

**NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH  
BOARD OF SCIENTIFIC COUNSELORS (BSC)  
May 15, 2018**

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**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)**

SEVENTIETH MEETING

**BOARD OF SCIENTIFIC COUNSELORS**

**(BSC) MEETING**

May 15, 2018

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

Meeting held on May

15, 2018, 8:30 a.m.

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**PARTICIPANTS**

(alphabetically)

KARLA ARMENTI, ScD - BOARD MEMBER  
MICHAEL BEHM, PhD - BOARD MEMBER  
TERRY BUNN, PhD - BOARD MEMBER  
SHARON COOPER, MD - BOARD MEMBER  
THEODORE COURTNEY - BOARD MEMBER  
ALBERTO GARCIA - DESIGNATED FEDERAL OFFICER  
GRUDEN - BOARD MEMBER  
JOHN HOWARD, MD - DIRECTOR  
CHRIS LASZCZ-DAVIS - BOARD MEMBER  
GRACE LEMASTERS, PhD - BOARD MEMBER  
JUDITH MCKENZIE, PhD - BOARD MEMBER  
MARK NICAS, PhD - BOARD MEMBER  
CHARLES REDINGER, PhD - BOARD MEMBER  
BONNIE ROGERS, PhD - BOARD CHAIRPERSON  
RONALD STOUT, MD - BOARD MEMBER

CHRISTINE BRANCHE  
AMIA DOWNES  
SARAH FELKNOR  
REBECCA GUERIN  
SELCEN KILNIC-BALCI  
RENE PANA-CRYAN

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**WELCOME AND INTRODUCTION, MEETING LOGISTICS**

MR. GARCIA: Good morning, everybody. I wanted to thank everybody for coming today and hopefully we'll have a very successful meeting. I wanted to start the meeting by thanking everybody here in D.C. that always helps us to get this meeting going and all the support that we from other staff locally.

The first issue I want to address is emergency exits. If we were to, for some reason, need to leave the building, we'll go down through the door we came in. We'll turn right and then we'll turn left on the (Hyatt @ 00:07:16) place, which is Fourth Street, I believe.

PARTICIPANT: Yes.

MR. GARCIA: And then we'll walk about a block and a half and we'll find a baseball field and we'll be inside the baseball field.

So, we want to remind you that this is a Federal Advisory Committee and the Board of Scientific Counselors is subject to the rules of a FACA committee and we'll be running the meeting based on those rules. One of the important things for FACA is that we ensure all the members that are present and on the phone also have no conflict of interest or at least managing those conflicts of interest accordingly. So when we do a roll call, I'll ask that you guys say your name and if you have any conflicts of interest.

The other thing I want to mention is for the third time, we won't be taking minutes itself. We are doing recordings, so everything that you say is going to be on record and it's going to be transcribed verbatim to what you say. So just be mindful of that. When we do the roll call, Michael, who is sitting in the back of the room, he's helping us with all the audio, and it will be helpful if when you speak if you say your name. That way they can capture what we're trying to do and capture on the minutes accordingly.

So I guess with that, unless Dr. Howard, Doctor, if you don't have anything, we'll do a roll call and then I'll give the meeting to Bonnie. So let's start with Dr. Redinger.

DR. REDINGER: Thank you, Alberto. I'm Charles Redinger and I have no conflicts.

DR. LEMASTERS: Grace LeMasters, no conflicts.

DR. NICAS: Mark Nicas, no conflicts.

MS. GRUDEN: MaryAnn Gruden, no conflicts.

DR. ROGERS: Dr. Bonnie Rogers, no conflict.

DR. BUNN: Terry Bunn, no conflict.

DR. STOUT: Ron Stout, no conflicts.

DR. COOPER: Sharon Cooper, no conflicts.

MR. GARCIA: All right, I know we have at least three members on the telephone, so if you mind, state your name and conflicts. Ted?

DR. MCKENZIE: This is Judith McKenzie. I have no conflicts.

DR. ARMENTI: And Karla Armenti, I have no conflict.

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MR. COURTNEY: Hi, this is Ted Courtney. I have no conflicts.  
DR. BEHM: Hi, this is Mike Behm. I have no conflicts.  
MR. GARCIA: Great. All right, so with that, I'll turn the meeting to Dr. Rogers.  
DR. ROGERS: Okay, good morning, everyone.  
PARTICIPANTS: Good morning.  
DR. ROGERS: I take it you all had a good trip in with the storm last night.  
PARTICIPANT: And another one today.  
DR. ROGERS: And another one today. What time is that heading in, do you know?  
PARTICIPANT: Usually they're later, like five, six, seven.  
DR. MCKENZIE: It's a little bit difficult to hear on the phone, I'm sorry.  
DR. ROGERS: We're just whispering, sorry. We're talking about the storm in D.C. So you're not missing much, it's all right. Well, get ready for another storm today, so we have the agenda before us. So you see what that's about, the whole agenda until about 2:30 this afternoon and have a lot of good presentations today so that'll be fun. And the minutes are there for approval. Any additions or corrections, anyone?  
Ron?  
DR. STOUT: Just to note the honorary PhD I received..  
PARTICIPANT: Oh, well, it will be in the mail.  
DR. ROGERS: Well that's good, huh? Any other additions, corrections to the minutes?  
MR. COURTNEY: Bonnie, this is Ted Courtney. There's a section where I talked about disaster relief workers and in that section, I think the transcript recording came up with, "I think disaster relief on September 11..." It was, "I worked disaster relief on September 11..." with Red Cross and Baptist Disaster Relief.  
DR. ROGERS: Do you happen to know where that is?  
MR. COURTNEY: I will shout it out here in a second.  
MR. GARCIA: And Ted, if you can email me when you find out.  
MR. COURTNEY: I can email it to Alberto, yes.  
DR. ROGERS: Other than that, are there any other additions or corrections? Do we have a motion to approve?  
DR. REDINGER: I move that we approve the minutes, Charles Redinger.  
DR. ROGERS: Second?  
DR. STOUT: Ron Stout, second.  
DR. ROGERS: All right, let's have the minutes approved with the correction added when Ted gets that to Alberto. Is that acceptable? Good? Perfect. Any announcements anybody has?  
MR. COURTNEY: Oh, Bonnie? Alberto has asked me to say just a little bit about my status. So I was planning to be there for the meeting. My apologies for not being able to make it in-person. But the good news is, I started a new position at Harvard Medical School. I don't know if all of you know but the Research Institute for Safety at Liberty Mutual closed last June. So I'm now at Harvard Medical School full-time. I'm the Executive Director of the Football Players Health Study at Harvard and we're

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doing work looking at obviously exposure to professional football athletes but it has cross-cutting impact for public health in areas like cardiovascular heart disease, metabolic syndrome, science-related problems like CTE, Alzheimer's and dementia. So I'm really excited to be in my new group and they are also highly supportive of my activity with the board. So we apologize, we had an inescapable conflict that came up today to where I couldn't travel. So I'm only able to join you for the first chunk of the meeting. So my apologies, in particular to Sarah and Rebecca's presentations I was really looking forward to. I will definitely read through those and get back to you if I have any further stuff. But glad to be back in a permanent role and glad to have a group that's very supportive of my work with the board.

DR. ROGERS: Well, thank you, Ted and congratulations on that. So how long have you been there?

