot of stuff in terms of intervention to begin to look at impacts. The Center for Maritime Safety and Health, they're going to be really focused on the collection and documentation of some of those intermediate outcomes. And then you see at the bottom are the Ag Centers. One of the things that we found during these reviews is we really need to bring our extramural program more into the fold with these reviews and looking more at intermediate outcomes and evaluation overall. So we chose to start with the Ag Centers for several reasons: 1) The centers are really pretty stable over the years in terms of being consistent in funding. And they have an evaluators' group. The Ag Center directors were supportive of evaluation. And we previously had a fellow working with the Ag Centers and so they are somewhat familiar with contribution analysis. So we figured that that was probably the best group to start with out of all of our centers. So that's where we'll be. Those are groups or programs that will be kind of involved from the beginning.

So in terms of questions for the Board, there's really two but I'm most interested in hearing your answers to the second question. But as far as audiences we should prioritize for targeting with these impact stories, the first group we've prioritized are policymakers. But beyond that, I'd be interested in hearing who you think would be next in line for targeting for impact stories. And then the next question is, from your perspective, we've identified several barriers. Obviously, resources

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is going to be a barrier. And I've talked a little bit about just the historical makeup and some cultural issues. And I'd be interested in hearing other barriers or suggestions for how we overcome even the barriers I've mentioned or other barriers, what suggestions do you have for sort of addressing those as we get started?

DR. BUNN: Excellent questions to start the discussion and excellent presentation on all that NIOSH is doing to really start the ball rolling in evaluating all of their programs. So as Amia says, pertaining to these questions, what do you think NIOSH should prioritize for targeting its impact stories beyond policymakers? Yes, Marc?

DR. SCHENKER: Marc Schenker. Well, first, I think this is really important. I grappled with this as a vice provost for outreach and engagement at the University for three years and struggled because the University reward system doesn't really recognize this. You're absolutely right, we train researchers to do etiologic studies and then they kind of drop the ball and they go on to the next study. But the reality is this is what's really important. It's the translational aspects, it's the engagement aspects. And the first thing I would say is that communications is really critical. I mean we live in an age where we're fighting to get the message out, competing with a lot of fake news and false information and everything else flooding the media. And we need to be as sophisticated as possible in how we do that and how we get that message and how we change behaviors or whatever the outcome is. Obviously, the regulator world is important when that's appropriate. But I think the effort needs attention and I'm delighted to see people thinking beyond just doing the etiologic studies to saying how much impact are we having? How much effect is there from these efforts?

DR. BUNN: Thank you. Yes, Christy?

MS. LASZCZ-DAVIS: Chris Laszcz-Davis. Listening to—I mean this is very, very good work, but I had a question for—I could respond to one of your questions here, one or two of the questions here. Have you had any recommendations to simply stop doing what NIOSH is doing?

DR. DOWNES: To stop doing program reviews?

MS. LASZCZ-DAVIS: You guys have done a fair amount of work in evaluating existing programs that you consider robust. Have any of the 47 recommendations thus far said—it's stopped? None. Okay. And my follow-up question to that would be is I know you used the term "external review." Is that external within NIOSH or external outside of NIOSH to gauge impact and the end-use impact?

DR. DOWNES: Good question. The external reviews are panels that are made up of folks external to NIOSH.

MS. LASZCZ-DAVIS: Okay.

DR. DOWNES: And we have then—essentially we have a contractor, the panels give a list of—I'm sorry, the programs give a list of three to five names for potential chairs. The contractor reaches out, gauges interest and availability, chooses one of those

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three to five people. And then once the chair is selected, the chair gets to pick the rest of the panel. We just require that they sign Conflict of Interest forms.

MS. LASZCZ-DAVIS: Okay. Then thank you for that. With regard to the second question, then, I've always been a big advocate of concept practice. If it doesn't make a difference tomorrow, we're wasting our time. So any communications, any evaluations, any community outreach, the story of potential impact and the way the lives out in the community and then the work world will change is absolutely critical. People don't move otherwise, they just don't.

DR. BUNN: Thank you, Chris. Tony, I believe you had a question as well?

DR. COX: No, I'm going to hold off. I think there's a lot of interesting technical issues about figuring out cause and effect in these evaluation programs. But that's not yet on the critical path to answering your questions, so I'll hold my fire for a while.

DR. BUNN: Okay. You might want to go into a little bit of detail about contribution versus attribution, which I think is what he's getting at.

DR. COX: Yes.

DR. DOWNES: So with contribution analysis, it kind of throws causation out the window. And that's sort of what we've tried to do. At a project level where you're doing that smaller-scale, scientific study, you might be able to measure the cause and effect. But when we're looking at these larger programs where hopefully some of that cause and effect has been demonstrated at the (inaudible @ 1:44:47) level, we really are looking at contribution because we can't do those RCT, gold-standard trials.

DR. COX: Right.

DR. DOWNES: So what we're looking at is putting together a contribute claim. And so one of our chapters might be on reducing highway fatalities—

DR. COX: For ambula—yes.

DR. DOWNES: In construction workers. And that was actually one of the chapters we put together. So we put together a package that really kind of puts out a story. And it's in the form of a logic model, so what were our inputs, our activities, our outputs, and essentially our intermediate outcomes so people adopting—external folks adopting our products. And basically then asking panel members, "Is it reasonable that, based on these impacts that we're claiming, these intermediate outcomes, that it was likely that NIOSH contributed to a reduction in highway work zone injuries to construction workers?" And it's an actual legitimate evaluation theory.

And we also recognize that there are what we call alternative explanations. So obviously OSHA and MSHA and professional organizations are working in these areas too, and they're obviously probably contributing to reductions too, so we recognize those as well. So I know that probably—we can't do the gold standard, which I think everybody would like to be able to do is that association. We're just not able to do that. So that's why we've kind of gone out to American Evaluation

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Association and some of these other groups to see what our evaluation colleagues think of this. And actually this theory is used more so in Europe and Canada than it is in the United States.

DR. BUNN: Interesting, thank you. Michael, I think you were next.

DR. BEHM: Mike Behm. That was a great presentation, thanks. I was just curious how much you work with the individual—like the NORA sector councils at all.

DR. DOWNES: We haven't worked with the NORA sector councils at all during this process. We've only worked—because it's a review of the intramural and extramural program, just the NIOSH components, so we've just worked with the intramural programs.

DR. BEHM: Okay, I was just thinking. I mean I'm just familiar with the Construction Sector Council and in terms of an audience for stories and impact and they've been very active. I don't know, I just thought that might be a nice conduit or connection.

DR. DOWNES: That might be—I think part of what we're learning here is not only do we have to do a better job of documenting these intermediate outcomes, but we have to do a better job of making our external partners—because I think they would give us that information if they knew we needed it.

PARTICIPANT: Yes.

DR. DOWNES: So making them aware that this is information that we need going forward.

DR. BEHM: And if I could just add one more thing. Maybe working with the sector councils we could make the NORA agenda that much more robust.

DR. DOWNES: Uh-huh.

DR. BUNN: Yes, yes. I think probably what Michael is also getting at is not only having them provide you with the information, but taking that information and providing back to them as the target worker population.

DR. DOWNES: Got you.

DR. BUNN: For, to—because of course if you're giving the information it's like, well, what do we get out of it and what did you, NIOSH, do with it? So I think that it's a—

DR. DOWNES: That's a good point.

DR. BUNN: Yes.

DR. DOWNES: Okay.

DR. BUNN: Grace?

DR. LEMASTERS: It would seem that it's always hard to go back retrospectively, but certainly prospectively you could build in requirements. Like any center coming in for re-funding would have to have built in these intermediate evaluation process, final evaluation process, and how did they reach the public or their stakeholders. I think that should just be built into any grants, whether it's intramural or extramural, that this is requested for them to do. And if they don't do it, then that's going to be part of the evaluation process. But I think you'll see a lot of compliance and a lot of information that you can get based upon what the centers will build in to have happen. I mean we keep funding them and we have to have deliverables and

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measurable deliverables and change, did we make a difference? If we didn't make a difference at a center, then...that's it, cut off.

DR. BUNN:

Thank you, Grace. Charles, I believe you were next.

DR. REDINGER:

Thank you. Charles Redinger. Dr. Downes, really nice presentation and great work that you all have been doing. A question I have is back when you started with—I'm not familiar with the Act that you mentioned. The whole piece within evaluation plan, is that prescriptively defined of what that is? I mean are you constrained by what's in that, or is it pretty broad?

DR. DOWNES:

It's pretty broad. And OMB just came out with some guidance about what should be in there, but even that's not extremely prescriptive. And again, at least at NIOSH, that particular act is for the Department of Health and Human Services. We as NIOSH, we do not have to come up with an evaluation plan. But we are wanting to do that to stay ahead of the game because the guidance that came out from OMB encourages the lower-level agencies under the umbrella agency to follow suit.

DR. REDINGER:

Thank you. It wasn't clear to me the extent to which part of the question is how does the agency develop its evaluation plan and then conform to the requirements of this new act? So program evaluation, as we all know, is a well-established field for decades upon decades upon decades. So now this piece of evidence-based policymaking, whether—I'm not sure how you'd say what's layered on top of whom on top of what, whether it's policymaking on top of evaluation or vice versa. But within this field, and to your question, it would seem to me that this has got to be a live topic within AEA on whether there are subgroups and all of that. This is kind of a secondary area that I dwell in as a member of AEA is the extent to which this is kind of new, this is old news, and you all are kind of—not making it up, that's not the way to say it—but that this is a creative process and there is something being evolved here, going back to Scriven and all of that, even Lincoln and whatnot, and whether the extent to which some would say, is evaluation objective or subjective? And so that's a debate for through the ages in the field. But I've got to think the AEA is a place that there's got to be good resources.

DR. DOWNES:

You're exactly right. Emily and I have gone to sessions at AEA. There's also the Center for—where's Nick Hart? I can't remember. Bipartisan-based policymaking, I think, something like that. And they've been very involved in this, putting on presentations and having different folks from different federal agencies. The former Chief Evaluation Officer at DOL who actually started learning agendas, which are really what these evaluation plans are based on, Demetra Nightingale has come and spoken several times. So we've actually listened in to those webinars and are trying to get some ideas and things from those folks too. But we're in a little bit of a unique place in that they have the ability to—I don't want to oversimplify it, but sort of count widgets and it's a little different when you're trying to evaluate research. So our methods are often more qualitative

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- than quantitative.
- DR. REDINGER: Absolutely. And just one final comment and suggestion is you might get some value out of looking in the organizational learning literature. And in particular I'm thinking of Chris Argyris and those folks who developed the arena of action research. So obviously there's different pros and cons and what some people think about action research and validity and all that, that stuff there. But a piece there is time horizon. So one is are we looking is there an impact today, tomorrow, a year, two years, whatnot? And some people would assert that the example that you gave of, yes, gosh darn, at least I downloaded and printed the articles. They're in a stack. And it may be six months. But depending on perspective, some might say that's a success or not. So I think that's (inaudible @ 1:54:32).
- DR. DOWNES: Okay.
- DR. BUNN: Thank you. Cristina, I think you had your hand up at one time?
- DR. DEMIAN: No, I did not.
- DR. BUNN: Oh, okay. Oh, yes?
- DR. LERMAN: Steve Lerman. If I understood correctly, I think what I'm about to say is actually in support of a comment you made in response to Tony's observation. So the general thought is, the best is the enemy of the good. And with that in mind, I think that although in an ideal world you want to know how many lives you've saved, how many illnesses you've prevented, and how many quality-of-life years you've preserved.
- DR. REDINGER: Good luck with that.
- DR. LERMAN: And I think if you focus on a couple of the upstream things, you'd be doing a great job. What you're probably already doing reasonably well is to make sure that your recommendations, programs and science is evidence based. You could probably say been there, done that. And then the next is are they truly getting implemented? I mean a step beyond downloading it and putting it on your desk, but actually implementing the programs. Roger and I were at a NIOSH conference earlier this month on fatigue risk management and there was a recurrent theme that despite the fact that the science has been out there for a long time, very few companies are implementing robust fatigue risk management programs. And if you get to that, if you say NIOSH has good data on what a good fatigue risk management program has, for instance, and we know that major organizations, not-for-profit companies, firefighting organization, who, whatever, employers are implementing it, that would be huge. And to try to go beyond that, put too much effort in going further downstream probably would distract from accomplishing that. So I would, for the foreseeable future, focus on going that far downstream and no further.
- DR. DOWNES: We actually had, with the Mining Program, Emily Haas come in. And she's the rock star over at the Pittsburgh Research Mining Division. And she had actually

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teamed up with some of the engineers there and done some research on exposure to dust. And all it really kind of took was she had some miners looking at—they were just coming out and she had video of it and going like this with her gloves. And they didn't even realize that that was bringing that dust up into their face. When she sat them down and they were looking at this video and they were seeing the exposure, it was like—or the clothing booth that you could go in and get all the dust off your clothes and it was like, well, why isn't this being used? Like it's a good science, it whether. And it was in the end all about where the booth was placed and why it wasn't getting used. So it's stuff like that where it's good science, it's great technology, but all it was the placement of the booth. But it took someone with a different scientific background to come and figure that out. So you're absolutely right, looking at things that are out there but might not be getting the uptake that you would expect and why is that happening? And that's really what we're hoping with the translation science, why isn't that translation happening? So thank you for your comment.

DR. LERMAN:

Christ, thank you.

DR. BUNN:

Any other comments? Yes, Jessica?

DR. GRAHAM:

Jessica Graham. Building off of what Michael was saying about going to the end users, the folks who are going to be impacted with your work, I think after watching how different industries will try to influence policy, if you're able to talk about the issue and they're buying into the issue and they're looking for a solution and you can offer them a solution with the work you've done, I think publications with multiple coauthors from different organizations that have that same goal are very useful in the field of actually pushing the impact, getting an idea as to like who you're impacting. And then I've also seen industries send out surveys to say, okay, who is using this guidance and is it working for you and do you see any other alternatives to this guidance? Unfortunately, it was pretty labor intensive to go out to trade organizations to see what they're doing, but that seems to be what I've seen other industries doing to get a pulse on whether their work has actually been accepted in the organizations.

DR. BUNN:

Thank you. Tony?

DR. COX:

Thanks. Tony Cox. I think this approach is an interesting and useful partial step. So I think contribution analysis is kind of cool if you're trying to tell a practical story that most people would buy into. It might be right or it might be wrong. So that invites the question of once you have a good story, then there's a lot of other techniques for using observational data to strengthen, or weaken, as the case might be, a plausible causal story.

It might be worth thinking about taking the best stories and taking a second step, which is to use methods for quantification of impact using observational data. There's sort of a quantitative methodology that might complement the contribution analysis. But the contribution analysis should come first because you don't even

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know if whether you have an interesting story until you've done the contribution analysis.

To answer your questions of, well, what audiences should we go to and what barriers are all there, and so forth. It seems to me, maybe one good heuristic would be to say: Can we show in certain areas that the benefits that NIOSH is creating greatly outweigh the costs, because we're really having an effect.

So I read an article recently in the nuclear industry saying the nuclear regulatory commission had required all these expensive probabilistic risk assessments that cost a half a billion bucks apiece. I'm not saying that it's burdensome, I'm not saying it isn't, but it's, yeah, something that utilities, the nuclear power plants had to go through. So what? So what was the impact of all this burden?

So somebody did an evaluation, looking at the number of disruptions in that, safety-related disruptions the operations of nuclear power plants before they submitted their probabilistic risk assessments afterwards. And lo and behold, there's a substantial reduction in disruptions after they had submitted their probabilistic risk assessments. It was significant. And it wasn't because there was a historical trend, it was because they submitted their assessments at different times.