MR. COURTNEY: A week.

DR. ROGERS: Well that's really exciting news for you. I'm really glad, good for you, excellent.

MR. COURTNEY: Thank you.

DR. ROGERS: Okay, any other announcements? Any other exciting new jobs? Yet? No, all right. So first on our agenda of course is the comments by our director.

**DIRECTOR'S OPENING REMARKS**

DR. HOWARD: Sure, yes, thank you and Judith, can you hear me on the telephone?

DR. MCKENZIE: Yes, I can hear you.

DR. HOWARD: Oh okay, great, thank you.

MR. COURTNEY: Reasonably, John, if you could really project, that would be great.

DR. HOWARD: Well, that part I—

DR. MCKENZIE: You guys in the room are very muted. It's not loud, it's not loud.

DR. HOWARD: Yes, well I'm not sure I can do much more than increase the volume. So you may have to see if you can increase the volume on our phone. But we—you know, our sound is being picked up. It comes from there. So from a ceiling-mounted device which usually works pretty well. So, so apologize for that. Thank you, Michael, for your transcription. This is I believe the first time that we started or did we do it last time?

TECHNICIAN: Yes, we did it last time.

DR. HOWARD: Okay, all right, so appreciate that. I always remember an (IAQA @ 00:15:19) meeting that we had in Illinois one time and Senator Obama came to the meeting. And he kept referring to "NIOSHA" and we managed to extract that from the transcript. So if anybody makes that kind of error today, there's always the chance we can—although I had a fight with the transcriptionist who said, "No, no, he said NIOSHA." I said I don't think he's planning to combine OSHA and NIOSH together if he ever gets to the White House.

So the noise that you may hear in the room comes from the construction crew in the building. They're preparing for the Inspector General for DHS to move into our

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building. So that's all the hammering and stuff that you may hear, unfortunately. The cameras in front of the building are for Mr. Mueller, who may emerge to get coffee during the day or at lunch, or to see people that are coming into the building to talk to Mr. Mueller. He's on the second and third floor.

So Ted, congratulations on your new job and appreciate still remaining with our group. So I have two bittersweet things to do at the beginning. This will be the last meeting for Bonnie as our Chair and I just want to thank you for all of your great efforts. Don't feel too bad because we have a couple other jobs lined up for you. Nobody ever leaves NIOSH. But I wanted to present you this certificate of appreciation. Yes, so thank you.

DR. ROGERS:

Thank you.

[Applause.]

DR. HOWARD:

And then another one of our members, MaryAnn, exits also but never exiting NIOSH totally, just in this position. This meeting will be the last and we really appreciate you joining us and hope that you come around for another round.

MS. GRUDEN:

I'd love to. Thank you, it's been an honor and a pleasure.

[Applause.]

DR. HOWARD:

Okay, so I have to apologize for the nametags. Alberto was very upset because our Federal Express package did not arrive from Atlanta. We should have given it to Amia to bring up on the plane. But it ended up at the Federal Express warehouse somewhere in northeast. And my assistant Alfreda drove there last night to pick it up. So we made these nametags that are inferior to Alberto's. So we apologize to Alberto for that, that issue. So but we did retrieve them, so if you want your own nametag, your own placard, we have them in the box. So sorry about that, Alberto.

So I'll be brief. We have some great presentations today and hopefully, we can get some real good discussion going and then Alberto, as is the custom now, put all of the remarks, except the budget remarks, into your handout here. So I'm not going to go over all of that material. So if you have a question about any of it, then just shout out. I did want to explain the budget because it is a little hard to understand what's going on here in Washington with the federal budget. So as some of you remember, the President's Proposed Budget for FY18 which began in October 1, 2017 and extends through September 30, 2018, so we're now in May and September is not too far away. We actually start closing the books in June. So we were able to get a budget here about a month ago. We haven't actually gotten our ceiling levels which allows us to spend, etc. So it's another late year.

Surprisingly, even though the President's budget proposed a 40% reduction in the NIOSH budget to \$200 million from \$335.2, the Congress passed a budget that was a \$335.2 million budget for FY18, so essentially flat, as we say which was a great relief and surprise at the same time.

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Now, the President signed the budget but was very reluctant to sign the budget immediately and, as is the case with a lot of administrations, asked to return some money from the budget. That's called a rescission and it's allowed under the Budget Impoundment Act of 1974, which was passed in the Nixon years. The rescission package that was sent to make things even more complicated—that was sent to the hill actually did not attempt to take away appropriations in FY18 but rather to collect funds that were lying around, not being used, somewhere in the neighborhood of \$15 billion.

For us, one of the effects of that is some money that we had for the future began to rely on for the campus consolidation in Cincinnati which is in the non-expended fund, or the NEF, of the Department of Health and Human Services. And the proposal is to take money from the NEF and that would take money from our budget. The NEF, however, can be replenished with monies that are not used from the Department of Health and Human Services.

So the rescission package is currently being considered by the House and they expect—they were going to vote on it this week and they decided to put it off because there is some concerns about money that is targeted in the Children's Health Insurance Fund or CHIP. And then the Senate will do it—the problem with all of the rescissions is that the Congress has 45 legislative days to consider rescission. So that puts one into somewhere in October, if you count out the number of vacation days versus legislative days that the Congress has. So right now we don't know about the rescissions. The White House, OMB has suggested that there might be additional rescission requests sent to the Congress. So it's a new complication and makes the budgeting issues more complex.

Meanwhile, the President's proposed '19 budget is a little hard to explain. It is a budget that provides or proposed a total appropriation for NIOSH of \$200 million again. So that's a 40% reduction like FY18. It also proposes to realign NIOSH within NIH. However if you read the language very carefully, it's NIOSH would go into NIH initially as it is a separate institute but NIH would then have the ability and the obligation to review the feasibility of consolidating NIOSH programs in other NIH institutes. The budget when you look at the budget for NIH, we're now included in the proposed '19 budget as \$200 million. When you look at the budget in CDC for NIOSH, it's zero. So what it is is an actual savings of the total federal budget because NIH is expected to absorb the NIOSH budget in their \$38, \$39, \$40 billion budget. I'm not sure what it is lately. So that would be for OMB budgeteers a savings of \$200 million.

The other part of the '19 budget would separate one of NIOSH's programs, the World Trade Center Health Program, and it would remain in CDC and the rest of NIOSH would go off to NIH. So the FY19 Budget is a bit complex to understand and to absorb but it is a proposed budget and it's unlikely that there will be a budget for FY19 passed in time for October 1, 2018, even though the Senate and

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the House are rapidly going through the 13 appropriation bills. This Thursday at 10 o'clock, Dr. Collins will be testifying in the Senate Health Committee on the NIH budget. So the Congress is moving ahead but it's unlikely that they will do a budget on time since it's been quite a number of years that a budget has been done on time. And during a mid-year election year, it's probably not to the advantage of the minority to do a budget until they see the outcome of the election in November.

So that's the budget and it's taken a little longer than usual to explain it but happy to answer any questions that anyone may have.

DR. ROGERS: Questions? Questions on the phone? Everybody in shock.