The punchline for this was actually the utilities made a lot more money by doing these probabilistic risk assessments, by reducing the number of safety-related disruptions than they spent on these estimates themselves, so it was clearly a good idea.

That story—that's a cool story, right? I mean, it shows something that's kind of a win/win for everyone. That story was then driven home with quantitative analysis. It seems to me that could be kind of a role model for both thinking about who we want to tell stories to. I'd say people who need to be persuaded that what we're doing actually is really worthwhile from multiple points of view.

And then for barriers, I don't know whether this was a barrier but I'll suggest that the ability of the human mind to put together great stories and see patterns and causation where it doesn't exist is a threat as well as a benefit. If your story is right, great. But all the time, we confabulate who we put together stories, "We did this and that happened and it's because of this."

So I don't know whether other people are as uptight about causation as I am, but I would say for Question 2 about barriers is that technically, there is a lot of great program evaluation methodology stemming largely from the 1970s forward on quasi-experimental design and analysis of observational data that could take the next step to show that the plausible story is, in fact, true. And therefore, the stories that look best for the CAs look exciting for the stories that you want to tell. It might be worth taking a select subset of those and going one step further to apply these other observational data techniques. So, those are some thoughts on your question.

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- DR. GRAHAM: I think that's a valid point, and I think we need to make sure—because what you're saying, I believe, is that those would apply at what we call our project level. And I think, because at the program level, we have all these different projects and all these things feed in.
- DR. COX: That's right. That's right. I think you're right, yes.
- DR. GRAHAM: Because we do do—we have had some cases where we did have that data, that cause and effect, where a project did have...they had a baseline and then they had the measurement at the end or six months or a year later to be able to show. So where we had that, we did include that in the evidence package, but it was related on a very small scale to maybe a company or two companies.
- DR. COX: Right.
- DR. GRAHAM: So we do have that but maybe in hindsight or going forward, what you're saying, if we have a few of those that seem like they're really good cases, maybe we should go back on that particular...or those particular projects and do—
- DR. COX: Yeah, I mean, the point of doing it is not—so what I'm thinking is, how can you have more impact with your impact assessments, right? And if there is a question of, well, do we really have that effect, then there's more tricks in the bag to pull out and apply. But if it was already happy, we've already bought into it—and it's true that behavior has changed and you can measure that—then there's no need to do it. So I'm really looking at trying to overcome a potential barrier by saying we have a lot of tricks in those bags. We're very convincing with observational data, given if we put enough elbow grease into it, and if we're lucky, that's it.
- DR. GRAHAM: I like it.
- DR. COX: Yeah, okay. And you're right, I do tend to think, thank you, in terms of project level as opposed to program level. And absolutely, I understand it's the program level that really matters, so thanks.
- DR. BUNN: Thank you. Sorry, I just have a couple comments myself—Terry Bunn—just as far as the audience is to prioritize. Kind of prepping up and bringing together what, you know, everyone's mentioned here, are the target worker populations themselves for the programs, the standards and regulatory boards that are affected, are the main target populations as well. And then you brought up the question of evidence-based. I would also like to, you know, maybe as a board member, you know, kind of advocate not just for the evidence-based but informing the evidence. So it's evidence-informed programs, and then what are some promising practices to build more evidence in the end. And last, when you're—we're looking at the potential barriers and how to overcome them, I guess my first thing would be is, not everyone may think of themselves as being an evaluator. But in the end, all of the current staff members could actually contribute to the evaluation. So first step in that might be training—having training sessions that involve all of the relevant staff members in those programs so that they could have a piece of that evaluation. And then last, as far as being—also assessing the

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impact, and stuff like that, is to think about if there is an opportunity for cost benefit analysis associated with a program, or cost effectiveness analysis.

DR. GRAHAM:

Thank you.

DR. BUNN:

Do I have any questions from the phone? All right, thank you. We are... What time is it? Okay, if we could take just a very short seven-minute break until about 11:50? 10:50. Sorry, that would be great.

[Break.]

BULLYING, HARASSMENT, AND PHYSICAL WORKPLACE VIOLENCE: MAGNITUDE, PREVENTION STRATEGIES, AND CURRENT NIOSH RESEARCH

DR. GRUBB:

Thanks for having us here. So as you said, we're going to talk about workplace bullying, harassment, and physical violence, sort of the magnitude of prevention strategy in current NIOSH research. So today, just as an overview, we're going to give a little bit of background and some definitions. What's the extent and the magnitude of the problem? Some overview of a previous research that Dan's going to cover, and then what some of the current research priorities are for NIOSH in this area. So to define workplace violence, it's violent acts including physical assault and threats of assault that are directed by persons at work or on duty. Physical assaults can range from anything from slapping, hitting, biting, pinching, beating, rape, and homicide. And the component is nonphysical assaults, and these include things like verbal threats, verbal or electronic harassment, bullying, what you might call psychological violence, and emotional abuse. And we'll talk more about it as we go on.

So in 2001, Iowa came up with a typology for workplace violence, a means of categorizing. So we talk about four different types of workplace violence. Type 1 is criminal intent. And that, in this case, the person engaging it or a perpetrator doesn't have a legitimate relationship with the business. It usually comes in the commission of a crime such as a robbery. Type 2 is a customer/client, where the person has a legitimate relationship with the business. So these would be people, for example, customers, patients, students, clients, inmates, that type of thing. Type 3 is worker-on-worker violence. In this case, the perpetrator, usually an employee, or can be a past employee for the company, who attacks or threatens or otherwise harasses another employee in the workplace. Type 4 is an intimate partner violence, and in this instance, the person doesn't have a relationship with the business, per se, but they have a personal relationship with an employee. So I'm going to tag out for Dan to cover the early days of workplace violence research at NIOSH.

DR. HARTLEY:

Okay, thanks Paula. So looking back into the 1990s when NIOSH recognized that workplace violence was indeed a problem and needed further research, at the time, we used the National Traumatic Occupational Fatalities database, the NTOF database, which was a death certificate-based recording system that did include homicides. With that data, there were some papers that were published, and then

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in 1992 the NIOSH report: *Homicide in U.S. Workplaces: A Strategy for Prevention and Research*. Following year with the NIOSH alert: *Request for Assistance in Preventing Homicide in the Workplace*. And then in 1996, the Current Intelligence Bulletin. And the risk factors and prevention strategies in that bulletin are still applicable today.

At the same time that NIOSH was doing the research with the NTOF database, the Bureau of Labor Statistics was developing a more comprehensive multi-source recording system called the Census of Fatal Occupational Injuries. It includes death certificates, OSHA logs, and newspaper reports as some of the sources that they use for the data. This became the standard that we use. So the NTOF database did go away so we weren't duplicating efforts within the government, and BLS's CFOI became the standard that we use.

If you notice, in 1994, that was when in BLS data, 1080 homicides were committed in the workplace. So that was the high. That number has been dropping off through the years, and you will notice over the last decade, we have averaged between 400 and 500 homicides in the workplace.

And this graphic indicates that 75 percent of those are robbery-associated violence. So those are the ones where you have a single convenience store clerk, or taxicab driver, or somebody like that who is killed in the workplace. Ten percent of the incidents in the workplace are worker-on-worker, or violence by coworkers or former coworkers. And these are the ones that a lot of times do get the media coverage, because there are some incidents that have more than one fatality. But 75 percent, if you remember are the single person being killed, usually a convenience store clerk or a taxi driver.

And then seven percent is the average for customer/client and intimate partner as well. Intimate partner violence is when it does spill over into the workplace. So sometimes, those are a multiple-fatality incident as well, a homicide/suicide thing. And sometimes the people are employees at the workplace.

So when we look at some of the occupations, the criminal intent, retail workers have the highest frequency of homicides, and taxicab drivers have the highest rate. And then customer/client, law enforcement and corrections officers have the highest incidents of workplace violence. And then worker-on-worker and intimate partner violence occur in all occupations, so there is really no pattern to this other than with the intimate partner violence, a lot of times it's the occupations where there are more women who are working, such as healthcare and then education. Our early research at NIOSH focusing on fatalities and homicides in the workplace looked at crime prevention through environmental design accepted principles. These are, a lot of them are very low-cost or no-cost, and so they can be implemented by the major chains. But for some reasons mom and pops, the smaller stores, don't tend to comply with any of the municipality requirements based on these. So some of the things as examples, signage and lighting within

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the establishments. So if you notice, the top picture is a major chain operation; hardly anything in the windows and very good lighting. Below you have a mom and pop with almost all the windows blocked and very poor lighting.

So, insurance companies have been offering some incentives to smaller mom and pops to try and get them to adopt some of these easy no-cost or low-cost prevention strategies.

And now when we look at non-fatal, you'll notice under "criminal intent," we have retail workers and taxicab drivers again, suffering not-fatal as well as fatal workplace violence. When we look at customer/client, this is where we see a couple of different occupations pop up. Law enforcement drops down to third, and then we have healthcare workers and education workers. And again, worker-on-worker and intimate partner violence are in all occupations.

One thing to note with the healthcare workers and the customer/client is that they count for around 13 percent of the overall non-institutionalized workforce in the U.S., but over 60 percent of the non-fatal workplace violence incidents are to healthcare workers. So with that in mind, NIOSH worked with some grantees and some external partners, and our internal workplace violence prevention researchers to develop an online course for the prevention of violence against nurses. This was released in 2013, and here are the statistics related to the usage of that course through June 30 of this year. I will tell you the top number. We have over 40,000 registrants now, and we're still averaging 88 percent on completion rates. So you can see how many CMEs we have given out over the past six years for people completing the course.

We incorporated an evaluation to the course, and of the participants taking the course in order to get their CMEs, they needed to complete the evaluations, so we had a 100 percent response rate on this for those completing the course. Ninety-five percent of those agreed or strongly agreed that upon completing the course, they were able to meet these performance-based objectives and identifying risk factors for workplace violence, recognizing behavioral or warning signs, and then employing communication and teamwork skills to prevent and manage these in the workplace, and identifying appropriate resources to support injured nurses if a workplace violence incident does happen in the workplace.

So when we look at non-fatal violence at NIOSH and workplace violence research in general, there are three major sources we go to: the Bureau of Justice Statistics National Crime Victimization Survey, the NCVS, which is a nationally representative sample of 60,000 households with approximately 80,000 respondents in the US on an annual basis. The thing about the NCVS is you do not have to be injured to be someone who is reported in their data. So we have some non-injury incidents and injury incidents coming from the NCVS. The Bureau of Labor Statistics collects the survey of occupational injuries and illnesses, which is an establishment base, so they are going to the employers and

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the state and local government establishments to get their data. And to get incorporated in this database, you have to have missed at least one full day of work to be counted as one of their statistics. And then the Consumer Product Safety Commission, and the National Electronic Injury Surveillance Occupational Supplement, NEISS-WORK, NIOSH actually gets the raw data from this database. And this a representative sample of emergency departments in the United States. So it doesn't have to involve a consumer product, but it will be someone who reported to the emergency department with an injury. So with all of those databases, and all of those websites that you have to go through to get those, at NIOSH, we proposed with Bureau of Justice Statistics and Bureau of Labor Statistics to put together a document that would incorporate all of the latest data from each of the databases, and that way it's a one-source, you go to this page, you get it, and you don't have to search through chart after chart and table after table on everyone's websites. So for the fatal—of course we're using the census fatal occupational injuries. And then we have the NCVS, the BLS, SOI and NEISS-WORK. We have put together the first document in this series of reports, and it's for 2012 to 2016. It has been reviewed by external stakeholders, as well as internal people at every one of the agencies listed, and now it is currently at the Bureau of Justice Statistics for a final review by their director. It has been there for quite a while now, and we're not sure when it will be published, but we're expecting, hopefully within the next several months to—who knows? It's actually been there for almost a year now. So we are working, we continually check with BJS to see what the status is. We're not sure what's going on. Anyway, once we get that out, the hope is that every three to five years, we can update that reports, and that will keep everything current for all the users. Some of the things with the grantees and the partners through the years—you will notice that healthcare and social assistance has gotten quite a bit of attention for surveillance and intervention research in the grants; retail workers as well. There was some that were redundant with law enforcement and intimate partner violence, and now with education workers as well. So we're trying to cover the industries and occupations that have the highest numbers of fatal and non-fatal workplace violence. Some of the impact of these, about 250 scientific articles and publications recorded by NIOSH; and research and influenced employer practices, state and municipal regulations, and OSHA guidelines. OSHA came out with guidelines for retail workers, taxicab drivers, and health care and social services, all influenced by NIOSH research and NIOSH grantee research. So on a more personal note, this is out of our online course. We have what we call the Nurses' Voices, which introduce each unit of the course. And so you'll notice, these are testimonials from nurses who have experienced workplace violence. Liz, on top, talks about the fact that she can't open doorknobs and that

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she can't grip a steering wheel from the physical violence that she had when someone crushed her hand. And then you have Sheila and Ellen who talk about PTSD from seeing and witnessing some of their coworkers being victims of workplace violence. And then Marsha, she was held hostage, and now she has PTSD symptoms to where she can't sleep at night. And so she constantly feels that she needs to check the doors in her house to see if they're locked. So these are some of the things that psychologically and physically are happening to our workers in the United States. And I'm going to turn it back to Paula so she can talk about the psychological violence.

PARTICIPANT: How does your hand get crushed by helping a patient?

PARTICIPANT: In a door?

PARTICIPANT: With a door, with a wheelchair, with all sorts of things.

PARTICIPANT: So it's not by the patient, it's by some...

DR. HARTLEY: The patient slammed her hand in a door, yes.

DR. GRUBB: Thanks, Dan. I'm going to shift focus just a little bit and talk about more subtle forms of workplace violence. I'm going to talk about—basically, you'll see a lot of terms used, and you might think these are umbrella terms as workplace psychological aggression. But you will also see in the literature incivility, mistreatment, bullying, horizontal hostility, lateral violence, and disruptive behavior often used in healthcare; lateral and horizontal meaning coworker to coworker. Disruptive behavior is what happens usually when a physician engages in the behaviors; and just counterproductive work behavior is another very global term. So you see a lot of terms used in the literature, so it makes it a little bit difficult to keep up on what's going. So you'll have a really broad range of behaviors that are described.

So something like incivility, which you might think of as just generally being rude or disrespectful in the workplace, all the way to someone that has encountered workplace bullying. So in terms of finding out workplace bullying, again, it's a very broad range of behaviors; undermining, humiliating, and threatening verbal or nonverbal behaviors. It could be directed by one or more than one person in the workplace towards another coworker. It creates a risk to the safety and the health of employees, and it really generates quite a bit of costs for organizations. It is something that is worldwide, and it appears to be present in most occupational sectors across most countries.

PARTICIPANT: Is it equally worldwide? I mean, do you have statistics? When you say "worldwide," are some countries worse than others?

DR. GRUBB: Yes. It's different in different countries. And we can talk about that a little bit. So you will see different aspects emerge in different countries. There's something called the Negative Acts Questionnaire, which is used quite a bit in different countries, and has been translated into different languages. And you will see different profiles emerge from different countries. So yes, to answer the question,

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in some questions, it is worse. A lot will depend on the industry as well as some other things, on a national basis.

In terms of the defining features of bullying make it, we talk about it differently in terms of incivility. Bullying is something that is repetitive and patterned, normally. And it occurs over a period of time. It's obviously unwanted and unsolicited by the target. It violates the standard of appropriate conduct towards other people in the workplace. And the exposure, whether it's intentional or unintentional, causes harm to the target. A lot of times, a power imbalance will be described in the bullying relationship. And bear in mind there are formal and informal sorts of power in the workplace that may come into play.

So some example behaviors: insulting or offensive remarks, ridiculing, spreading gossip or rumors, being excluded at work, yelled or shouted at, throwing or hitting objects, invading someone's personal space. And also things— withholding information that someone needs to do their job can be considered bullying. So a lot of times you hear now, you will also hear things called microaggressions, that is another term that will come up.

So some of the sources of information that—so we know what we know about this. We have national surveys; for example, the Quality of Work Life Survey that was mentioned earlier; General Social Survey; National Organization Survey, which is an establishment-level survey; a National Health Interview Survey. And then we also get quite a bit from international surveys and partnerships within our national researchers. So the Negative Acts Questionnaire; the European Working Conditions Survey; and also the (Essilor @ 2.28.04) Survey, which is a European survey also on the establishment level.

There are also organizational surveys and interviews that have been done. For example, we did some secondary analyses with the Northwestern National Life Insurance Survey. And there have been workplace studies, and also expert meetings bringing people together who are working in this area. So this is how we have the information that we have.

So in terms in talking about the prevalence of workplace bullying, it's going to depend on really how you measure—how you ask the question is what it's going to depend on. So five to fifteen percent of the workforce globally report having been bullied in the past twelve months. In the US, it's a little bit broader; you'll see seven to 59 percent of workers experiencing bullying. And again, it really depends on the survey and how the questions are asked. So in some of the European surveys that we have just talked about, since they have built into their survey the definition has to be something very persistent and very frequent that has gone on for some amount of time, the prevalence isn't as broad, because it's a much narrower definition.

So for example, in some of the survey NIOSH has been involved in, the NHIS, the prevalence is around seven percent, and in the Quality of Work Life, around nine

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percent. So you will see most commonly somewhere around 13 percent in the United States in general, including our surveys and other surveys. But again, it's very broad, and also because it will depend on what industry and the demographics of the industry as well.

Now the reason I bring up the last number down there, 12 percent, workers have witnessed bullying behaviors, and just like Dan talked about other people, nurses witnessing violence, this too, even though you're not the target of bullying, witnessing these acts can often, are often reported as making the stress levels be just as high, even when you control for other factors. It's very difficult for people who witness these behaviors on a regular basis as well.

So who is at risk? This is a little bit different than what we talked about with physical violence. There are some similarities. There are some at-risk occupations. If it is a service industry, public safety; of course corrections officers, law enforcement; health care, it's very prevalent in nursing; and in retail is another place where you will see workplace bullying and harassment occur. And you will also see some indication that some ethnicities or racial groups experiencing more bullying than other groups. And also men and women are both likely to be bullied in the workplace. You will see more of a tendency towards same-sex bullying most of the time. Supervisors and non-supervisors can be bullies. So there's a phenomenon that we talk about called "upward bullying," we talk about power differential where subordinates may actually withhold things and bully their supervisors.

Older and younger workers are more at risk, depending on the study. Recent NIOSH work that Jim Grosch and I have worked on, there is also some other to indicate younger workers are typically more at risk for being bullied. There was some idea that maybe older workers have more coping mechanisms and they are not likely to consider themselves bullied. They have a whole array of other things from their experience that they may be able to bring into play.

Who's doing it? Also a little bit different from what we have talked about with physical violence, it's most likely to be coworkers, managers, and supervisors; then possibly clients, customers, or patients, or subordinates. But coworker and manager/supervisors are going to be the primary actors in the aggression. Some of the risk factors include job insecurity or they have insecure employment; there are poor relations between management and employees; low levels of supervisor and coworker support. Understaffing plays a very strong role, particularly in health care. High work demands, and when people have role conflict and ambiguity, there is room for other kinds of conflicts. A poor work climate; and then there are some organizational cultures where bullying and harassment tend to flourish. Healthcare is one type of environment for various reasons where the culture seems to be particularly fertile.

So the impact of workplace bullying and harassment on the individual, we'll see,

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obviously, increases in their job stress; higher reports of burnout; and compassion fatigue. In fact, nurses will talk about leaving the profession altogether. And so you are getting a thing where you have a workforce that is not going to work along in that profession as it should, unless the economy is bad, and then sometimes people return to it. Symptoms are anxiety, depression, post-traumatic stress, headaches, sleep problems, musculoskeletal pains, just a whole hosts of impacts on the individual.

In terms of the organization, it costs the organization as well because you're going to have turnover and intent to leave. Like I said, people leaving the profession before they should; sick leave is increased; reduced commitment to doing their job; reduced satisfaction; lower productivity; and then reduced customer satisfaction, which is one thing in health care that they will notice are the customer reports. And then you have costs in terms of legal actions or even citizen complaints.

So to talk about some of the products that we jointly have that NIOSH has produced, we have NIOSH guidance documents and Dan talked about not just the one but some other ones as well. And also we have topic web pages, journal articles, and others. You will see the journals represented up there, off to the right. We have done a lot of presentations at scientific conferences and professional associations. And there's a training curriculum; obviously the online course that Dan talked about, and we have also done several webinars on the topic.

So Dan, I think it's back to you.

DR. HARTLEY:

So NIOSH continues to make workplace violence prevention a priority, as evidenced by this summary of the strategic planned goals. Research-related surveillance intervention for health care workers continues to be a priority, as done intervention and translation research to prevent violence towards first responders such as law enforcement and emergency medical workers. And intervention research is also a goal in preventing bullying and directed towards health care and social service workers. And so with that, today we have brought a few questions for the Board, and maybe we will just go ahead and start with question number one, and see what kind of responses we get and work our ways through.

So what are some key partnerships that NIOSH could pursue in order to conduct intervention and translation research in workplace violence?

DR. GRUBB:

Have you contacted the ANA and AMA to engage their...?

DR. HARTLEY:

We have, and we will continue to do that in the future with the online course. The ANA, the ENA, the ALH, AOHP, and several others.

DR. BUNN:

I was going to say, can we spell out some of these acronyms?

DR. HARTLEY:

American Medical Association, yes we have. The American Medical Association, American Nurses Association, the Emergency Nurses Association. I have a slide that is filled with partners that we have for the online course.

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DR. GRUBB: And is there a CE given with these online courses, continuing education points?

DR. HARTLEY: Yes.

DR. GRUBB: For all those groups?

DR. HARTLEY: No. We have them for nurses, and we have them for the health scientists.

PARTICIPANT: The CME needs, the medical group needs continuing education to get those points. If it's free, especially.

DR. HARTLEY: And it is a free course. It is free. I am trying to remember, there was some kind of a glitch when we did try to do that before.

PARTICIPANT: There's always glitches with CME.

DR. HARTLEY: We will look into that again.

DR. BUNN: Marc?

DR. SCHENKER: Any of these bilingual, or done in other languages?

DR. HARTLEY: Currently, no. We do have a health care pamphlet that is out that is in Spanish, and that is the only one I am aware of? Do you know of any others?

PARTICIPANT: No.

DR. HARTLEY: That's the only one I am aware of. Do you know of any others?

DR. GRUBB: No.

DR. HARTLEY: That's the only one I know of so far.

DR. SCHENKER: I think that that should be a priority task.

DR. HARTLEY: What languages would you –

DR. SCHENKER: I work with immigrant Latino workers, and I am thinking about the sexual harassment in farmworkers is a big issue. That is just one example. But there are a lot of industries with a large number of non-English speakers, or non-English-fluent speakers. And I think reaching that population would be important.

PARTICIPANT: Home healthcare workers.

DR. BUNN: Michael?

DR. BEHM: Mike Behm. Thanks for this presentation. It was great. I learned a lot. It seems to me like the bully aspect is particularly interesting and hard to uncover and hard to really talk about, from all sides, I think. So I was wondering if you have reached out to other organizations, like maybe the Society for Human Resource Management, who may have some interest in these areas and may benefit from your expertise or may have stories or data.

DR. GRUBB: So we have talked with Society of Human Resource Management, and also we have had some dealings with the Academy of Management as to getting into that.

DR. BEHM: I was just curious, too, about if you've looked at social media and bullying on social media and how that may be occupationally-related or work-related.

DR. HARTLEY: That has come up in a couple of studies. One, in particular, that I can think of it was done with education workers.

DR. BEHM: Yes. You know, I think particularly, news, or as you say, Mark, fake news, a story gets out there, and someone reads the headline, but yet someone may have said something but either it doesn't get read or it gets taken out of context and then

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- that person become this target from people that they don't even know because they might have someone who has shared a news story. I think that's an interesting phenomenon.
- DR. GRUBB: We have an upcoming conference on work stress and health in November, and what I am recalling is some of the abstracts that were submitted, there was somebody that who was talking very much about this aspect of this sort of shared news and how people are getting the news about and who is reading it and sort of what you were saying, people becoming a target of something. I think they actually have a study they've been trying to do.
- DR. BEHM: Perhaps you could share more details. I could follow up.
- DR. GRUBB: I will know more in November, I guess.
- DR. BUNN: Chris?
- MS. LASZCZ-DAVIS: Chris Laszcz-Davis. This is a tough issue, because while the impact evidences itself in the workplace, its root causes and its risk factors really originate at home, in the communities, in the schools, in the cultures. So while we within NIOSH provide guidelines to workers who are impacted by this, is there any intersection, or any plans for intervention with teachers and families and communities? That's where it's got to start, otherwise we're just tracking numbers. Just a thought for consideration.
- DR. HARTLEY: So sort of a total worker health/life...
- MS. LASZCZ-DAVIS: Totally. It isn't going to turn around any other way.
- DR. BUNN: I think Charles was next.
- DR. REDINGER: Just to build on it, I was intrigued, in reading the materials for today, of that link between the opioid initiative and total worker health. And so apropos of what Chris was pointing to, I was thinking are there pieces from total worker health, those principles, potentially applicable here?
- DR. BUNN: Michael? Do you want to –
- DR. BEHM: I just wanted to piggyback off of Chris here. That sparked a thought in terms of maybe partnering with the Young Worker Initiative. It's going to start with, I think, the youth changing their perspectives and educating older people.
- DR. BUNN: Tony?
- DR. COX: Tony Cox. A couple of thoughts. One is there are obviously some occupations that are more prone to workplace violence. I think teachers at multiple levels, being an outstanding example. Another observation drawing on accounts that I have heard from teachers that I know is that complaints about bullying can be used as a form of bullying. So it's something to be aware of. Folks with real-world experience will know probably what I'm talking about.
- DR. BUNN: Ron?
- DR. STOUT: A couple of things that Chris brought up—we often identify the what, the bullying; we don't identify the why. And in some areas of social and public health, what's been emerging is this concept of trauma-informed care, and starting to impact the

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why. So I am wondering if we're looking at some of those aspects of why some of this is happening. And then what Tony just shared—at my former place of employment, it was very interesting. You have a question here about what types of communications. I think HR leading others, could use some help on how to manage employees with problems. Because often the HR manager becomes the problem when they're trying to manage that.

DR. BUNN: Good suggestion. Any other? Yes, Jessica?

DR. GRAHAM: Jessica Graham. At least in our group, EHS reports up to Legal. So I think if there's a good occupational legal organization, this would be important to put in front of them, because companies aren't really proactively pursuing this type of information. So it would have to almost be posed in a way that the benefits would be at a baseline as to whether it's an issue in the organization, and then the ability to point to NIOSH for guidance to help them improve those metrics.

DR. BUNN: Yeah, I think the companies want the exposure. They don't want negative press. So I think you might have to be strategic about who you ask –

DR. GRAHAM: What are the benefits?

DR. BUNN: Right.

DR. GRAHAM: But there's also an aspect of it. If an employee gets that kind of survey, they are going to all of a sudden feel like their company is caring about their environment. So there's a couple different benefits.

DR. BUNN: Grace?

DR. LEMASTERS: To go to the nonstandard employment arrangements, I have taken a lot of Lyft and Uber rides and hear numerous stories from what has gone on, particularly with people who are inebriated and had too much to drink. And these folks, not just taxi drivers, and this new group of Lyft and Uber are harassed and abused a lot. And some of them really restrict their hours of work because of the fear of getting inebriated clients.

DR. BUNN: Have you guys done a taxi driver?

DR. HARTLEY: Yes, I think Cammie Chaumont Menendez within the Division of Safety Research is looking into the Lyft and Uber drivers as well as taxi drivers. So there is some research going on with that, not just with the physical violence and also with the harassment and everything.

DR. LEMASTERS: And that would be a good outreach for educational. How do you deal with that situation? How do they intervene?

DR. HARTLEY: Yeah, because with the taxicab driver, she has the International Association of Taxicab Regulators, the IATR, that she works with. But then when you get into the Lyft and Ubers, it's kind of like with convenience stores—how do you reach the mom and pops? How do you get the smaller organizations? Lyft and Uber you go through the main organization, but she's trying to get the main organizations through the drivers.

DR. GRUBB: With some of the retail, we have worked with community-based organizations to

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try and get the word out that way about retail violence in certain communities. I don't know how it would with Lyft and Uber. I don't know how it would be contacted. That might be something to think about.

DR. BUNN:

Mary.

MS. DOYLE:

Mary Doyle. Another key partnership might be the EAP programs, the Employee Assistance Programs, because they are in many of the workplaces. They may be the first person that's in contact with an employee who's being bullied.

DR. DEMIAN:

Christina Demian. So in terms of partnership you have a product, this training and this video. And this is my line of thought. I kind of overlap mentally a lot of risk factors there, and you get a worker group called home health care, or home health aides, and they are notoriously exposed to a lot of harassment, bullying, and physical violence. So every state may be different, but if you go down the path of their certification, and you have an Office of Regulating Professions, or Department of Health, or some other state-based organization, or regulatory institution, you can reach out to them, offer a product that doesn't cost them anything, then transfer or to require as part of the certification process to get this training. It's very far overreaching, if you will, a very early step into prevention, if you think about it.

DR. GRUBB:

So that would be the state boards of nursing?

DR. DEMIAN:

Yes. The state boards of nursing, or I don't know who regulates –

DR. GRUBB:

CNAs are state boards.

DR. DEMIAN:

CNA, home health aide, companion care, these are more nontraditional work arrangements or job titles which are suitable for this.

DR. BUNN:

Patrick.

MR. MORRISON:

Patrick Morrison. Just recently, a paramedic assault and EMS assault, it's a lot larger than we thought. We just did a pretty big presentation on it at our last health and safety conference. And I never thought that we would be teaching EMS defense, lessons on how to defend yourself. It really helped to do a size-up. A lot of times you go into a scene, and you're just taking care of the patient; you're not looking at what's around you. We have had a couple of really serious assaults with weapons and knives from Philly. And it really taught us a lesson, and we are starting to get requests for these classes to start to educate the EMS on assault. On the bullying too—there's more and more of this conversation coming up, I think, in the newspapers and everything, and the unintended consequences of what happens to somebody who's bullying and what they do to themselves after they have been bullied for such a long time. For us in the fire service and the sector, there is really a lot about what is acceptable and not acceptable and tolerance level and the leadership. And you can see it down in the supervisory levels that you could have different stations that you could have this event, and you could follow the pack. And what was, what we could consider acceptable in some cases, that they would just allow some of this, thinking this is just good-

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hearted humor to harassment too bullying; in some cases what is normalized, we call it normalization of deviance, but when it's normalized, then it's accepted and that persists, and then the consequences in the workplace have to come too from the leadership and the organization. This is coming up more and more in the fire service.

DR. HARTLEY: You'll be happy to know that we are working on an additional unit to the online course, that is for EMS, first responders, anyone who responds that is not armed. So we didn't do police officers. So we did EMS, paramedics, fire fighters. In one of the videos that we did for that particular course, they go to a scene where somebody becomes violent in the back of the ambulance. And that is dealt with, and everything is taken care of. Then they go back and they get bullied by their supervisor. And then it says, "What did you do to cause this person to attack you in the back of the ambulance?" So we went through the workplace violence from a patient and from a supervisor on the EMS workers. So that's going to be coming out. We have it right now with our computer programmer, and when we get that back, we will put that in the NIOSH review process. And hopefully within six months or so we will have that course out.