MR. COURTNEY: So John—this is Ted—so did I hear you right that the expectation is the budget that NIOSH currently has would be cut to 200 from the current value and then it would essentially be absorbed into NIH, not just moved but there wouldn't be a separate...essentially the actual direct funding to NIOSH would be zero or that NIH would have to dislocate \$200 million from someplace else in its funding to support NIOSH? Is that right?

DR. HOWARD: Yes, the latter would be the case. NIH would absorb the NIOSH budget of \$200 million. That's the proposal.

MR. COURTNEY: Right, okay.

DR. ROGERS: Mark?

DR. NICAS: Yes, it's Mark Nicas. If this were to go through, would that effectively eliminate NIOSH's training programs for universities, like you know the education resource centers and...

DR. HOWARD: We would—the proposal is we would go in whole as an institute, except for the World Trade Center Health Program and then it would be up to NIH to look at the feasibility of...program by program.

DR. REDINGER: Thank you, Dr. Howard, Charles Redinger. Is it able—are you or we able to see on the NIH side of it that the \$200 million or even the additional part of the 40% that's been cut out, is that found somewhere over on the NIH side or is that unknown?

DR. HOWARD: Oh, that's totally unknown.

DR. REDINGER: Thank you.

DR. ROGERS: So what is the likelihood, do you think?

DR. HOWARD: I don't know the likelihood. That depends on the Congress's view of the President's proposal.

DR. ROGERS: So if it was within NIH, would it be NIEHS, do you think or do you know?

DR. HOWARD: No, that would be up to NIH.

DR. ROGERS: Charles.

DR. REDINGER: Then just another quick question, Charles Redinger again. So there is a—if I'm tracking correctly, just to knock out cobwebs from my public policy days—is that there's a statutory requirement for there to be a NIOSH. If that's correct, yes?

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From the OSHA Act.

DR. HOWARD: Yes.

DR. REDINGER: And then the form of it, well, then that's a whole other kettle of fish that obviously there can be congressional acts and things in place. So NIOSH can't go away, per se. I mean, I guess it's always one of these conundrums of Congress and how things work out and whether things are funded. But some people might interpret that if there are no monies, that the agency could go away and that's not going to happen. It may be, to use the term we used a minute ago, that at least right now it looks like it would anticipate the agency would go whole or the institute would go whole—

DR. HOWARD: That's what the proposal states, yes.

DR. REDINGER: So I'm not sure that was a clear question.

DR. HOWARD: Yes, that's the actual—yes. Quote: "Initially these activities..." referring to the Occupational Safety and Health—"...in addition to the Agency for Healthcare Research and Quality..."—which would also—is proposed to move to NIH and a very, very small institute on disability, independent living and rehabilitation which is in HHS, quote, "Initially these activities would be established as separate institutes but NIH will assess the feasibility of integrating these research activities more fully into existing NIH in states and centers over time," unquote.

DR. REDINGER: Thank you.

DR. ROGERS: Other questions or...? Ron.

DR. STOUT: So this NIOSHA thing that you encountered in Indiana so many years ago, it's coming to be.

DR. HOWARD: What?

PARTICIPANT: NIOSHA.

DR. HOWARD: Oh that, yes I don't know about that. Maybe, nice joke, yes. Sorry I didn't pick up on that, yes.

MS. GRUDEN: MaryAnn Gruden. Is there anything we can do now? Because I know in the past we've written letters to support NIOSH funding. Do you think there's anything you can do—

DR. HOWARD: Well, as I always say, you know, I think your individual capacities and your individual organizations are far more effective as—with appropriators.

DR. ROGERS: Anything else on that particular issue? No. All right.

DR. HOWARD: Okay, so I had just wanted to go, to emphasize a couple things here, so not to take time from our presentations and other discussions.

One of the issues I wanted to talk about, on Page 2, is our issues relative to the opioid crisis which is occurring and is taking a lot of Congressional time. There's actually multiple bills on the hill about opioids and there's multiple activities that are occurring from the Presidential Directive of a public health crisis, as well as activities that are occurring that—in the government you can go to [opioids.gov](http://opioids.gov) and find out all that information. In the Department of Health and Human Services, you

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can go to [hhs/opioids.gov](https://www.hhs.gov/opa/opioids) and find more information. You can go to the CDC website and find lots of information, both surveillance information from the National Center for Health Statistics, as well as the CDC prescribing guidelines which are now being adopted everywhere. And you can go to our website and find information about fentanyl and its analogs. Those are all, you know, great sources of information.

For us, on the occupational area, we can probably see a number of emphasis in a continuum of occupational issues. First of all, there are antecedents to opioid use. One antecedent can be work itself, where very hard work, harsh physical work, people can seek pain relief, either prescribed pain reliever, a diverted pain relievers or street-level pain relievers which are often adulterated with fentanyl analogs. And it goes to the issue of employers' health plans and what the employers' health plans are offering and having to do with prescribing guidelines, etc. or a worker can develop and file a claim in workers' comp and then they go into a medical system in workers' comp in which opioids are used significantly. And in some worker comp medical systems they are the number one drug that's used.

And then there's just opioid use working, where workers are maybe taking prescribed opioids at work and it goes to the whole issue of folks within that category with opioid use disorders and what's the employer's policy about that? How much assistance do those workers get? And then eventually it gets to opioid use becoming real misuse and possible overdose and then you have other types of workers brought into the picture, like healthcare workers, first responders, police, fire that we talk about here in the Health Hazard Evaluation Program where we've been asked to look at some of those situations where first responders have become ill.

And what's interesting about those preliminary reports is that we are really in an area where we're describing effects that you don't find in the toxicology textbooks. If you look in those textbooks, you find people that are cyanotic. Their pupils are pinpoint. They're flat out on the floor, breathing one or two times a minute. They describe the full lethal, full-on overdose. What we're seeing are responders who are light-headed. They're not feeling right. It's just not their normal high level of performance and they know it and they sense it. They're going into emergency rooms. They're often given naloxone and they respond to it favorably. So we're seeing something much less than those toxicology textbook described situations and we hope that an article that I have submitted will be published soon on the science and the recommendations for first responders. But it's an issue that I think is very important and one that it's emerging and we're beginning to understand our place in the national dialogue on opioids.

And then after that overdose situations in which we have first responders or healthcare workers involved, then the issue goes back to the workplace. You have

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somebody with an opioid use disorder. Maybe they had an overdose, maybe they have an issue, maybe they're in medication-assisted treatment. What is the rehabilitation return to work policies that do that? What does the employer offer there? So there is a spectrum, a continuum of involvement I think on the occupational health side to this whole things.

And it's not just the first responder issue. It's much broader than that and I think it's one that will be highlighted at the American Industrial Hygiene Conference in Philadelphia on March—on May 22, in a panel in which a representative from the White House Office of Drug Policy and several other industrial hygienists will be presenting, moderated by Steve Lacey, the current president. And I think it will be trying to garner the attention of industrial hygienists about the broad spectrum of issues. So that's the opioid issue that I wanted to mention. At one of our meetings, I think it would be important to have some conversation about that. But happy to take any questions that anybody has.

DR. ROGERS: We had that discussion last time as I recall, too, and—but it brings up the issue, and Ron and I were speaking this morning a little bit about the issues of medical marijuana, as well, in terms of safety issues at the work site. So it's not just the health piece but—and the emergency medical people, but the people who are workers at work who potentially are using stuff and creating safety issues, as well.