We will also have that with home health care workers. It's about the same stage in development. So those are with the computer programmer to get them from our PowerPoint slides into something that can be used online and actually on mobile devices. So anything that has an internet connection will be able to take these courses. And it won't be like—the nurse course that we have, it's 2.4 CMEs. These will be shorter. These will be about 1 CME, or continuing education units for the people. So it will be a little shorter. You can take it from the convenience of your cellphone, or tablet, or whatever you have, wherever you are; if you're in the workplace, or if you're at home. And we'll have those out hopefully in the next six months to a year.

MR. MORRISON: And the hard part is, we talked about that earlier, it's always the implementation that we struggle with but getting that out from different organizations will really have a message in itself that this is an important subject that you can take note of.

DR. HARTLEY: Absolutely. And to let you know, too, we had input as we were creating the courses, from EMS workers. We had focus groups with different EMS workers who helped with that material.

DR. BUNN: All right, I just had a comment too, Terry Bunn. Just as far as the key partnerships, kind of what's been mentioned here wrapping everything together, the relevant licensure boards would be a great opportunity to both disseminate and to be able to conduct the needs assessments and the focus groups, as you mentioned, as well as the relevant training academies for the relevant professions that are being studied. So I think that's a couple of things. And then—Patrick, you might be more familiar with this—we actually worked with our local and state police and are pretty much funding through another grant to fund their training, the

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crisis intervention training, or CIT training, due to their exposures to individuals who are under the influence of substances, particularly methamphetamines or stuff like that, which I think would also be a concern for your relevant worker populations. So that might also be something to team up with or something like that, to add complementary training modules that are relevant with them.
Chris?

MS. LASZCZ-DAVIS: Chris Laszcz-Davis again. A couple of other groups you may want to consider, the RIMS organization, the risk managers. And that would certainly apply to all occupations. And they're huge. And another one, you talked about some difficulty in getting to small to medium sized businesses. An underutilized set of organization are the Chambers of Commerce. They're huge in every state, and they exist in every town. And again, we're talking about moving the message out to the public sector; they are the advocates for small to medium business in every state. So Chambers of Commerce, I would clearly put on that radar screen. And the other thing, and two people have made reference to it, but I think it's real important. The guidelines I'm hearing are devoted to certain worker groups—firefighters, EMS, health care—but the truth it is, it all starts at the top in any organization. So a company should have, and this is bigger than EAP or HR, but there ought to be required courses in leadership management/organizational development, that really ascribe to the tone that the leader sets in terms of what's acceptable in this arena. So if they're some way down the road, to team up with leadership programs, schools of management, they exist all over the country. But the tone is set at the top, and what's allowed is set at the top. So these—we work with specific work groups, that those who are enablers or disablers really start at the top.

DR. HARTLEY: Sometimes.

DR. BUNN: Marc?

DR. SCHENKER: Marc Schenker. To follow up on that thought, the Business Roundtable recently came out and said their goals are broader than just profitability of the companies. And they are usually influential in setting the tone in saying this is a priority. This is a goal for our community, which is Business America. My other thought was that this seems to be a blue-collar focus, and there's a lot of white-collar need as well. You know, I'm thinking of the law profession for example, or other service industries where one probably doesn't think of this at first blush, and yet I think it would be valuable.

DR. BUNN: Tony?

DR. COX: A couple of things. Sometimes it starts at the top. I'm thinking about a guy that worked for Verizon, which actually at the top had really good principles, but at the garage level, things were quite different. There were sometimes layers of culture. Sometimes it starts at the top; sometimes it starts in the middle. The other thing—I would just like to sound a note of caution, again, about real bullying, versus, and

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I speak as a white male, ambiguous bullying, for example at a law firm. You get a lot of big egos, a lot of high passion, a lot of shoving around. Whether that is bullying is open to interpretation. Then you have cases where people are messing with the equipment that other workers are using in a garage. That's absolutely, clearly, bullying. To get the biggest bang for the buck, I would love NIOSH to be focusing on stuff that—I think there is a lot of low-hanging fruit where it's really clear what is going on, and then there are cultural and psychological things that are more ambiguous, harder to discern what's going on. I think there is plenty of work to be done on the easy parts before we worry about the hard parts.

DR. BUNN:

Michael?

DR. BEHM:

I think Ron had his hand up first.

DR. BUNN:

Go ahead, sorry.

DR. STOUT:

Ron Stout. There is another way of approaching this that I saw quite nicely at a previous employer of mine where the leadership talked about the adult business model, and talked about the utilization of straight talk, and how those principles, when embedded in a culture of resilience that allow the kind of interaction that needs to take place without it degenerating into or being perceived as bullying. So I think perhaps as not only talking about the negative behaviors and what to avoid, but in a business environment, how the adult business model or similar constructs can help you address critical issues in a time-sensitive manner, putting it all on the table, and not getting personal about it, if you will.

DR. BUNN:

Great point. Excellent point, actually. Michael?

DR. BEHM:

I think you should be looking at those deep-seeded, hard to find things because you have a definition of such things as repeated behavior. And an organizational culture needs to figure out what it is that internally offers people, and people should have the freedom to come forward if they want to, and have a conversation without recourse. And so it is that deep-seeded stuff that I think NIOSH should be tackling should be tackling those difficult questions. Thanks.

DR. BUNN:

Yeah, and when you're talking about repeated behavior, is that defined as more than three instances? What is the cutoff?

DR. GRUBB:

We've had a big discussion about the cutoff.

PARTICIPANT:

I'm just asking a quick question. Was there anything in building surveys for organizations for their workers to drill down to? A lot of times, the leadership will say that, well, they don't know what they have because they haven't really gone down to—they say we have a perfect program here; we have this, we have this. And it's all policies on paper. But when you go to the worker, and you ask them what does exist at that level, and you might get a different picture, and then you can formulate that there is something if it's not asked, sometimes it's not there until it gets into the newspaper or somebody gets terminated or somebody gets a lawsuit. But having that, saying that you really have to find out what is persistent in your organization that you might not know.

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DR. BUNN: Steve?

DR. LERMAN: Steve Lerman. Along those lines, in several European countries, mostly Scandinavian countries, there are regulations that require them to do surveys of the work environment. It sounds like you're familiar with that. There might be some things to pick up to transfer to this evaluation of what's really happening in workgroups.

DR. BUNN: Any other comments? All right, thank you very much for the presentation. Very, very—very enlightening. All right, so we will take a take a break for lunch. I think Alberto provided you with a page of options for lunch in the nearby local area. And we will start again promptly, right at one o'clock on our next presentation, which is the immunological effects of subchronic fungal exposure.

[Lunch.]

DR. BUNN: ...as I said, on the immunological effects of subchronic fungal exposure.

IMMUNOLOGICAL EFFECTS OF SUBCHRONIC FUNGAL EXPOSURE

DR. GREEN: First of all, I would like to thank Alberto, the BSC, as well as the NIOSH OD for providing me the opportunity to present a part of my research program that is focused on occupational fungal exposures this afternoon. And specifically, I will be introducing you to work that is conducted as part of an interagency agreement with the National Toxicology Program. And this work is actually conducting the NTP subchronic exposure studies of mold, because mold is nominated to the NTP.

First, I would like to introduce you to who I am. I am Brett, and I'm a research biologist in the Health Effects Laboratory Division, and I lead the Occupational Allergy team in the Allergy and Clinical Immunology Branch. My team consists of two associate service fellows, or postdocs. I have a laboratory technician, as well as a PhD student, and she is currently conducting her candidate training at the School of Medicine at West Virginia University.

So there are four main things to my team's mission: firstly, my team developed a contemporary method to better identify and detect microbiological exposures in occupational environments, and specifically we focused on the development of amino assays as well as molecular best approaches. We also collaborate extensively with a number of internal partners, especially in Cincinnati and in the respiratory health division, where we provide support for identifying specific biomarkers, as well as identify and characterize emerging occupational high-molecular-weight allergens.

As part of what I'll be introducing to you all today is our work with—all our work is part of the interagency agreement, and that is the development of acute subchronic and chronic murine models to characterize both pulmonary immunological and toxicological mechanisms of exposure to occupational hazards. And finally, and this is the most recent work that's been conducted by my

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team, we evaluate the relevance and impact of intervention strategies to effectively prevent exposure to microorganisms in the workplace. And this is some really exciting work that was recently funded by (Laura @ 3:05:09), and we are utilizing ultraviolet germicidal radiation to actually inactivate an emerging opportunistic fungal pathogen that is threatening the US healthcare sector at the moment. Many of you have probably heard of *Candida auris*. We are utilizing that approach to at least develop strains to inactivate that organism.

So fungi continue to be a public health burden in the US, and there has been a lot of heightened awareness of fungal exposures following natural disasters, especially hurricanes as well as inland flooding. Now the image on the left was taken after Hurricane Harvey that dropped 50 inches of rainfall over the Houston metropolitan area. And the combination of water, building materials, temperature, and humidity is a perfect combination for the growth and proliferation of fungi in building materials.

Now the image on the right was taken after Hurricane Katrina, and this is what often confronts a homeowner, remediator, or a first responder when they enter a premises once the floodwaters recede. And these are the scenarios that really scare people. They are concerned about what they are breathing and the consequences on their respiratory, and in some cases their neurological, health. Now it's not just the built environment in which you can encounter fungi. We're actually breathing in fungal spores right now. But in many occupational environments, these spores can actually be elevated in several magnitudes of order higher than what we are currently breathing in at the moment. There are a number of occupational environments in which you can encounter mold. These range from the agriculture to forestry, the biowaste industry, the manufacturing sector, even the services sector. Many of the schools that were built in the United States were built before the 1950s, so they have a lot of water infiltration issues. So these are some of the reasons why we're studying fungi at NIOSH. In addition to the public interest, we also receive a lot of phone calls regarding indoor dampness and microbial contamination, and as a result, there have been a number of health hazard evaluations conducted by NIOSH. Also, our colleagues at the National Institute for Environmental Health Sciences also receive a number of phone calls and concerns from the public.

Now many of you may be familiar that fungi cause infections, in particular cutaneous infections, subcutaneous infections, especially following a traumatic injury, you have an implantation of spores, and they can also cause primary infections that affect immunocompromised as well as the immunocompetent. And an example would be *Coccidioides immitis* that causes coccidioidomycosis in the desert Southwest of the US. And NIOSH has been involved in several HHEs associated with that organism.

But exposure to spores in the built environment and occupational environment

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has been a little bit more controversial until the publication of two consensus reports, one by the National Academies of Science as well as by the World Health Organization in 2009, that concluded that there was sufficient evidence of associations between adverse health effects, fungal exposure, as well as dampness in indoor environments. But these documents identified several knowledge gaps.

Firstly, we don't have exposure limits for fungi, and this is in part because of the limitations of existing methods to analyze and detect fungi. And we don't completely understand the mechanisms that modulate respiratory and even neurological or cardiac effects associated with fungi.

So following the publication of the National Academies report, mold was nominated for evaluation to the National Toxicology Program in 2004. And the NTP aimed to recreate a real-life exposure scenario that would reproduce what you would find in a damaged or a damp indoor environment. Now it wasn't until 2007 that they actually convened an expert panel that included the likes of my division director, Dr. Beezhold, as well as myself, to discuss how to design these studies, because this was a very—would have involved a very complicated study design.

So there were a number of key recommendations. Firstly, to evaluate single organisms first, that were nominated to the NTP, and then moved into mixed organisms, and that's predominantly what you will find in a contaminated environment. But there are a number of issues and challenges. Many of you would be familiar with chemical exposures, but here we're dealing with microbiological exposures. It's a living organism. It consists of viable spores, and that viable spore can become metabolically active and result in the release of secondary metabolites and hundreds of high-molecular-weight antigens. Also, fungi are extremely diverse. There are approximately 1.5 million species estimated to exist. And they all differ in terms of their nutrients and what they need to grow and proliferate. So what organisms do we test? They vary depending on the environment as well as the ecology. And then finally, what is the appropriate relevant exposure scenario, so what is the route of exposure? Should we test individual organisms or mixtures?

So it wasn't actually until 2012 that the NTP identified our lab and the Health Effects Laboratory Division to be a partner. Essentially, they couldn't find anyone in the commercial or academic sectors that had the background or expertise to conduct these studies. So as part of an existing interagency agreement that we have with the NIEHS, we started to design and conduct these studies. Now actually, this original agreement is set to expire at the end of this week, but we have drafted a new agreement that will carry us over for the next five years. And that agreement is basically divided into two tasks, and these tasks highlight the knowledge gaps that were identified in these original consensus reports. So task

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one is focused on developing improved methods to identify and detect microorganisms in the environment; specifically we are focused on the development on improving molecular methods, specifically, ITS region sequencing. Project 1.2 is focused on the development of chemical methods, and this is conducted by my colleague Dr. Jun-Hyeong Park in the Respiratory Health Division, that is developing ultra-performance liquid chromatography tandem mass spectrometry methods to detect fungal secondary metabolites and mycotoxins.

And the third is focused on discovering new biomarkers of fungal exposure. But really, the main aim of this work are the murine models of repeated fungal inhalation exposure. And these are conducted in two phases. In the first phase that is conducted in my lab, we optimize the growth conditions of the selected fungal species. We then optimize the aerosolization of that species in our chamber. And then we conduct a preliminary pulmonary immunology study where we look at the infiltrating silt populations into the lung by flow cytometry. We also look at the specific genes that are being activated as part of the molecular analysis of the lung. We also look at the, from a proteomic perspective, the various proteins that are expressed as part of that response. And then we incorporate that into ingenuity pathway analysis and look at the downstream, the activation of specific pathways.

Once we complete that phase, which essentially is a dry run, we then move into phase two, which is the NTP subchronic toxicology study. This is also conducted at NIOSH, and it's conducted in the spirit of GLP. And the study is brought down in collaboration with Battelle Memorial Institute.

So as many of you come from an exposure assessment background, I wanted to very briefly highlight some of the results derived from our Task 1 studies. And as many of you may be familiar, the way in which we identify fungal exposure is really based on what I would term "traditional methods." These involve a viable culture and morphology. Both of these methods have some limitations. Viable culture, you only select for those fungi that can grow on a silica nutrient medium.

Morphological methods involve the collection of spores onto an adhesive surface, or onto a membrane, and then you require microbiologists to identify those spores based on the morphology or the phenotype of the spores. Many of the fungi share the same morphology. In fact, many fungi also fragment, and so it's very difficult to identify them. And as a result, the paradigm of exposure has really been focused on filamentous fungi, especially those placed in the phylum Ascomycota. So many of the other fungi are completely overlooked.

So my lab, as I have mentioned, has been focused on the development of contemporary detection methods. And when I first joined NIOSH back in 2005 now, I was working under Dr. Don Beezhold, and the main focus of our group was the development of monoclonal antibodies towards fungi that commonly infiltrated

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the indoor environment. So several of the monoclonals that were developed were actually patented and utilized in the commercial sector, and developed into a lateral flow assay. This assay is still available at a number of hardware locations, where you can go in and buy it, and then utilize it in your environment to make an identification of, in this case, *Stachybotrys chartarum*, which is known as black mold or toxic mold.

We then moved on and, as I mentioned, a colleague in the respiratory health division is focused on the development of chemical-based methods that will take mycotoxins as well as volatile organic compounds. And my lab has been focused on the development of those DNA-based approaches, in particular, internal transcribed spacer region sequencing, or ITS sequencing. The ITS region is colloquially known as the “fungal bar code.” So we are able to extract DNA from an occupational air or dust sample, and then using universal primers, we can amplify the ribosomal regions and then identify the ITS region which is different for which individual fungus. So we can identify specifically what’s in an environment. And we have utilized a lot of different sequencing approaches. Some of you might be familiar with them, but recently we have utilized aluminum high throughput sequencing, and you can identify millions of sequences. So this has really provided a much broader understanding for us in terms of the times of fungi that are present in occupational environments.

I just wanted to point out that many of our colleagues in academia have been utilizing these approaches, especially in ecology, looking at sole microorganisms for a number of decades. But it’s only been recently that we have utilized this approach in occupational health studies.

Now, utilizing these approaches, we have participated in a number of NIOSH health hazard evaluations where we have employed ITS region sequencing. And this has provided new insights into the spectrum of microorganisms that workers are exposed to, especially with specific job tasks. And this is just to provide highlight of one of those particular studies which we’ve been involved in, those of the cannabis harvesting and processing environment. And it was part of a health hazard evaluation located in Washington state. And here, we actually utilized a NIOSH two-stager sample on the workers. And they would wear these samplers during a work shift. So here you have the worker and they are trimming the particular plant here, and we would then process the samples after the particular shift. And in this particular scenario, we actually identified that the workers, while they were trimming, actually resulted in the release and aerosolization of gray mold, which is a plant pathogen of cannabis. And this was aerosolized directly into the breathing zone of the worker.

Now for those of you not familiar with fungal terminology or taxonomy, if you leave strawberries in the fridge for too long, you get this white growth. That is *Botrytis cinerea*, which is also known as gray mold. And what was interesting about this

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was that botrytis produces unicellular spores that are around three micrometers in size, which is part of the respirable fraction. So they were breathing in these spores. So ITS sequencing, in this particular scenario, helped us to identify specifically what workers were exposed to, but there were also downstream applications where we were able to educate the employer in terms of the potential exposures the workers would come across as part of the specific job tasks. Now there were also a number of research to practice components with this technique. We are also developing quantitative polymerase chain reaction methods based on the organisms that we're finding in ITS sequencing. And this has enabled us to collaborate with a number of internal partners, especially in the National Center for Emerging and Zoonotic Infectious Diseases, which is a division in CDC. And specifically, we are working with these CDC Mycotic Diseases Branch and helping them as part of a study which is focused on Hurricane Harvey recovery. So they are very much interested in understanding the types of opportunistic fungal pathogens that infiltrate indoor environments following natural disasters. We are also helping them develop QPCR panels to better detect fungal pathogens, also in hospital environments, because quite often they rely on traditional methods to identify these types of microorganisms.

As I mentioned, we are also involved in a number of NIOSH HHEs. And this has really provided innovative data sets that have also shown the diversity of microorganisms that workers are exposed to and that can help, as I mentioned before, educate the employers as well as the workforce, and in some cases, also drive personal protective equipment recommendations. And we also collaborate with a number of intramural and extramural partners, especially in academia, where we are utilizing this methodology.

So the Task 2 is focused on the development of animal models. And we do this in collaboration with the National Toxicology Program, where we are conducting the subchronic inhalation exposure studies. As part of these studies, we are utilizing the NTP's subchronic exposure model. We are utilizing the NTP-strain mouse, which is a B6C3F1 strain. And to date, we have evaluated three of the four organisms that were nominated to the NTP, including *Aspergillus fumigatus*, *Stachybotrys chartarum*, and *Aspergillus versicolor*.

Now as part of these studies, we expose mice to viable conidia, or spores, and we have found viability to be a very important parameter that results in a number of downstream activation of, downstream infiltration of various cell types. So we also exposed mice to heat-inactivated conidia, or spores, and this is used as a biological particular control. So we exposed mice twice a week for 13 weeks, and then euthanize them 24 to 48 hours after the final exposure. As part of our phase 1 studies, we evaluate by flow cytometry various pulmonary immune endpoints. We also look at microRNA as well as mRNA expression, as well as the proteomic profiles. As part of the phase 2 study, this is the NTP toxicology study, and that's

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conducted in collaboration with Battelle Memorial Institute.

So if you remember back to my earlier slide, the goal of the NTP was to reproduce the environment that you would often find particularly with a damp indoor environment. So we achieve this by inoculating autoclaved rice with our selected fungal test article. We inoculate this for a period of one to two weeks at the optimized temperature. And after that period of time, what you will have is the growth and development of networks of hyphae that form around the rice grain. And then you have the development of aerial hyphae and long chains of spores. And that's what you see here on the right. We then desiccate those spores, and we place them into our NIOSH acoustical generation system, which is essentially a modified Pit-3 generator. And it consists at the bottom of the chamber, a rubber membrane, and underneath that is a stereo speaker. So our engineers in HELD actually have developed a software that enabled us to control the energy that is input into the speaker. So that essentially vibrates the rubber member that includes the rice fungal inoculum. So that vibration results in the dissemination of spores into the chamber.

We then control the amount of air that passes through to the chamber, and then an air/spore mix is delivered to mice that are housed in the multi-animal nose-only exposure chamber. And we can house up to 22 mice. As part of this system and the software that we have with it, we actually can control the exposures as well as the estimated deposition, which is based on a modified local lymph node assay. So in the remaining time, I wanted to introduce you to two very different organisms and the results that we see utilizing this unique exposure system. The first is *Aspergillus fumigatus*, and this is a very well-known opportunistic fungal pathogen. But importantly, in occupational environments, it is a problem especially in the biowaste industry. The organism is a filamentous fungus. It produces hyphae as well as these aerial hyphae and long chains of unicellular spores around three micrometers in size.

So to date, we have conducted a number of pulmonary immunology studies, and we have also completed the first NTP toxicology study, which to date, should be published in the next couple of months.

So when we optimized the growth conditions for *Aspergillus fumigatus*, and we placed it into our acoustical generation system, we were able to aerosolize unicellular spores. It was important that we didn't see an aggregation of spores, and we also didn't see the production of fragments or the fragmentation of rice. And as I noted, we exposed the mice to lymphoproliferative doses that were determined in a modified local lymph node assay. So in these studies we exposed mice to 1×10^5 spores per exposure. So when we repeatedly exposed mice to that dose, twice a week for 13 weeks, the data that we acquired by flow cytometry and our molecular and histopathology was really exciting. I know that this slide is quite loud, but essentially we see an infiltration of leukocyte populations, but we also

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see a shift towards more of an allergically-skewed response with a specific lymphocyte population. And this was confirmed in our molecular analysis. And we also saw an increase of serum IGE. In the histopathology, we see peribronchial inflammation, and goblet cell metaplasia. We saw chronic active inflammation that was characterized by infiltration of neutrophils. But we also saw, for the first time, arterial remodeling. This is muscularization of the pulmonary arterioles, which was a really exciting finding that we hadn't seen before.

And this was also seen in concern with the deposition of fungal spores. But the really exciting finding that demonstrates utility of this model is that we saw the spores become metabolically active. And in some cases, they began to germinate. And this is important because this results in the release in additional secondary metabolites, as well as high molecular weight antigens. And in fact, many of my colleagues had hypothesized that this process was required for the expression of specific fungal allergens. Many of the allergens that have been characterized were actually derived from the hyphae and not the spore. So we were able to see this for the first time using this model.

Now I just also wanted to point out that this did not result in an infection. They just activate, germinate a little bit, and then that's it.

DR. BUNN:
DR. GREEN:

Okay. That was going to be my question.

So we have also, as I mentioned, completed the first NTP toxicology study. And we recently went down to North Carolina to review the results derived from this study. And we hope that this particular report will be published by the NTP in the next or two. What we found in this study that the target organs were the lung, the bronchial lymph node, as well as the larynx. We identified the same inflammatory leukogram that we saw in our pulmonary immunology studies. And we also identified a number of non-neoplastic lesions. The most important was the arteriole remodeling that I noted before. The image on the left is of, and they were under control of the image of the right, is of the viable exposed. And we do not see this in the heat-inactivated conidia.

So here you have muscularization of the pulmonary arteries, and this is also known as pulmonary arterial hypertension and can result in increases in blood pressure. And this obviously puts some cardiac elements into these particular findings, which are quite novel. And in this particular study, we actually saw an increase in heart rate, as well as hypertrophy in the heart. So this has really become the focus of my lab at the moment.

The other organism, *Stachybotrys chartarum*, which biologically is very different, and many of you may be familiar with this particular organism; it's also known as black mold or toxic mold in the community. When you dampen building materials, it results in the growth and proliferation of this particular organism. Now we have also conducted several pulmonary immunology studies as well as the NTP toxicology study for this particular organism. And the report is currently being

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drafted.

So compared to *Aspergillus fumigatus*, we actually evaluated two strains of *Stachybotrys chartarum*. One produced a high level of macrocyclic trichothecenes and this is a well-characterized mycotoxin of *Stachybotrys chartarum* that interferes with protein synthesis, and Strain B produced lower levels of the macrocyclic trichothecene. And when we optimized the growth and put it into our acoustical generation system, we saw the aerosolization of unicellular spores, but we also saw the production of fragments.

Now, this isn't new. Actually, a close colleague of mine at the University of Cincinnati, Tiina Reponen, has shown that this species produce fragments. But this is the first time that we see differences in the production of fragments between strains.

So this is what the organism looks like after two weeks of growth. It's really dark in color. That's the melanin that's found in the cell wall. And when we aerosolize it, we end up with these unicellular spores that are around 4-5 micrometers in size, but Strain A also produce these fragments that were aerosolized from the hyphae, the spores, as well as the reproductive structures called the aerial hyphae.

So when we repeatedly exposed mice to these two strains, the red indicates the Strain A and the blue is the Strain B, we see differences in responses after 4 and 13 weeks of exposure. With Strain A that produces the fragments, we see infiltration of various cell types into the lung much earlier than Strain B.

What was also interesting is that the immune responses also varied to *Aspergillus fumigatus*. However, we also saw some commonalities, especially in the histopathology, where we saw peribronchial inflammation but again, we also see pulmonary arterial remodeling, so this was consistent with *Aspergillus fumigatus*. And in this study, we also saw a continuum of pulmonary arterial remodeling where it was observed earlier in the high-fragmenting Strain A compared to the low-fragmenting Strain B. But after 13 weeks, it was approximately the same.

So the highlights of these studies utilizing this unique delivery method or model is that we actually see differences between species. With *Aspergillus fumigatus*, we see a shift towards more of an allergically mediated response, whereas with *Stachybotrys chartarum*, we see a mixed immune response. And this is dependent on the biology of the organism.

Aspergillus fumigatus requires more—spore viability is an important process. You have the metabolic activation and in some cases maybe even the germination of the spores important for the ensuing immune response, whereas with *Stachybotrys chartarum*, viability isn't important. It's actually fragmentation that appears to be driving these responses.

We also see some universal responses—pulmonary arterial remodeling in particular. And as I mentioned, the datasets that we acquire from these studies, we put them into Ingenuity Pathway Analysis, and we see an activation of various

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cardiac pathways.

So this is a really exciting time for our lab to delve into these particular responses, and the contemporary literature has identified a number of cytokines to be involved in this process, in particular IL-4 and IL-13, IL-33 as well as several other cell types.

So my two postdocs are actually focused on this at the moment, and they are going to be looking more closely at the pulmonary arterial remodeling by utilizing knockout strains, and the knockout strains will have had these various cytokines knocked out. So they will be able to investigate pulmonary arterial remodeling a little closer, to understand exactly what is going on with these repeated exposures.

So in summary, our collaboration with the NIEHS and NTP as part of our interagency agreement has really been a very productive collaboration. We've been able to develop contemporary methods to better identify and detect microbiological exposures in occupational environments. Also, we've been able to utilize existing NIOSH technologies and expertise in inhalation exposure studies for the first time, to provide a better insight into the mechanisms associated with repeated fungal exposures, and these studies have really highlighted that the responses vary between fungal species. So in some, spore viability is very important, whereas in others, it's not. It may be based on fragmentation.

Now, there are a number of future directions with our group. I really wanted to also introduce you to some findings with *Aspergillus versicolor* but these studies are currently ongoing, and we plan to have them completed at the end of this year. We also plan to have the next NTP toxicology study. We'll have that conducted by FY20.

I also wanted to note that we've begun a collaboration with an investigator at Indiana University to look at neuroinflammation. In addition to concerns about respiratory health, there are also a lot of concerns about neurological endpoints and as part of our *Aspergillus versicolor* studies, we've actually had some of the brains analyzed and we see neuroinflammation as soon as a week of repeated exposures. So I think, at least in the future, these are going to be some really exciting collaborative studies.

We also aim to look at cognitive dysfunction and conduct some behavioral studies to better understand some of the downstream responses to repeated fungal exposures.

We also aim to complete the remaining individual organism, which is *Alternaria alternata*, and then we're going to transition into the mixed fungal exposures, and this will be a really exciting transition, to see if we see some of the same immune responses or determine if they also vary when we see different cell populations infiltrating following repeated exposures.

So that's a broad overview of our work with occupational fungal exposures. I got a

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little excited with my questions. There is some overlap, and particularly with the two speakers earlier this morning, particularly with Questions 1 and 3, which are really focused on communication.

So I'll start off with Question 1. Are these datasets reaching the correct stakeholder audience and how can we better communicate the results derived from Task 1 and Task 2 studies to NIOSH stakeholders and the broader occupational health community?

I wanted to put that as the first question because in HELD, we do very basic science research and the datasets are prepared and published in peer-reviewed journals, and then generally that's it. So how can we share these datasets to a broader audience? So I guess we'll start off with that question first.

DR. BUNN:

Yes, Steve.

DR. LERMAN:

Before I provide input, I have a question here, arterial remodeling. I gathered that was an unanticipated, surprising finding, is that correct?

DR. GREEN:

That's correct.

DR. LERMAN:

So I guess the first question, in translational work, in my mind, would be: is it a good model to develop into humans and can we look at, now with that in mind, can we look at mediation workers or people who were in the affected homes, or exposed populations, and see if there are clinical corollaries that support that this is happening in people. And clearly before—to my point, I think that's necessary before you start to translate those results to policy or to health recommendations.

DR. GREEN:

Yes. Most of the focus has been on respiratory endpoints and I'm not familiar with many epidemiological studies that have focused on cardiac endpoints.

DR. SCHENKER:

Yes, well—Marc Schenker. Similar question is: are you connected with any of the epidemiologists, because there are obvious epidemiologic questions in terms of allergy, immune response and so on? And I would add that there are some wonderful natural experiments going on.

DR. GREEN:

Right.

DR. SCHENKER:

First of all, the cannabis industry is now the largest agricultural commodity in California, which is the largest agricultural state in the country, estimated \$10 billion, with a large workforce and as you pointed out in the HAT, this is one of the concerns about that workplace. And the other setting—I don't know if it's as occupational, but we have recurrent flooding, and it would be possible to design studies to look at before and after almost. I mean, some of these flooding areas like Houston, I think they just count the time until the next flooding now. But—

DR. GREEN:

In hours, not days.

DR. SCHENKER:

There are a lot of interesting human questions that relate to this wonderful basic stuff, research that you're doing, and I just wonder if you're connected with those branches to, you know, explore that.

DR. GREEN:

So within NIOSH, we're connected with the Respiratory Health Division and the two investigators are Ju-Hyeong Park and Jean Cox-Ganser. They are actually

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running one of the largest school studies in the United States and so we've utilized at least the ITS region sequencing-based approaches as part of that study. But unfortunately, in terms of our animal work, that came after the particular epidemiological—the service that we utilized in that particular study. But I think in future studies, if we could incorporate some of these additional cardiac endpoints, that would be good.

And just to note, in terms of our cooperation with extramural partners, it's primarily focused on pediatric populations. But we have at least discussed incorporating or looking at some of these additional endpoints that we've found with our animal studies.

DR. BUNN: Tony.

DR. COX: Just a mechanistic question. Is there inflammasome involvement in these responses?