DR. STOUT: Ron Stout. Excellent example and I really do think, John, that there's room for some education for those of us that are on the frontlines of how to deal with the opioid crisis itself. And for people that are coming back into the workplace and using different substances that optimize their health and return to work, but they're still taking medications that could be considered mind-altering, perhaps. Maybe medical marijuana is a different but similar issue. How do we assure that people are fully qualified for safety-sensitive functions, how we weight the different stakeholders groups? Maine is a state now where a lot of us are struggling to understand the right path forward. So if NIOSH had some thinking there for the provider community on how to walk through that it could be helpful.

DR. HOWARD: Well and also it would help having that feedback from the provider community about what they're experiencing, too. So that we can collaborate.

DR. ROGERS: Terry.

DR. BUNN: Terry Bunn. Just a few comments regarding your discussion on this. We are actually, through (South Arm @ 00:40:06), which is funded actually by NIOSH, have taken this on as a primary topic and the UKERC has funded four states, as well as Kentucky too, that administered a survey of first responders, to get a good idea of kind of what's going on with the states and then help to pursue—to follow-up on those results, to see if they can develop targeted interventions. But in the meantime, we're also working with the Fire Commission in Kentucky to do training that is actually funded by NCIPC to be able to get those first responders the personal protection that they need and know what to expect when they're

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responding to these drug overdose situations. I mean, not that they're not knowledgeable anyway, but just to make sure that they're utilizing the correct PPE like it's recommend, instead of N95 that you use N100s during the course of those responses.

The last thing too is I actually agree with Ron that I think it would be great to have someone from maybe the provider community come in to speak to us, especially when you're talking about medication-assisted treatment which is evidence-based treatment which provides enough—I'm calling it opioid, but so that the individuals with substance use disorders are functioning well but they're not high. So it might be worthwhile for us to hear something from some sort of provider on this subject, as well as employee assistance programs that are offered in the workplace that can help these individuals.

DR. HOWARD: Right, and we should mention for everybody's education, there are those who believe medication-assisted treatment is not the right thing to do, that it is not true sobriety and that controversy exists in the addiction community all the time. So...

DR. ROGERS: Charles?

DR. REDINGER: Thank you, Charles Redinger. Dr. Howard, you mentioned an article that said—my interpretation of what you said is it sounds like it might be a comprehensive review article—maybe I'm making that up in my mind. Where are you going to publish that?

DR. HOWARD: Well, right now it's at the American Journal of Industrial Medicine and hopefully, we would hear soon.

DR. REDINGER: Perfect, thank you.

DR. LEMASTERS: Grace LeMasters. Has there been a surveillance study looking at the extent of opioid—reported opioid use by workers whether or not it's prescribed or unprescribed medication. I think there's a tremendous amount of use out there in the work place that has nothing to do with receiving prescriptions. That people are going there under the influence and barely functioning and I'm just wondering if a surveillance of trying to get at the extent of the problem out there, which I think is huge.

DR. HOWARD: Well, with apologies to all you who are experts in surveillance, I look at it this way. There are 11 million people who are known drug issue users and are they all not workers? You know, so there's got to be some of those people that are working. So a surveillance study specifically about that, I don't know of one, but clearly one can infer.

DR. LEMASTERS: Yes, I think it's underestimated how bad it is in the workplace, how dangerous it is.

DR. HOWARD: Well certainly that issue—because we don't even have the data but NCHS will tell you that even their number of overdoses which they count, they believe are 20% underestimated. And overdoses are pretty easy to figure out. So they're saying we're 20% underrepresented.

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DR. ROGERS: Ron, did you have a...?

DR. STOUT: Ron Stout. Quest Diagnostics and a number of the folks who do drug screening the workplace and otherwise have some interest in data that's available in their databases that when you look at it, kind of expands your mind, so to speak. As you mentioned, Grace, the breadth and the depth of this opportunity.

DR. ROGER: Terry.

DR. BUNN: Terry Bunn. Just wanted to comment that through the FACE programs, that is being tracked, presence of drugs in the decedent system at the time of death. In Kentucky, we find about one-quarter of all of the work-related deaths, they do have drugs onboard at the time of death. And then we and Massachusetts have both done death certificate analysis and if you look at it by industry, it's clear that the top industries where drug use is present at the time of death is in the construction and in the service industries.

DR. HOWARD: Yes, so again, apologies to all of you that really are into surveillance but you know, the statistics that—

DR. BUNN: The non-fatal, yes.

DR. HOWARD: That I use is America counts for 5% of the world population and we consume 80% of the opioids, you know? So we could all raise our hand in this room, who's got old Vicodin sitting in the cabinet and all those kinds of—it's just an amazingly broad problem and there are workers involved at every level.

So the other issue I just wanted to mention before we turn to our other presenters is as you know, right now in this town, the only game going on is happening at the EPA with the Toxic Substance Control Act as amended activities. As you know they've selected—they have very tight timelines under TSCA. They've selected the first ten chemicals that they're processing through scoping documents, problem formulation documents and then their risk evaluation documents. The problem formulation documents are supposed to come out on 23 April and I think they did not come out. So they are late on that. There are—John, correct me if I'm wrong—five or six of the original of the ten are actual occupational issues, as best as 1-Bromopropane etc. methylene chloride. So we've been working with EPA on providing them information from our studies, etc. But so I wanted to make sure that everybody was aware—and I'm sure many of you are following what EPA is doing and their various documents, and commenting on them. So I think it's an important issue and maybe one of these meetings, we can have a conversation about that.

I did want to mention one item that EPA has published recently in the Federal Register on 23 April, I think, which is entitled "Strengthening Transparency in Federal Science." And that's a very interesting proposal where EPA defines pivotal science which is used in federal rulemaking and in terms of making sure that that science, the dose exposures, etc. and formulations associated with that are able to be evaluated and reanalyzed in a public forum. Now one of the things

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that our ADS John and his staff and all of NIOSH are working on is our own pivotal studies that are important for regulatory purposes or guideline development, etc., like diesel exhaust, for instance, which is subject to an IARC carcinogen evaluation, making sure that that data can be reanalyzed by those who are interested in doing it.

So we have been interested in transparency of our own science for quite a while and that's something that I think we'd like to have the committee look at at some point. But now we're seeing it on the EPA side and their—if you haven't seen this in the Federal Register, I encourage you, the comments are due 30 May. So not too much time but important issues that EPA is raising. Issues that have raised some concern are the confidentiality and the medical information that is often in that type of primary data. That would be reanalyzed and its disclosure, etc., has raised lots of issues and has been the subject of various op-ed pieces in various newspapers. So again, right now in Washington, EPA is the only game and so it's important to pay attention to these issues.

DR. ROGERS: Any questions? Questions from the phone?

DR. HOWARD: Yes, I'm going to let you all read the rest of it and I've taken enough time and we've got some great presentations today.

DR. ROGERS: All right. So next on our agenda is Amia is going to be speaking. Are you going to come up here? Wherever you like.

DR. HOWARD: Why don't you sit here, Amia? Let me move and then—

PARTICIPANT: I can move over.

DR. HOWARD: No, no, no, that's okay. I can—I need to move anyway.

DR. ROGERS: So Amia Downes is, for those on the phone—you all have the agenda—but is going to be talking about evaluating science impact analysis.