DR. GREEN: That's something that, you know, we haven't looked at as a group but I assume that with all the various datasets that we have with Ingenuity Pathway Analysis and the various pathways that are activated...

DR. COX: Yes.

DR. GREEN: You know, that's something that we could look at.

DR. COX: Okay, because your first question—are these datasets reaching the correct stakeholder audience—if it turned out that the NLRP3 inflammasome played an important role, I think that would have a somewhat different set of audiences than your other mechanisms. So it would be interesting to understand the mechanisms more deeply.

Also, your remodeling finding, I find quite surprising and very interesting. And as far as I know, that has nothing to do with the inflammasomes, so very interesting work. But to connect it to the right people, I need to connect a few more dots in terms of mechanisms.

DR. BUNN: Yes. Chris.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis. Really directly related to your question number one, you've got the data but the people that take that data, interpret and who operationalize it, if you will, are people within three associations that I'm aware of: AIHA, ASSP and ACGIH. I mean, I guess my recommendation is to connect with the executive directors of each. They each have their own indoor air quality committees and taskforces. Let them take a look at the data, and ask them these questions. I mean, I'm assuming they may come back to you with a complimentary response, but they may not, and that in and of itself would be interesting too. But that would at least take you to the next phase.

And if you need some help connecting with them, those organizations, we'd be happy to do that, either Charles or I.

DR. GREEN: Okay, thank you.

DR. BUNN: Actually, I had my own questions. Very, very interesting. I guess, you know, you're

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showing results about the effects—I think I'm kind of getting into another question here about the effect on T-cell responses. What I see here are mainly results associated with the inflammatory response which will eventually drive the T-cell response. So I was just wondering as far as—because you say “mixed T-cell response” with the one mold, and TH-2 response with the other mold?

DR. GREEN: Right. So in terms of...?

DR. BUNN: Oh, just as far as results go and stuff like that, I mean. I guess a bigger question is this research brings up more questions than what it answers as far as the next studies that should be done with that, and maybe your first stakeholders should be back to NIEHS or something like that...

DR. GREEN: Right.

DR. BUNN: For more funding for more studies. And then also I was wondering, you know, because based on your model here for the exposures, it says here at 13 weeks you started, so were the mice 13 weeks old when you...?

DR. GREEN: No, no, sorry.

DR. BUNN: What was the age of the mice?

DR. GREEN: They were 6 to 8 weeks.

DR. BUNN: Okay, 6 to 8 weeks.

DR. GREEN: So as part of that, when we get them in, they obviously go through...they're put into the pods so they're acclimatized to the pods for a week and then we proceed with the exposures twice a week for ten weeks.

DR. BUNN: Okay. Ah, for 13 weeks total is the exposure.

DR. GREEN: Right, yes.

DR. BUNN: Okay, okay. So they're actually exposed while they're juveniles.

DR. GREEN: Yes.

DR. BUNN: Okay, okay. So then that brings up my next question is you have this twice a week for 13 weeks. Have you—bringing up more research questions—would you have a recovery period at all? Have you stopped those exposures and then look at persistent effects where you have no more exposure but you test them again after another, like, eight weeks to see if those are real persistent effects or if they're transient effects that go away after that first exposure?

DR. GREEN: So I'm really glad that you asked that question, because that's actually what we're currently doing in our studies of *Aspergillus versicolor*. So we have exposed mice for 4 and 13 weeks, and then we've allowed them specific temporal intervals of recovery, and we've just pulled down those studies within the last couple of weeks so we'll be able to have some data soon.

DR. BUNN: Ooh, all right.

DR. GREEN: Yes.

DR. BUNN: Yes, we'll hear about the results of those. So, excellent, excellent. Yes, that's all I had. Any other—

DR. GREEN: Well, I'm particularly interested if any of you are familiar with any additional

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species that we could be incorporating into our particular model. You know, we've been focused on the built environment but not so much specific occupational environments. And with the sequencing-based approaches that we've utilized, we've gotten a lot of insight into the various types of organisms that are present in air and dust samples. But if any of you have any sort of background or past experiences in this field, it would be really appreciated.

DR. BUNN: Well, the big elephant in the room is of course healthcare facilities with potential Candida infections that are starting to pop up all over.

DR. GREEN: Right.

DR. BUNN: And what they can do to—what will be effective, actually, in reducing those, well, the load of the yeast in this case.

DR. GREEN: Yes, and I obviously don't have as much time to present everything but that's some, a really exciting one because our colleagues in the Respiratory Health Division have been utilizing UVGI to inactivate microorganisms, and the healthcare sector was really interested in this work, primarily because it eliminated a lot of the harsh chemicals they utilize to inactivate microorganisms. So we've been focusing on utilizing this approach, and we're actually working with the CDC Mycotic Diseases Branch, who are focused on the chemical-based approaches to inactivate *Candida auris*. So we hope that the data acquired can be utilized from a policy perspective as well as disseminate to the broader community.

DR. BUNN: Yes, yes. Chris.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis again. You know, just listening to you—you know, and asked you to comment about healthcare facilities, what about the construction industry?

DR. GREEN: Yes.

MS. LASZCZ-DAVIS: I mean, really, talk about an industry that's impacted by this and has been, in a very big way, is the construction industry.

DR. BUNN: And remodeling.

DR. GREEN: No, especially the remodeling efforts.

DR. BUNN: Exactly.

MS. LASZCZ-DAVIS: It's huge, you know.

DR. GREEN: Much of the information, at least on the NIOSH pages, there's several that are focused on—my colleagues in the Respiratory Health Division, they've recently produced a tool called DMAT, which is a tool that you can use in an indoor environment to determine whether there are dampness issues. But there is not much information about fungal exposure in occupational settings. So do you think that there would be much of an interest in maybe expanding that sort of communication and incorporating some of—well, at least having a separate page focused on fungal exposures.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis. I'm not sure I understand the question. Are you asking whether or not there would be—it would be important to have a dialogue with the construction industry as to once they cast their eyes on this expanding the work

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from an exposure assessment standpoint?

DR. GREEN: No, I was wondering, there's not much information on the webpage about occupational fungal exposures. Do you think it would be helpful to have maybe a bit more information?

MS. LASZCZ-DAVIS: NIOSH's webpage?

DR. GREEN: Yes.

MS. LASZCZ-DAVIS: It would be, only if people knew to go to NIOSH's webpage on fungal exposures. I mean, it's a push/pull system. I mean, most people don't go to websites unless they know there's something there of relevance.

DR. BUNN: How about a link from NIEHS to your website? That might help.

MS. LASZCZ-DAVIS: And an affirmative outreach to these other stakeholder groups. If they're not in a position of receiving this information, right, they may want to be. If they don't know the dialogue is desirable, is desirable, I hope they know the... It's an outreach I think that might be a very important one.

DR. GREEN: There's actually a federal interagency committee that convenes every couple of weeks where we talk about some of the work that we're doing in the field of fungal exposure, but I'm not sure if that information is getting to the correct stakeholders.

MS. LASZCZ-DAVIS: Probably not.

DR. BUNN: Yes. Michael is a professor in the construction sector. What do you think, Michael?

DR. BEHM: I mean, sure. I concur that it would be important. I don't really have a lot to say on it. You know, it's, yes, yes.

MS. LASZCZ-DAVIS: Okay.

DR. BUNN: Steven.

DR. LERMAN: Steve Lerman. I was just going to comment that the industries that have been raised are challenging industries to get to. The construction industry, we're not talking about people building skyscrapers; we're talking about people building and remediating residential homes. Tough population—the builders are small businesses; the employees are casual employees. I don't know too much about the marijuana industry in California but I would imagine that it is an equally challenging industry to get into.

So by all means, yes, but we talked this morning about effectiveness, validation of effectiveness. I think these are going to be tough nuts to crack. Doesn't mean we shouldn't be trying, but they would be tough nuts to crack.

DR. BUNN: Jessica.

DR. GRAHAM: Hi, Jessica Graham. Just a question, since the topic is allergenicity but then you mentioned a modified local lymph node approach, which I usually think of as being sensitization-related. How is it modified to differentiate between sensitization and allergenicity?

DR. GREEN: In terms of...well, we specifically, when we characterize these responses, we're looking at infiltrating cell populations. And so we are repeatedly exposing the

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- mice. We then look at the specific cell populations that are coming in and determining what those particular responses are. Now, in relation to—we do a dose response study first. We do a modified local lymph node assay. We look at the bronchial lymph nodes and look at the lymphoproliferation, and that's what we determine to expose the mice to repeatedly.
- DR. GRAHAM: So are you thinking, did you—are you thinking that the proliferation in the bronchial local lymph node is not sensitization-driven?
- DR. GREEN: No, no, I'm just saying that we are looking at at least characterizing those responses and understanding them in relation to our—what we repeatedly expose the mice. So I'm sorry.
- DR. GRAHAM: I'm just curious because I could see somebody seeing the data and saying, "This looks like a respiratory sensitizer."
- DR. GREEN: Okay.
- DR. GRAHAM: Which opens up a whole other occupational hazard which is also another hazard that there's not a lot of (inaudible @ 3:54:24) for.
- DR. GREEN: Yes, but it may vary between species.
- DR. GRAHAM: True.
- DR. GREEN: And that's where it gets back with *Aspergillus fumigatus* where you have the metabolic activation and the germination, and you have those release of high molecular weight antigens that some of them are actually characterized (pathogens @ 3:54:41). But with *Stachybotrys*, you don't have that. So that's where I think we'll need to look a little further into it and understand those responses.
- DR. GRAHAM: Yes, I mean just it's always helpful to different—just to mention that there's a differentiation between allergenicity and sensitization.
- DR. GREEN: Right, right.
- DR. GRAHAM: Just because of how it could be construed to mean—
- DR. GREEN: Yes. Yes.
- DR. BEHM: Mike. This discussion reminds me a little of the situation with other complex mixtures like polycyclic aromatic hydrocarbons where, when you try and study an individual agent, it may or may not be very mutagenic or carcinogenic, and then there's hundreds of other agents. And I think being able to study mixtures that you collect, you know, may reflect another reality from individual agents, which have their own characteristics but may be different from what you see in the real world. And you know, in air pollution there have been concentrators and other ways to get, you know, sufficient dose for exposure studies and with fungi, it should be the same to me.
- DR. GREEN: And this is also going to represent its own challenges because with mixed exposures, you have the production of secretory metabolites that actually suppress some of the other species. And so we'll be very interested to see what the results of these studies are.

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DR. BEHM: You're damned if you do and damned if you don't.

DR. BUNN: Grace.

DR. LEMASTERS: Yes, I was wondering about your future direction in neural inflammation. What is the mechanism you're thinking is going on there?

DR. GREEN: So it's very preliminary at the moment. As I mentioned, our collaborators have been, we've sent brain sections and they looked at various markers of inflammation. But they suspect a circulating protein is involved with that inflammation. So we plan on looking at that more extensively with our collaborator.

DR. LEMASTERS: So it's crossing the blood-brain barrier, this protein?

DR. GREEN: Right. Very preliminary though.

DR. HOWARD: I wanted to suggest a context. You know, one of the reasons that we asked Brett to come and present was, you know, oftentimes when we talk about translation, it's not that hard because it's after an intervention effectiveness study at the end of the line. And the Health Effects Laboratory Division that Brett is from is a basic science part of NIOSH.

DR. BUNN: Yes.

DR. HOWARD: And it's a challenge for them to figure out how you move their research because it's at usually a very early, or earlier, stage in the development process. So we thought it would be interesting for scientists from HELD to be able to present to the committee, to provide that context. NIOSH is not all, you know, intervention effectiveness out the door. We do a lot of very basic research. And it's a challenge to figure out how you move that forward, other than to the next levels of the research that Brett's talking about. So that's some of the context that we wanted to sort of enrich the committee's view of NIOSH.

DR. BUNN: I'd also like to add that, you know, being an immunotoxicologist by training, I should have mentioned that in the first place, but anyway, kudos to you guys for actually looking at physiological exposures, physiological levels of the fungi and the yeast, because that's number one. I mean, you can look at see the effects, you know, when you're looking at mega-doses of these, but what does it really mean? You need those physiological levels of exposure to really get a good handle on, first of all, are there effects? You're mentioning the mixtures. I mean first, you really need to, as you say, look at those single exposures and then start looking at the mixtures. So you know, kudos for what you're doing in this. It's a very, very important project.

DR. GREEN: Thanks.

DR. BUNN: Any other questions or comments? Oh, I see we did not get to, what, number 4?

DR. GREEN: That's right. I think we covered a lot of ground.

DR. BUNN: Well, actually I have a comment on that then, as far as the assays developed in Test 1. Are any of them kind of based on an ELISA model that would be kind of

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simple to use out in the field? If there's not, then maybe something could be developed in that regard.

DR. GREEN: Right. So in our earlier work that I referenced back in 2005, we were developed monoclonal antibodies.

DR. BUNN: Right.

DR. GREEN: And so, yes, those could be developed into ELISAs. But now, moving into the molecular realm, it's really—

DR. BUNN: Yes.

DR. GREEN: It's a little bit more challenging but at the same time, you're able to develop assays that are very specific for organisms that may be occupationally relevant and can be utilized and epidemiological studies get improved datasets. So...

DR. BUNN: Great. Any other questions/comments?

MR. GARCIA: Just before we move forward, we didn't receive any public comments written but I want to ask people on the phone or in the room if they have any public comments, to voice them now.

Okay.

DR. BUNN: All right, thank you. Great presentation.

All right, so do you want to speak first?

MR. GARCIA: No, you can.

SUMMARY & WRAP-UP, FUTURE AGENDA ITEMS, MEETING DATES, CLOSING REMARKS

DR. BUNN: All right. Okay, well, I think this has been a great set of presentations. I myself have been very excited about what was presented here, and we'll be looking forward to the next phase, which is hopefully in a year or two, listening to further results based on the input that has been provided today by everyone on the Board.

So, brings me to my next item as far as future agenda items that you would like to see in the next meetings. Happy to take any ideas that you have. One was mentioned, on the exposures to peracetic acid, are there any other suggestions for future meetings? Yes, Marc.

DR. SCHENKER: Well, I have suggested the issue of precarious workers and immigrant workers and the vulnerable workforce, which is I think is very real and significant.

DR. BUNN: Definitely. Other suggestions? All right. So I guess the next thing is as far as setting the next meeting date, I'm guessing that will be probably next May, Dr. Howard, or?

MR. GARCIA: Yes, I think that we were talking about doing it a little—March or April.

DR. BUNN: Oh, March or April this time?

DR. LEMASTERS: How soon? The sooner, the better as far as our schedules go. Can it be set up?

DR. BUNN: Yes.

MR. GARCIA: Yes, we will do it with Alfreda to look at Dr. Howard's calendar and maybe the later part of March or the first week of April timeframe.

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DR. HOWARD: Cherry blossom time.

DR. BUNN: Yes. Cristina?

DR. DEMIAN: Probably some information around, I don't know if it's relevant at all, but the ACOM meeting next year is in D.C. end of April/beginning of May.

DR. BUNN: Oh, okay.

DR. DEMIAN: I don't know if that helps, doesn't make any difference or...

DR. BUNN: Yes.

DR. HOWARD: Book your hotel room now.

DR. BUNN: All right, so I will turn it over to Alberto right now then.

MR. GARCIA: So I wanted just to say a quick thank you on behalf of NIOSH to all you guys for spending your day with us. We know that all the interactions that you have with the different programs are being taken to heart, and we truly appreciate all of you being here today with us.

I want to thank those retiring members. We'll miss you guys. The oncoming members, we welcome you and those of you who will remain with us, then we're happy to keep you.

And yes, I just wanted to say thank you very, very much for your time today and I hope that you enjoyed the meeting as much as we have.

DR. BUNN: All right, well, I would like to—yes, Pauline.

MS. BENJAMIN: I have something to say. Did everyone sign the register, and for your expenses, if you email them, that would be great. I know I gave you envelopes but email is always good. Thank you.

DR. BUNN: Thank you very much, Pauline, and I would also like to echo Alberto and thanking all of the four members who, for which this will be their last meeting, the welcoming of the five new members, and the current members as well, as well as to Dr Howard and to Dr. Kitt for providing us with great presentations on the current work that NIOSH is doing right now, very relevant, innovative work. So thank you very much for that.

DR. HOWARD: Before we adjourn, we need to make sure that we open it up for public comments.

MR. GARCIA: Oh, I did.

DR. HOWARD: We mentioned at the very beginning that no one had signed up but we need to make sure it gets opened up, and that's just a general call.

MR. GARCIA: Yes, I did it a few minutes ago.

DR. HOWARD: Oh, I apologize. I apologize. Sorry.

DR. BUNN: Yes. Okay. All right, anything else.

PARTICIPANT: What happened to your gavel?

DR. BUNN: Yes. All right, meeting adjourned.

[Adjourn.]

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G L O S S A R Y

ABPM	American Board of Preventive Medicine
ACGME	Accreditation Council for Graduate Medical Education
AEA	American Economic Association
AIHA	American Industrial Hygiene Association
AIHce	American Industrial Hygiene conference & expo
AOHP	Association of Occupational Health Professionals
ASSP	American Society of Safety Professionals
BSC	Board of Scientific Counselors
CDC	United States Centers for Disease Control and Prevention
CE/CME	Continuing Education/Continuing Medical Education
COSH	Conference and Exhibition on Occupational Safety and Health
CPSC	Consumer Product Safety Commission
CRA	Cumulative Risk Assessment
DART	Division of Applied Research and Technology
DOE	Department of Energy
DOL	Department of Labor
DOT	Department of Transportation
DSHEFS	Division of Surveillance, Hazard Evaluations, and Field Studies
EPA	Environmental Protection Agency
ERC	Emergency Response Center
FACA	Federal Advisory Committee Act
FDA	Food and Drug Administration
FSIS	Food Safety and Inspection Service
GPRA	Government Performance and Results Act
HELD	Health Effects Laboratory Division
HHE	Health Hazard Evaluation
HHS	US Department of Health and Human Services
HRSA	Health Resources and Services Administration
ILO	International Labor Organization
IOHA	International Occupational Health Organization
IRB	Institutional Review Board
MSHA	Mine Safety and Health Administration
NACOSH	National Advisory Committee on Occupational Safety and Health
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NORA	National Occupational Research Agenda
NPPTL	National Personal Protective Technology Lab
OEL	Occupational Exposure Limit
OMB	Office of Management and Budget

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OSHA Occupational Safety and Health Administration
PPE Personal Protective Equipment
TWE Total Worker Exposure

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Appendix A

**Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
Board of Scientific Counselors (BSC)
Agenda: Seventy-third Meeting**

NIOSH Offices
395 E Street, S.W., Suite 9000
Washington, DC 20201

Conference Number: 888-397-9578

Participant Code: 63257516

<https://odniosh.adobeconnect.com/nioshbsc/>

Tuesday – September 24, 2019

Time	Topic	Presenter
8:30 am	Welcome and Introduction Meeting Logistics	Alberto Garcia DFO, NIOSH
8:40 am	Agenda, Announcements, and Approval of Minutes	Dr. Terry Bunn Chair, NIOSH BSC
8:50 am	Director's Opening Remarks	Dr. John Howard Director, NIOSH
9:20 am	The Evaluation Turning Point	Dr. Amia Downes OPPE, NIOSH
10:20 am	Break	
10:30	Bullying, Harassment, and Physical Workplace Violence: Magnitude, Prevention Strategies, and Current NIOSH Research	Dr. Paula Grubb and Dr. Dan Hartley DSI and DSR, NIOSH
11:30 am	Lunch	See Lunch Suggestions in Folder
12:30 am	Public Comments	Alberto Garcia DFO, NIOSH
1:00 pm	Immunological Effects of Subchronic Fungal Exposure	Dr. Brett Green HELD, NIOSH
2:00 pm	Summary & Wrap-up, Future Agenda Items, Meeting Dates, Closing Remarks	Dr. Terry Bunn Chair, NIOSH BSC
2:30 pm	Adjourn	

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Appendix B

**National Institute for Occupational Safety and Health (NIOSH)
Board of Scientific Counselors Update
Washington, D.C.
September 24, 2019**

Budget

On Wednesday, 8 May 2019, the Appropriations Committee of the House of Representatives conducted a “mark-up” of the fiscal year (FY) 2020 appropriations bill for the Departments of Labor, Health and Human Services, and Education.

The House Appropriations Committee provided a total budget for NIOSH of \$346.3 million. This amount is \$10.0 million dollars above our FY 2019 funding level of \$336.3 million and \$156.3 million above the President’s proposed budget request of \$190 million.

Included in the House bill is an additional \$2 million for Education and Research Centers as a group, \$2M for the Agriculture, Forestry and Fishing Program as a whole (which includes the 10 Agriculture Safety and Health Centers); and \$2M for the Total Worker Health Centers as a group. Additionally, there is an increase of \$600K to support the Firefighter Cancer Registry, an increase of \$400K for the National Mesothelioma Registry and Tissue Bank and \$3 million for Other Occupational Safety and Health Research.

The text of the House Appropriations Committee mark-up is available at https://appropriations.house.gov/sites/democrats.appropriations.house.gov/files/FY2020%20LH_HS_Report.pdf.

The Senate Labor, Health and Human Services Committee provided a total budget for NIOSH of \$338.5 million which \$2.5 million above the FY 19 enacted mark. Specifically, the proposes the following increases: +\$1.000 million for Mining Research; +\$1.500 million for the Firefighter Cancer Registry and provides level funding for the Total Worker Health Program. Provides \$60.500

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million for the NIOSH Mining Program, an increase of \$1.000 million above the FY 2019 Enacted level, to provide additional grant opportunities to universities with graduate programs

Organizational and Personnel Announcements

Celebrating 100 Years of Respiratory Protection: Looking Back and Moving Forward

Earlier this month NIOSH celebrated 100 years of respiratory protection as part of our first annual Respiratory Protection Week. This event honored a century of respiratory protection research, evaluation, and testing and celebrates how far we have come in this effort to protect workers.

Today an estimated 5 million U.S. workers are required to wear respirators for their jobs. More than 11 million U.S. healthcare workers would need respiratory protection during an infectious respiratory pandemic. Respirators are critical for many workers, and our research helps to inform and improve the design and application of respirators to ensure worker safety and health.

Staff

- **Ray Wells, M.S., Ph.D.** has accepted the position of Branch Chief, Exposure Assessment Branch, Health Effects Laboratory Division (HELD).
- **Doug Johns, M.S., Ph.D.** has been appointed Director of the Spokane Mining Research Division (SMRD), effective September 29, 2019.

New Programs and Initiatives

Outbreak of Lung Injury Associated with E-Cigarette Product Use or Vaping

CDC has activated its Emergency Operations Center (EOC) in response to the national outbreak of lung disease associated with e-cigarette product use (vaping). Since 2015, NIOSH has recommended e-cigarettes and other electronic nicotine delivery systems be included within smoke-free workplace restrictions <https://www.cdc.gov/niosh/docs/2015-113/> and NIOSH is contributing to the current CDC response. As of September 17, 2019, 530 cases and 7 deaths had been identified across the nation. Respiratory findings such as nonproductive cough, pleuritic

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chest pain, or shortness of breath have been reported to occur over several days to several weeks before hospitalization. Systemic findings such as tachycardia, fever, chills, and fatigue; and gastrointestinal findings such as nausea, vomiting, abdominal pain, and diarrhea have preceded respiratory symptoms in some cases. Patients have had chest imaging findings such as bilateral infiltrates on chest radiograph and ground glass opacities on chest computed tomography scans. Many have been hospitalized with hypoxemia, which, in some cases, has progressed to hypoxic respiratory failure requiring invasive life support. Many of the patients who were treated with corticosteroids have improved. CDC is coordinating a multistate investigation and has engaged a range of partners, including the Food and Drug Administration (FDA), in responding to the outbreak. Interim guidance has been published in the Morbidity and Mortality Weekly Report (MMWR) at <https://www.cdc.gov/mmwr/volumes/68/wr/mm6836e2.htm>. Updated information for the public, healthcare providers, and state and local health departments is posted on the CDC website at https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html.

Future of Work

NIOSH has launched a Future of Work Initiative to address issues affecting the future of workplace safety and health such as new work arrangements, differences in organizational design, technological advances, and changes in demographics. These transformations offer many opportunities, such as new job creation, sustainable practices, and clean technologies, but they also bring challenges that impact the workforce, such as skill and job loss, job displacement, emerging occupational hazards and risks, and worker exclusion. A NIOSH workgroup hosted by the Division of Science Integration will address the future of work innovations, opportunities, and challenges through intramural and extramural collaborative activities aimed at improving the quality of working lives.

Artificial Intelligence (Ai)

NIOSH has launched an Ai Interest Group which brings together those scientists across the Institute that are using Ai methods to see new relationships in occupational safety and health data. A new webpage is being developed to showcase that work.

Faces of Work-related Chronic Obstructive Pulmonary Disorder (COPD)

Faces of Work-related COPD is an impact video series that is part of a National Occupational Research Agenda (NORA) Respiratory Health Cross-Sector Council initiative. The series of four short videos includes a physician explaining the disease and interviews with patients diagnosed with work-related COPD. The patients discuss work exposures, their quality of life living with the disease, and ways to minimize the risks of getting the disease.

<https://www.cdc.gov/nora/councils/resp/FacesCOPD.html>.

Participation in Workplace Health Promotion Programs

A [new study](#) by NIOSH researchers describes the availability of workplace health promotion programs and how sociodemographic and work organization characteristics affect participation in these programs. Close to 47% of workers have access to, and among those with access, only 58% of workers take advantage of them.

Office of the Director (OD)

Upcoming International Conferences

The XXII World Congress on Safety and Health at Work will be held October 4-7, 2020 in Toronto. Our Canadian colleagues have put together an exciting program with the theme of *Prevention in the Connected Age*. The Call for Abstracts is now open with submissions due December 15, 2019. The announcement and preliminary program can be found at <https://www.safety2020canada.com/>.

The World Social Security Forum will be held in Brussels, Belgium 14-18 October 2019. The International Social Security Association (ISSA) Special Commission for Prevention will hold its meeting during the Forum. More information is available at <https://ww1.issa.int/wssf2019>

Division of Science Integration (DSI)

Occupational Exposure Banding

NIOSH published a new technical report in July 2019, *The NIOSH Occupational Exposure Banding Process for Chemical Management* (<https://www.cdc.gov/niosh/docs/2019-132/default.html>). The report offers employers a way to categorize those chemicals that do not have occupational exposure limits (OELs). OELs establish a guideline for the levels at which chemicals can cause harm to human health. There are more than 75,000 chemicals in commerce without OELs. To facilitate the occupational exposure banding process, NIOSH also developed and launched an online occupational exposure banding electronic tool (e-Tool; <https://www.cdc.gov/niosh-oeb/Home/Index>). NIOSH is currently working with the American Industrial Hygiene Association (AIHA), American Society of Safety Professionals (ASSP), and other stakeholders to promote and disseminate the occupational exposure banding information through professional development courses, presentations, and outreach to small businesses.

NIOSH Quality of Worklife Survey

The fifth wave of data collected in 2018 from the NIOSH Quality of Worklife Survey (QWL) is now available to download from the General Social Survey (GSS) website, <https://gss.norc.org/>. The QWL is the only national survey in the U.S. devoted to tracking work organization factors and their impact on worker health, safety, and well-being. The QWL is a module in the GSS and has been administered every four years since 2002. The QWL plays a vital role in guiding work organization and stress research within NIOSH and is a primary data source for the Healthy Work Design and Well-being cross-sector program. It has been heavily utilized by external researchers for publications and other efforts. For example, the QWL is being used to develop a general population job exposure matrix of work organization hazards, and NIOSH is working with external partners to develop a work organization assessment tool for manufacturing that is based on the QWL. More than 34 papers based on the QWL have been published. QWL key trends can be explored at <https://gssdataexplorer.norc.org/trends>. More information about the survey is available at <https://www.cdc.gov/niosh/topics/stress/qwlquest.html>.

Occupational Health Equity Program and the Future of Work

The Occupational Health Equity Program is collaborating with the Mexican Foreign Ministry and U.S. occupational safety and health organizations to explore the feasibility of promoting safety as a career path for immigrant workers and their children. This project integrates the three areas of concern for the consulates: health, education, and economic success. The project targets three groups: workers, students, and small business owners/entrepreneurs. Programming for workers focuses on improving access to formal training and certification as a way of securing employment (e.g., Occupational Safety and Health Administration [OSHA] 10), getting better paying jobs (e.g., Hazardous Materials Handling), and potentially leading to safety-centered jobs such as trainers (e.g., OSHA 30). Programming for college-bound immigrants and children of immigrants focuses on raising awareness of the different safety professions and providing information about safety-related academic programs including existing safety-related financial resources such as scholarships and internships. Programming for small business owners and entrepreneurs focuses on incorporation and maintenance of a small business. Safety-related topics are an integral component of the classes.

Division of Field Studies and Engineering (DFSE)

Continued Expansion of Industry and Occupation Coding

DFSE scientists are currently conducting a pilot study with 10 states to code Occupation and Industry from death certificates using the NIOSH Industry and Occupation Computerized Coding System (NIOCCS). This a collaborative effort between NIOSH, the National Center for Health Statistics, and the states. Beginning in January 2020, industry and occupation data from 47 states will be coded using NIOCCS and returned to the states. This effort will significantly enhance the ability of states to evaluate their mortality data by industry and occupation.

International Symposium on the Effects of Complex Noise Exposure on Hearing

NIOSH arranged an *International Symposium on the Effects of Complex Noise Exposure on Hearing* at the State University of New York (SUNY) in Plattsburgh on August 27-29, 2019. Attendees discussed the state-of-the-art research and findings from the joint collaboration

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between NIOSH, the US Office of Naval Research, Institut National de la Recherche Scientifique (INRS), SUNY-Plattsburgh, and the University of Montreal regarding the effects of complex noise on hearing in Chinese industrial workers. The main goal of this symposium was to use information and recommendations produced by the various working groups to update national guidelines for exposure to complex and impulsive noise in the U.S., including the NIOSH 1998 criteria document on noise exposure.

Update to Federal Guidelines to Assess and Respond to Cancer Clusters

DFSE is represented on the Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR) workgroup to update the 2013 federal guidelines on public health agencies' assessing and responding to potential cancer clusters in communities. The update began 2018 in accordance with the Trevor's Law provision within the [Frank R. Lautenberg Chemical Safety for the 21st Century Act](#). The updates, expected to be published in 2021, will ensure that stakeholders have access to current information about scientific tools and approaches. More information is available at: <https://www.cdc.gov/nceh/clusters/guidelines.htm>

Division of Safety Research (DSR)

Board of Certified Safety Professionals Foundation Hosts First Research and Innovation Summit

The Board of Certified Safety Professionals hosted its first biennial [Research and Innovation Summit](#) August 6-7, 2019 in Indianapolis, IN. NIOSH supported the summit as a partner organization. Researchers from the Division of Safety Research participated in multiple panels which included the Executive Panel on Research and Future of Safety and in a Professional Panel on Practical Application of Research and Innovation; Fall Safety Research Conducted by NIOSH; Effectiveness of Slip Resistant Footwear Program for Reducing Workers' Compensation Claims; Motor Vehicle Safety in the Workplace: Research and Best Practice. The NIOSH Office of Health Communication also presented a session on Organization and Culture that can Support or Suppress Innovation.