DR. DOWNES: Thank you.

DR. ROGERS: Go for it.

**USING CONTRIBUTION ANALYSIS TO EVALUATE RESEARCH IMPACT**

DR. DOWNES: Thank you for having me this morning. As Bonnie and Dr. Howard have said, my name is Amia Downes and I'm very excited to be here this morning because I'm an evaluation nerd and I'm very excited to tell you about the new way that we are moving forward in trying to evaluate science here at NIOSH. Next slide. So for many of you, you've probably been involved with sort of reviewing our progress from when we did the National Academy Reviews. But just a refresher—

DR. ROGERS: I remember that.

DR. DOWNES: Yes. Bonnie has been here through it all. So just a refresher for some of you, in 2005, NIOSH commissioned the National Academies to review eight of our programs and as part of that, a committee was formed to develop a framework for which the National Academies Committees would use to evaluate those programs. They developed the NIOSH logic model and definitions for each of the headings which you'll see up there for the logic model such as inputs, activities

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and outputs. And then scoring criteria for impact and relevance. And then each program developed an evidence package and we had the help of the RAND Corporation to do that. And each evidence package was organized by an occupational safety and health outcome and within those outcomes, they were really organized by the headings within the logic model.

So you'll have all the inputs, all the activities, all the outputs and they were really exhaustive lists and the evidence package ended up being hundreds and hundreds of pages. We actually still in Atlanta have very large binders to remind ourselves of just how much information was in those packages.

And what we noticed was the further you got back or the further you went right to the logic model, the smaller, the thinner, the fewer number of pages that we were seeing. So fewer numbers of intermediate outcomes and information that we had about end outcomes but we had lots and lots of information on activities and outputs and inputs.

So next slide please, we had some time between when we finished up those reviews and we had to decide on what we were going to do next, as far as restarting and doing some more program reviews. So during that downtime, we were working with the board to really start implementing the recommendations we got from the National Academy Reviews. But we also had some time to start thinking about, well, what do we want to do next?

So we considered the lessons we learned from those eight reviews and there were some great things that happened. It was a great first step for NIOSH to take. So we looked at those lessons. During that seven, eight-year time span there was also clearly some advances in evaluation science. But we also had to consider the resources that we spent during the National Academies' reviews and what we could foreseeably continue to do to conduct rigorous independent evaluations over a long period of time as we went forward. And then ultimately, what we couldn't negotiate with Office of Management and Budget, in terms of developing a new GPRA, Government Performance and Result Act target, which we had done for the National Academy reviews. So these things were the main considerations as far as how are we going to go forward? Next slide.

So voila. We came up with a contribution analysis, after all of our searches of the literature and consideration we gave to all of those things. And basically, this is really a theory-based evaluation approach. And thinking about the logic model, we develop a theory from how we go from all those impacts, the production impacts, like your tangibles of people, of money, of facilities, all the things you need to make your dreams come true—and your planning inputs which are really that surveillance data. The NORA agenda, those type of things to get to that impact, that end outcome on the right side of the logic model. So there's an actual theory or what we like to say it's a story that we're trying to tell of how we got from one side of the logic model to the other. but you also consider alternative explanations

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and those are things where NIOSH doesn't just work in a vacuum. There are lots of other players that are going to help make that impact happen. For example, our sister agency OSHA does a ton in these various areas. We have professional associations, such as the American Nursing Association that puts out statements, does campaigns. But one of the things that we can say is that where do those folks get a lot of their information? NIOSH. So we contribute through that way, as well. But there are also influencing factors such as, example, 2008 recession. Things that we don't necessarily control but they influence how long it might take us, different routes we might have to face or whether we get to that ultimate impact. So those are things that we consider when we consider alternative explanation. But then we put together ultimately a contribution claim and we looked to see—and this is what we're asking our external panel, review panels to do is based on all these claims that we've put together, is it reasonable to assume that NIOSH has made a contribution to this, an outcome or has made this impact, contributed to this impact. Next slide.

So why we can't do randomized control studies to evaluate these type of programs? It's just not feasible and it's incredibly difficult because there's no way to measure this type of thing. We can, through plausible association, look at trying to assess our contribution to that impact and that's what we're trying to do with contribution analysis. Next slide.

So John Mayne was actually the one who came up with this contribution analysis approach and what you'll see in these orange dotted lines are John Mayne's original steps for this process. What you'll see on the two ends in the grey dotted lines are what we at NIOSH actually modified and added to these steps. So I'm going to, in the next couple of slides, walk you through sort of what we actually do with the program to match up with each of these steps, the practical steps that we take with the program. So next slide.

This cause and effect issue is something that we really do and it's really looking at a evaluability assessments, when we're actually looking to select a program for contribution analysis. We're looking at things like what has the program been doing and in what areas, intermediate outcomes have they had? How much money do we invest in the program, what the FTEs look like, what is their future for making intermediate outcomes or achieving intermediate outcomes look like? So this is something we do and if we choose that program, we can actually, when we meet with the program, go to them and say we think that you should be looking at these particular end outcome areas or cause and effect areas.

So Christine Branche was nice enough to—she's actually, the construction program is actually having their panel review panel meeting tomorrow—she was actually nice enough to stay with me this morning because I wanted you all to have the opportunity to ask a program manager that's sort of been through this now. So I'm going to use construction as an example throughout this because

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she's here.

But one of the things we went to them with was some ideas of you might want to consider these particular topics such as MSDs, noise and here are some reasons. And so we talked about this because we had done this evaluability assessment when we chose them. So this is something that is completed by the evaluators in the Office of Policy Planning and Performance. Next slide.

This next step is once we've chosen that program, had some initial conversations about what the topic is going to be, we meet with them for a day, a day-and-a-half sometimes and for each of those topics, for example, MSDs—we'll sit down and start to make a logic model with them and we talk about—we usually work from the right side back to the left side. So we'll start talking about, "Well, what are some of the intermediate outcomes that have occurred?" and by intermediate outcomes, we're talking about has an employer adopted something? Has a consensus standard body adopted some sort of—or integrated some sort of consensus standard. Anything that an external person, a meeting or external organization, anyone external to NIOSH has done with a NIOSH product is an intermediate outcome.

And from there, we kind of worked backwards to how did we get to that point? What output did they produce? What activities led to the production of that output? And we worked backwards and—next slide.

Then from those initial logic models, they work on these two steps which is they start to develop their evidence package. They might have to go back and talk to the project officer who worked on some of those activities, to generate some of the narrative, like what actually happened on this project? What were the results of the project? Well, I think you develop the workplace solutions document but were there any other publications that came out of this particular document? Because the evidence package for everything that you'll see in the logic model, there's narrative in the evidence package that goes into much greater detail about what you're seeing in that logic model. Next slide. So we get to a point where the program will give us an OPPE, a draft of it. We'll look at it and we'll say, well, we think we're missing something here, or you've come to us with this intermediate outcome but it's not substantiated, meaning there's no reference, there's no personal communication. There's no testimony or something that says this actually happened because we go on the conservative side. If we cannot substantiate it, we don't include it in the package. So we might have to remove things. They might have talked to some researcher in a division and they said oh, do you know by the way that we also—this happened, this happened this happened. Because all we have when they're actually doing their initial research is project plans, emails, some documents that might be a NIOSH (shtick @ 01:02:46) too. We don't have the ability at this point to go out and do larger interviews, because of the Paperwork Reduction Act. We're working on that.

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We're getting a package together to submit to OMB, to be able to go out and do those more than nine interviews with people outside the government. And that should help us, but at this point, we were kind of limited by that.

We've also been working with the Office of Extramural Program. They give us information on extramural projects that are related to these various topics, so we can integrate those into this. So it's a really nice reflection of both the intramural and the extramural projects all in one. Next slide.

Ultimately, we come out with one evidence package and this is our contribution claim. This is what we will give to the panel to say, "This is how we think we contributed. These are the..." alternative explanations are included in there, as far as who else we think may have contributed to these efforts. Next slide. And we've added the program review portion on it, where we get this panel of experts together to say do you think it's reasonable that we have made this contribution? Next slide.

So I wanted to walk you through what one of these logic models actually looks like. And this is the logic model for the Construction Highway Work Zone. So as you can see on the right, you'll have various inputs. At the bottom, you'll have your production inputs which are really your tangibles, your staff, your funding, your facilities. And at the top is your planning inputs, such as obviously the construction agenda—

MS. BRANCHE:

Amia, that's on the left.

DR. DOWNES:

I'm sorry, the left, sorry. The construction agenda, surveillance data but you see on there OSHA alliances. There's actually two in the package and they're in the narrative of the package. They're spelled out. It tell you what they are, what the actual inputs are that we get the type of information we get from those alliances. You'll see FACE. Somebody mentioned the FACE program earlier. The review period for this particular program is from 2007 to 2017. So there are some FACE reports that occur prior to 2007 that were used for input for why some of these activities went on. But you'll also see FACE investigations as activities that happen during 2007, 2017 that are listed in the activities column. You'll see broader blind area diagrams, internal traffic control plans that were activities in this. In the narrative, you'll see actual projects that are spelled out in there. So these activities are listed fairly broadly but in the narrative text, you'll see very specific activities listed for each one of these.

And the outputs, obviously those are the specific products that came out of each one of those activities and the transfer translation section, we try to make this pretty straightforward. To keep it less complicated, we did one larger box instead of a bunch of little boxes, so there weren't arrows going everywhere.

And then ultimately, you have your intermediate outcomes. So just to give you an example of what we call theory strings, if you look under the activities column, you'll have the proximity warning system. And that produced the technology, the

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hazard technology and one of the things that happened with that is if you look under the translation column, you'll see equipment manufacturers. And so we had an equipment manufacturer that ultimately commercialized that product and that commercialization is listed under intermediate outcomes. So you can actually see the string of things going from one side of the logic model to the next.

And ultimately, what we would like to do is ask the panel is given all of these claims, is it reasonable to assume that NIOSH did contribute to a reduction in highway work zone injuries and fatalities is ultimately what we're asking them. Next slide. I was on a roll, too.

DR. ROGERS: Give you a chance to catch your breath.

DR. REDINGER: Quick question.

DR. DOWNES: Yes.

DR. REDINGER: So earlier, this may have been—as you were speaking, I thought what you said kind of with the intermediate steps, you used the word outcome, but I think—at least here, I think it's more of an output and obviously this gets a little bit blurred at times in evaluation science, but clearly here they're outputs, but I thought you said outcome earlier.

DR. DOWNES: So they are—

DR. REDINGER: Certainly at the end. But I thought you said intermediate steps earlier. You used the word outcome instead of output.

DR. DOWNES: So here—well there are, they're intermediate outcomes when the adoption actually happens. The outputs are really the products but when the products are adopted—for example in this case, a contractor or an equipment manufacturer actually takes the hazard or the technology and commercializes it. Then it becomes an intermediate outcome.

DR. REDINGER: Thank you.

DR. DOWNES: Uh-huh. So we actually are just finishing hopefully finishing our second round of these. We finished our first two programs—because we're doing these two at a time—and we learned some things from doing our first round that we I think can say have successful applied in the second round. So one contribution analysis does seem to be a good fit for NIOSH. We've done a presentation at the American Evaluation Association at the end of last year, to present some of this information. Hot off the presses, the Monday after I had to have these slides into Pauline, our article about this very topic was published in the American Journal of Evaluation.

So I gave the link, if you all are interested, it's still free right now but I also brought one copy with me if anyone would like to look at it. We also had a quote from a former director of an office within a federal agency who said, "I suspect there are many other government agencies that would benefit from this approach." So we're getting positive feedback about using it.

We've also noted that it's very flexible in the scope and the subject matter of the

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review. The first two programs we applied this to were exposure assessment and healthcare. Exposure assessment is a very basic science whereas healthcare ranges from surveillance, basic science intervention. It worked well for both. Exposure assessment, much smaller program. Healthcare, a larger program, construction even larger program. It seemed to work well for all three programs and we're actually—the fourth program that we're working with now is the Emergency Preparedness and Response Program which I can't tell you how many unique issues it has just because of some of the sensitive issues it deals with and things like that. But it's been flexible and we've been able to use it in that way too.

The recommendations that we get back, they've been able to—been a little bit more targeted and actionable than some of what we might have seen with the National Academies, because of these stories that we've been able to tell, as far as intermediate outcomes, really being specific in them. We might have said, well, we have evidence that a contractor or this particular audience adopted this, and the panel might be able to say, well, have you looked at maybe working with this group or maybe you need to work with this group in order to be more effective, or you're right on here, maybe you need to focus more on this. Or with construction, we've been very clear about what was done with our extramural grant program, what was done through CPR and their small studies program, what was done through NIOSH intramurally, so they can be very specific as they're making recommendations and findings. So that's been very helpful.

There were some definite process improvements after the first time we did this, in terms of the balance of the committee. We have the panels that review these are about five to six people and we definitely want to have a balance between industry, labor, academia and we also want to have at least one current or former federal employee, because there's some things that we face that are unique to the government but we want to make sure that somebody is on there that kind of brings that knowledge to the group. So I don't know that we hit the mark as much as we wanted to with the balance with the first two programs, but I think—and Christine can speak to this—but I think we hit it more with this second round. The amount of time, I cannot tell you the amount of time that this whole process takes. I mean, Christine has probably—I'm lucky that I have all my arms, my legs—no I'm just kidding. But Christine has been a gem to work with, but this is tough. This isn't easy because of the amount of time it takes to pull it and the thought that has to go into trying to tell the story. The organization of the package, we reorganized it so it's more intuitive to the reader and it goes right along with the logic model in each chapter, which is at the beginning of the chapter. And we also had some misunderstanding I think from—during the first two reviews about what they were supposed to be judging impact on, whether they were supposed be using intermediate outcomes to judge impact or our effectiveness on reducing

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injuries and illnesses as far as the end outcomes. And we revamped how we presented that to the panels from the very beginning. We're meeting with them more and I feel very confident that that's not an issue, at least with construction at this point. We haven't met with a second group yet. So I think that's been addressed. Next slide.

So where are we now? We're—the first two programs, Healthcare and Exposure Assessment are working on their responses and their implementation plans. The responses and implementation plans are even going to be different than what they were the first time. So you all won't have to look quite as much and the two programs that are currently under review, actually Construction Panel is meeting tomorrow. So we'll—Christine and I will be heading out of here a little early but we'll have to wish her luck but they are in good hands. So Emergency Preparedness, their panel will be meeting at the end of June. So I think questions for the board are two and possibly three.