Crowdsourcing Competitions to Refine Machine Coding of Occupational Injury Narratives

Machine learning can help occupational health and safety surveillance systems find scalable and sustainable solutions. A multi-federal-agency team, the //m_BrainGineers, are crowdsourcing programmers who are developing artificial intelligence (Ai) software to classify work-related injuries using narrative text. From March to May 2019, the team hosted the first CDC-wide intramural crowdsourcing competition, and the resulting natural language processing algorithm significantly outperformed NIOSH's existing program. The winning deep-learning model will provide the baseline for an upcoming extramural competition. The team, through a NIOSH-NASA Inter-Agency Agreement, and the NASA Center of Excellence for Collaborative Innovation (<https://www.nasa.gov/coeci/ntl>), will host the extramural crowdsourcing competition.

NIOSH Center for Motor Vehicle Safety: Evaluation and Strategic Plan

The NIOSH Center for Motor Vehicle Safety (CMVS) recently published an evaluation of its 2014-2018 strategic plan (<https://www.cdc.gov/niosh/docs/2019-166/>), including the main report, assessment of progress on performance measures, and impact stories on improving motor vehicle safety. The evaluation package has been submitted as the NIOSH entry in the CDC-wide evaluation competition. The CMVS is working on a new strategic plan, to become effective in 2020. The new plan will align with the NIOSH Strategic Plan by focusing on four industry sectors where motor vehicle safety is a priority: Oil and Gas Extraction; Public Safety; Transportation, Warehousing, and Utilities; and Wholesale and Retail Trade. Public comment will be sought via the Federal Register, and input to the docket will be appreciated. Target date for publication is late 2019-early 2020.

Health Effects Laboratory Division (HELD)

Peracetic Acid (PAA)

A novel PAA inhalation exposure system has been developed by the Inhalation Facility Team. Unlike previously reported research, this system allows unrestrained plethysmography (UP) measurements on mice during peracetic acid vapor exposures. PAA is used as a disinfectant in multiple settings including hospitals, and food processing facilities. The major advantage of UP

over restrained plethysmography is that the animals are measured under normal, low-stress conditions. The system has been used to expose animals to several vapor concentrations of a commercially available PAA mixture. Respiratory data and histopathological samples from the nasal passage have been collected and are currently being evaluated.

National Personal Protective Technology Laboratory (NPPTL)

Evaluation of Chemotherapy Gloves against the Permeation of Chemotherapy Drugs

NIOSH is conducting a post-market product audit research study to evaluate the performance of commercial chemotherapy gloves. NIOSH is using an accredited third party testing laboratory to evaluate 18 chemotherapy drug models from six different manufacturers. The ASTM test method for evaluating the performance of chemotherapy gloves is used to assess the permeation of nine different chemotherapy drugs for each glove sample. Permeation results will be compared to manufacturer's claims. Upon reviewing the data, NIOSH will seek to inform a consensus based post-market conformity assessment sampling standard, enhanced language for existing ASTM performance standards, and intervention and outreach materials for healthcare workers.

Turnout Gear Lifecycle Project

Turnout gear used by structural firefighters protects them from a variety of hazards such as heat, flame, and bloodborne pathogens. Currently, turnout gear retirement is linked to the age of the gear rather than the performance of the gear. NIOSH is conducting a study that will sample turnout gear coats and trousers from multiple fire departments. For each article sampled, use history estimates will be generated, which will be used to understand the relationship between the article's performance and its use history. Because the fire services industry certifies the performance of turnout gear using fabric rolls, NIOSH's current activities for this project include developing a methodology to evaluate constructed garments to these same tests and considerations. Developing this test methodology will be a significant step towards understanding the relationship between use and performance for turnout gear coats and trousers.

NPPTL Develops and Demonstrates a Secure Hospital Data Exchange Infrastructure for Emergency Response

NIOSH is currently developing a scalable technology infrastructure that allows information to be securely exchanged between hospitals and emergency response entities, such as hospital coalitions, health departments, emergency stockpiles, the CDC, and ASPR. Partnering with the Center for Medical Interoperability (CMI), NIOSH is initiating and facilitating the development and demonstration of this infrastructure. The initial application will be to address hospital personal protective equipment (PPE) shortages that may occur during pandemics or other public health emergencies. Using the data exchange infrastructure as the backbone, NIOSH and CMI will develop the software needed to obtain PPE inventory data from hospitals and securely exchange it with other stakeholders that will use the data to (1) trigger early intervention when localized shortages are on the horizon and (2) match stockpile inventories with that of regional hospitals. This data exchange will be demonstrated at six hospitals and expand to thirty hospitals and other entities through 2021. Once developed, this infrastructure may be used to securely exchange any type of information amongst any number of stakeholders. To support this expansion, NIOSH will be developing a stakeholder partnership organization to encourage participation, brainstorm ideas and plan next steps for this data exchange.

Respiratory Health Division (RHD)

Coal Workers' Health Surveillance

The 2019 Enhanced Coal Workers' Health Surveillance Program conducted screenings from April through June in several coal mining regions in the western part of the U.S. The team departed on April 1 and returned the first week of June. Nearly 1,000 miners were screened in the first month of the eight-week survey, with a total of 2,059 screened as of June.

Healthcare Disinfection Product Containing Hydrogen Peroxide, Peracetic Acid, and Acetic Acid

Researchers in RHD recently completed a health hazard evaluation (HHE) describing workplace exposures to a sporicidal cleaning agent that contains hydrogen peroxide, peracetic acid, and

acetic acid and associated respiratory symptoms among workers at a large healthcare facility. Hydrogen peroxide and peracetic acid were detected in all personal full-shift air samples. Some employees exposed to vapors from the sporicidal product reported work-related, eye, upper and lower airway, and skin symptoms. Researchers recommended that management tailor use of sporicidal products containing hydrogen peroxide, peracetic acid, and acetic acid to areas of high risk for healthcare acquired infections and minimize the use of sporicidal products on noncritical surfaces and in non-patient areas. Researchers also recommended management provide workplace accommodations for employees who develop symptoms related to the use of products containing hydrogen peroxide, peracetic acid, and acetic acid. Additionally, researchers recommended several ways to reduce employee exposure to the hydrogen peroxide, peracetic acid, and acetic acid vapors and liquids from the sporicidal product.

Previously Unrecognized Occupational Lung Disease in Manufacturing Workers

RHD scientists led an investigation of a cluster of severe lung disease in industrial machine-manufacturing workers and reported their findings in an August 2019 publication: <https://onlinelibrary.wiley.com/doi/abs/10.1002/ajim.23038>. They described a new pattern of lung disease characterized by lymphocytic bronchiolitis, alveolar ductitis, and emphysema, and called for additional research to clarify etiology and guide prevention.

Electronic Health Records (EHR)

NIOSH is building a prototype that demonstrates a methodology for collection of Occupational Data for Health (ODH) for health information systems. Usability testing will be conducted this fall and winter.

The full HL7[®] *Work and Health Functional Profile* of the EHR-System Functional Model became available for public download in July 2019. (As noted in May, a Functional Profile is a set of specific directions for software developers to use, in this case, for the collection, management, and use of ODH in electronic health record systems. Vendors use Health Level Seven (HL7)[®] products to develop software for EHR and health information systems). HL7[®] Interoperability Standards in all three product lines that contain ODH [(V2, Clinical Document

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Architecture (CDA), and Fast Healthcare Interoperability Resources (FHIR)] are expected to be published by HL7[®] for Trial Use fall, 2019.

Additional vocabulary for capturing ODH, including Industry and Occupation, will be made publicly available through CDC's Public Health Information Network Vocabulary Access and Distribution System (PHIN VADS).

Respiratory Hazards in Dental Practice Research

Researchers in RHD published a [report](#) in 2018 describing a small case series of idiopathic pulmonary fibrosis (IPF) that had occurred among current and former dentists treated at a Virginia IPF treatment center. The number of dentists identified was 29-times higher than the number expected to be treated. In the past few months, RHD researchers have been awarded two intramural grants to further investigate the association between IPF and dental practice. The first study will involve a thorough exposure assessment in collaboration with West Virginia University that will be conducted at a range of dental practice facilities involving numerous specialties. The second study will involve several projects, including a mortality assessment of U.S. dentists conducted in collaboration with the American Dental Association, an expanded case series identifying dental personnel treated for interstitial lung disease at six U.S. IPF treatment centers, and an assessment of lung tissue specimens from dental personnel treated for IPF using scanning electron microscopy and energy dispersive X-ray spectroscopy.

Training Physicians to Read Chest X-Rays

Established contract with the American College of Radiology to provide B Reader training to physicians in International Labour Organization classification of chest x-rays for findings of pneumoconiosis.

Total Worker Health® (TWH)

Opioids Coordination Efforts

NIOSH is applying *Total Worker Health*® principles to develop solutions to help workers and employers face the opioid epidemic in their communities. Included in these efforts are a meeting, *Advancing Workers' Compensation Research to Prevent and Treat Worker Opioid Use Disorders*, convened in July with more than 40 national Workers' Compensation experts, stakeholders, and working professionals. The event was held on the NIOSH campus in Cincinnati, Ohio. A formal proceeding document from this meeting is being developed.

In partnership with Hamilton County Public Health an Opioid Awareness Seminar was presented for all NIOSH Cincinnati employees, including Naloxone Safe User Training. Attendees received hands-on instruction for safe administration of naloxone and a free Naloxone kit to keep with them. A large number of NIOSH staff have been trained, creating a valuable community resource for an especially hard-hit region. Related, NIOSH also launched an intranet resource featuring "Important Information on the Opioid Crisis for Workers at NIOSH". This resource provides information on the connection between opioids, work and working conditions, and regions of the country strongly impacted by the opioid overdose epidemic.

We continue to update NIOSH's opioid portal with valuable tools, data, resources and actionable information. More here: <https://www.cdc.gov/niosh/topics/opioids/>

Total Worker Health® 1st Edition

This book was published in July and brings together the state-of-the-science knowledge on integrative prevention strategies that safeguard and ensure the health and well-being of workers. It includes contributions from over 60 researchers and practitioners at the forefront of the *Total Worker Health*® field. The textbook is already being used by a number of TWH graduate certificate and degree courses. (consider passing around a copy for perusal)

Total Worker Health® Affiliates Program

The total number of affiliates is at 48, an increase of 12 new Affiliates over the last year. Most of the affiliates gathered this July for a 3rd face-to-face meeting, held across the street at NASA's

headquarters, one of our earliest Affiliates. Due to increasing global demand, the *Total Worker Health*[®] Affiliates program is considering opening membership to select international entities.

Western States Division (WSD)

NIOSH Maritime Center Pilot Funds

The NIOSH Center for Maritime Safety and Health Studies announced one-year funding for pilot projects (during FY 2020) to conduct research in any area of maritime occupational safety and health, including research in the marine transportation, marine cargo handling, shipbuilding and repair, seafood processing, commercial fishing, and aquaculture industries. The intent is to fund these pilot projects so that the findings can be used to develop future NORA research projects. Proposals are encouraged that meet a wide variety of objectives, including collection of data to better understand an occupational hazard, establishing burden and need, or identifying a potential solution to a known or emerging hazard.

American Indian/Alaska Native OSH Workshop

In July, NIOSH hosted a workshop in conjunction with the Center for Work, Environment, and Health at the University of Colorado titled, “Building Bridges to Enhance the Well-being of American Indian and Alaska Native (AI/AN) Workers”. In attendance were 52 participants from a number of different tribes and tribal-serving organizations, OSHA, and representatives from the NIOSH Office of the Director and several NIOSH divisions (DFSE, DSI and WSD). Information collected during the workshop will be used to finalize a strategic plan focused on addressing the highest priority occupational safety and health issues among AI/AN workers.

Wildland Firefighter Research

In August, nineteen researchers from four different NIOSH divisions traveled to Idaho to conduct biological sampling and exposure monitoring with a US Forest Service wildland fire hot shot crew that was fighting the Cove Creek Fire. This research is part of the four year NORA project titled “Acute, Subacute, and Long Term Health Effects of Wildland Fire Fighting.” This is the first study ever to follow a cohort of wildland firefighters multiple times during a single fire

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season and across multiple fire seasons to identify both acute and long term health effects that may be associated with fighting wildland fires. The complexity of the study requires support from and collaboration across numerous NIOSH divisions including DFSE, DSR, HELD, RHD, SMRD, and WSD.

Social Presence Statistics

NIOSH continues to expand its presence on social networks.

NIOSH Social Media and Public Outreach Accounts and Services		2018	2019
<u>Facebook</u>	Number (#) Likes in month of August	134,899	142,565
<u>Twitter</u>	# @NIOSH Account followers	306,746	305,495 *
<u>Instagram</u>	# Followers as of August 31	1,870	3,221
<u>YouTube</u>	Cumulative # videos posted	215	269
	Cumulative # of views	605,629	899,917
<u>LinkedIn</u>	# of NIOSH members as of Aug 31	713	841
<u>NIOSH Website</u>	# of Views in month of August	1,396,605	1,421,326
<u>eNews</u>	# of Subscribers as of August 31	72,692	77,867
<u>TWH in Action! eNewsletter</u>	# of Subscribers as of August 31	79,660	64,403**
<u>Research Rounds Newsletter</u>	# of Subscribers as of August 31	69,931	55,350**
<u>Science Blog</u>	Cumulative total # of blog entries as of August 31	501	555
	Cumulative total # of comments as of August 31	7,823	8,514
	# of Views in month of August	34,765	31,286

* Twitter is actively deleting inactive accounts

** Due to a change in subscription services some subscribers were lost

NIOSH Publications

May 2019

[Prevent Construction Falls from Roofs, Ladders, and Scaffolds](#)

[Medication-Assisted Treatment for Opioid Use Disorder](#)

[Advanced Manufacturing Initiative](#)

[NIOSH Health Effects Laboratory Division \(HELD\) Fact Sheet](#)

[Division of Science Integration](#)

[Division of Field Studies and Engineering](#)

June 2019

[NIOSH Oil and Gas Extraction Program](#)

[NIOSH Personal Protective Technology Program](#)

[NIOSH Center for Motor Vehicle Safety](#)

[NIOSH Immune, Infectious and Dermal Disease Prevention Program](#)

[NIOSH Hearing Loss Prevention Program](#)

[NIOSH Healthcare and Social Assistance Program](#)

[NIOSH Manufacturing Program](#)

July 2019

[The NIOSH Occupational Exposure Banding Process for Chemical Risk Management](#)

[NIOSH Transportation, Warehousing and Utilities Program](#)

[NIOSH Engineering Controls Program](#)

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[NIOSH Traumatic Injury Prevention Program](#)

[NIOSH Respiratory Health Program](#)

[NIOSH Safe Skilled Ready Workforce Program](#)

[CPWR Center for Construction Research and Training, National Construction Center](#)

[NIOSH Construction Program](#)

[NIOSH Small Business Assistance Program](#)

August 2019

[Illicit Drugs, Including Fentanyl: Preventing Occupational Exposure to Emergency Responders—
Using Personal Protective Equipment](#)

[NIOSH Center for Occupational Robotics Research](#)

[NIOSH Center for Workers' Compensation Studies](#)

[NIOSH Health Hazard Evaluation Program](#)

[NIOSH Emergency Preparedness and Response Program](#)

[NIOSH Nanotechnology Research Center](#)

[Small Business International Travel Resource](#)

Certification Statement

I hereby certify that, to the best of my knowledge and ability, the foregoing minutes of the September 24, 2019, meeting of the NIOSH Board of Scientific Counselors, CDC are accurate and complete.

_____ 10/15/19 _____
Date

Terry Bunn

Terry L. Bunn, Ph.D.
Chair, NIOSH Board of Scientific Counselors