These evidence packages are pretty phenomenal. One of the responses that we got back from the construction, one of the construction panel members was, "I like this package very much. I think the program has done a tremendous job." But they're very lengthy and right now, our plan, once we get the responses done and the implementation plans built is to put them up on the web. But because of the amount of time and the amount of great information that's in them, we think that their use deserves to be—it could be beyond just being put up on the website, whether that's being used as the whole package or just pulling pieces of information out of the package to be used. And whether we use it just internally for things because I can let Christine speak to this but I think during this process, she's got a better understanding of the intramural, extramural, wherever holes might be, where there's possibilities to build on more things from just a planning perspective, but where there might be opportunities to really show the achievement of what the program's really done. And as Dr. Howard mentioned, with some of the things that are going on around the budget, this is an opportunity for us to really show what we've done. So I think it's really timely, as well. So we're looking for ideas on how we might take some of this information and use it.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis. My apologies, it took me three cabs to get here this morning.  
PARTICIPANT: Welcome, Chris.

MS. LASZCZ-DAVIS: You know, a couple of thoughts. This model generally isn't unlike—having hailed from industry—it's not unlike a lot of management system models we used that we often found that models like this, while they're excellent conceptually, what everybody wants to know is what will change tomorrow as a result of this? So a web-based approach is okay but unless it's user-friendly and something that can be applied tomorrow in a relatively simple fashion, I'm not sure how much use it would get. And I know you used the term impact but effectiveness is a whole different quotient. How do you gauge effectiveness? Impact might be a new

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regulation. It might be a new set of products or tools for the stakeholder to use. But how do you gauge whether or not they're of any value? Because that's really a very different question.

DR. DOWNES: When you say of any value...

MS. LASZCZ-DAVIS: For example, you know, you might have a new tool available for the public, for state, federal—for federal and state programs, OSHA programs for industry. But unless they embrace them and use them and see a difference in the results, that's impact to me. Does that make sense? So I was just wondering how you gauge that or if you aren't at this point

DR. DOWNES: I don't—I think every—some of it is just like a project by...a project, as far as that goes. I think Christine can speak to the falls, they've actually done some social—

MS. BRANCHE: Network analysis.

DR. DOWNES: Network analysis. So I'll let her kind of speak to that example.

MS. BRANCHE: Christine Branche, Director of the Office of Construction Safety and Health. I actually—based on your definitions, I think that once you have an opportunity to read the evidence package, at least for construction, you'll find a mixture of impact as well as effectiveness. I think several of our—of the impact measures would probably read like a mixture to you. And we do have some evidence to suggest—with great substantiation as Amia cracked the whip over us—that we were able to show how NIOSH products were used much, much more broadly than we ever imagined and we have the documentation to suggest it. The social network analysis to which Amia spoke was conducted by CPWR, Center for Construction Research and Training. NIOSH funds them through a cooperative agreement to function as the National Construction Center. One of the things that we wanted to do in creating—in working with OSHA and the folks from the NORA Construction Center Council in creating the National Construction Loss Prevention Campaign was to be able to evaluate it. Many means eluded us and many evaluation templates were considered but they were much broader than our budget would allow. But the social network analysis that CPWR undertook with a lot of guidance from us and OSHA really was able to help us understand the impact and effectiveness both of the campaign and that's one of the—and falls is one of the chapters and the campaign is one of the components of the chapters.

DR. ROGERS: That's helpful, thank you.

PARTICIPANT: Quick clarification, Dr. Downes, Chris's question is an important one but it's also—I guess as I think of evaluation continuum, this is a real macro looking as an overall policy regime I'd say, programmatic regime, is it effective? An actual tool, when there's different—from an evaluation standpoint—ways to evaluate the specific piece of that but I'm not sure that's this, what you're presenting. I mean, am I correct that you're looking at the big picture with this as opposed to a specific tool?

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DR. DOWNES: That's correct. I was actually going to mention that a lot of this happens at the project level, as far as whether the tool itself is effective. One of the assumptions that we make, for example with the healthcare, when they did the safe patient handling is, for example, Jim Collins had gone into the hospitals and he had actually done a lot of the testing to see is this effective before we even got to the point of looking at the impact of it. And he also tested it for the return on investment effectiveness of it. So by the time it gets to this point, that was already been established. So when we get to the point of intermediate outcomes and is this really going to have an impact, we're actually essentially telling the committee, based on what we know, the idea or theoretically since this is evidence-based—this is an evidence-based intervention, that if this is effective as we've found, that if people adopted it or were using it, it should have this reduction, which in his case, in Jim's case, at these hospitals, he was able to show that there was a reduction in days away from work, in workers' comp claims and things like that. So there is some of that, but that's a really good point. I think it's a very good point. I can't tell you how much the—that some people do forget about that effectiveness component, yes.

DR. ROGERS: Terry?

MR. COURTNEY: Amia, this is Ted Courtney. I just wanted to jump in here because I'm going to have to jump soon. Great presentation, thank you. Christine, thank you for offering up your group as an evaluation, you know, test. The thing I thought about it is I looked at that, it's related to what you were just talking about as to what extent you're leveraging the broader collateral impacts of the type of work. So when you're reducing fatalities in the work zone, you're reducing travel disruption. I think about National Safety Council about two, three years ago, we estimated their driving-related costs nationally based on an enhanced model of travel disruption and its economic impacts due to accidents. And that's the sort of thing that would give you significant impact extension. Ken Kolosh at NSC was over that work, so he would be a good guy to talk to potentially. But just ways you can kind of add some overall economic momentum to the, you know, harder public health targets you have, I think would be really helpful.

DR. RODGERS: Terry?

DR. BUNN: Yes, Terry Bunn. Excellent presentation. Just would you mind going back to that slide where it shows the intermediate outcomes? I was just wondering just maybe to help kind of further demonstrate the impact of the program, if you might consider another column called long-term outcomes, something like that and maybe because the top part of the intermediate outcome column is mainly one use of the products whereas the bottom might go into more of the long-term outcomes, where you're actually informing new policies or proving policies. You're informing or improving policy standards or you're informing and implementing new tools and practices. Something like that, which would kind of maybe help to

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- bridge...
- MS. BRANCHE: So yes, Christine Branche. As far as the intermediate outcomes and as we were guided by Amia and her expertise in this area, this particular example does not show the range of possibilities that you'll see for the other topics that are in the evidence package. But policy implications and changes in tools for work were among the intermediate outcomes that you'll see for other chapters. So there was no distinction with timing for long or short range. We took every intermediate outcome we could and we didn't make a distinction on the depth or temporality of the intermediate outcome.
- DR. STOUT: Ron Stout. I think it's great. A question on confounders and using the slide here that the end outcome reduction on highway work zone injuries, now look at the inputs funding. I'm wondering, for example, if funding for highways was cut by 50% how would this model account for that?
- DR. DOWNES: This might—that might go back to, well, one it could go back to would we select this as a particular topic to begin with, but if we did—if we'd already chosen this and then it go cut, because we do these retrospectively but if we were in the middle of this, we'd already chosen it, we would write this up—because none of the...this logic model doesn't include anything about alternative explanations or influencing factors. And so that's all covered in the evidence package but it's not reflected in the logic model.
- So that's where those items are covered, where we can mention things like recession that happened in 2008, things like that. Because we actually have that issue with falls, because even though Christine and her program have done tremendous things with falls, including the campaign, when we looked at the end outcomes, the fatalities have gone up during the period of review. And so there was a lot of questions, well, this group, this group have all done these things. NIOSH has done all these things but then we had the economy. We had an issue with the economy. We had a lot of younger, unskilled workers coming in. We had some older workers, aging workers. So there were all these influencing factors. This doesn't reflect—the logic model won't reflect those things but those things will be reflected in the text of the evidence package. The other thing that they can consider during—and we'll talk about this tomorrow with the panel is we've had these in-person meetings and the panel has already brought this up when I've spoken to them is that they relay want to recognize that and make that clear in their report. They just want to talk to the program more about how did you all deal with those things and how should we account for that in our report? So a lot of that is going to be a discussion with the program and I'll let Christine, if she has anything to add to that.
- MS. BRANCHE: So I think it's important to at least mention or repeat something that Amia said. NIOSH is one of several inputs to where you get to an outcome and we're simply trying to track and account for what would logically be within NIOSH's sphere.

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There are a number of things including for the Department of Transportation or any other number of transportation agencies at the federal, state and local levels, there are reductions or even increases in funding in those particular areas, that will have an effect on an end outcome into which NIOSH is only a component part.

DR. ROGERS:

I have a question on the phone. Michael?

DR. BEHM:

Hi, good morning, this is Mike Behm. I really enjoyed this presentation because I learned something new and I really appreciate that. And I'm sitting here looking at a 2001 NIOSH document that's another big document and this question and comment is probably more broader than—well, I'm sorry, is broader than this particular spoken presentation. But I think it's worth just making the comment that I'm looking at this "Guide to Evaluating the Effectiveness of Strategies for Preventing Work Injuries" and it's a 2001 document and there's been such great evaluation strategies developed and—well, utilized by NIOSH. I'm just wondering if this document would ever be updated. It's a great document. We use it in our graduate program here to supplement some other materials, but I just think the work you're doing and the other evaluation strategies that you're using that we've now heard about, I think it would be worth trying to disseminate more broadly to the occupational and environmental health community. Thank you.

DR. ROGERS:

Did you want to comment?

DR. DOWNES:

That is an excellent question. Actually, that pre-dates my time in NIOSH.

PARTICIPANT:

Can you repeat the document again?

DR. BEHM:

Yes, it's a 2001, it's an April 2001 document. It's called "Guide to Evaluating the Effectiveness of Strategies for Preventing Work Injuries: How to Show Whether a Safety Intervention Really Works." It's by Robson, Shannon, Goldenhar and Hale. It's just a really nice...it's just a nice, classic kind of experimental design type intervention strategy type. But it's really lacking, I think, out of these more newer evaluation strategies that are being utilized. And it would be great to have both practitioners and students and researchers to better understand how they can utilize intervention strategies.

DR. DOWNES:

Thank you for mentioning that. We'll be glad to take a look at it. We did bring it up on the intranet. We'll take a look. I don't think many of us are too familiar with that one, so...

PARTICIPANT:

No.

DR. ROGERS:

Sharon?

DR. COOPER:

Sharon Cooper. I was familiar with that document, as well, and my question kind of at...wants to know how applicable it is to other programs a little bit beneath the global program area for evaluation. Because I've sat through a gazillion evaluations of individual projects, ERCs, ACT centers. NIOSH requires you to do an evaluation, a social network analysis. I find them agonizing because they're so detailed. They're very detail and you see the amount of work that goes into them

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is huge. I mean, they can be six-hour sessions, a lot of these sessions to go through the detail, even from logic models. So the question really is I've always felt a little like that much work that went into it, I want to see the outcome of that work in the next grant application. And that's where I don't see it used in the future. So not just process evaluation, did you meet your specific aims and the highlights of the project but actually the results of the evaluation being required in a grant proposal to be in there for the next one, a competing renewal or even a continuing renewal. So that that work, that social network analysis or whatever, I don't see it. I see it in that year but then I don't see it after that project is over, the whole results of the evaluation. And I don't know if this particular technique applies to those other levels or not.

DR. DOWNES: Is that anything you want to...as far as grants go?

DR. FELKNOR: Well, I don't know. This is Sarah Felknor. So I don't know, Dr. Cooper, if your question was specifically to the extramural program or more a question of the general applicability of this method and technique to help programs evaluate themselves and improve.

DR. COOPER: I guess it's both. I mean, I really want to see how applicable it is, even to use it. But then if it is applicable, how it should be accountable to make use of all that effort and work, for the next project that might be funded.

DR. FELKNOR: Well, so with respect to competing continuations—so these are extramurally-funded projects that have a lifespan and then at the end of the lifespan, they get to recompete for another lifespan. And certainly, they're asked to report on their outcomes and their achievements and the expectation is that they would address any weaknesses that might have been in the previous application. The assumption is that theoretically those combine to make some kind of a mosaic of here's what we did that was really good and here's what you said that was missing five years ago and here's how we have something new and better for the next five-year—so I don't know. I think there's language in our funding opportunities that directs principle investigators to address that. It may be that it's too piecemeal, too respond to your summary statement and also tell us what you did. But we don't give them a framework to link it and this may be a way for us to think about that.

DR. ROGERS: We'll take one more question.

DR. DOWNES: Can—

DR. ROGERS: Go ahead.

DR. DOWNES: As far as the broader question, I think Christine might be able to speak to this a little bit more, but I think through this process I was really glad that she was so heavily involved because she can kind of see where there might be gaps or things that she can really build on. And she can refer to this—so if we have this NIOSH internal sort of NORA competition and things come through—she can maybe really push or rank something higher that she now knows, this really needs to be

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funded because I went through this process and I have a better idea, in terms of planning, what's out there, where we really need to go. And she can actually use some of this information to take back to her NORA Council and I don't know, Christine, do you want to speak more to that?

MS. BRANCHE:

Just briefly because I know that Bonnie wants to move forward. So Christine Branche. As you were asking the question and getting various answers, I agree with what everyone said in response to you. Actually, in our internal NORA competition for the role that I played just a few months ago, I have to say we made some decisions based on gaps that we found in the evaluation process that we were in the midst of completing at that point. But I think this methodology, this framework that Dr. Downes has introduced to the institute really helps to pull the rest of the thread on research to practice. Because it forces our scientists—reluctant through they may be—to account for how—many of them know how their research is being used because they go to meetings, people ask questions. But documenting it has been the challenge. And so because this is really about how our research is being used or not, I think it really helps to pull the thread through and I really think a little tutorial for all of our scientists wouldn't be a bad idea for us.

I haven't had an opportunity to do my post-mortem with Dr. Downes yet. That's certainly one of the things that I think the leadership across the institute could benefit from. Whether we use this particular methodology or something near it, the idea of documenting all the ways that our research is being used is critical for our being able to answer questions, whether they are for Dr. Howard as he goes to the hill or interact with people from OMB or any of our funders or for that matter, anyone who has a question like yours. But this particular process was really tremendous in forcing us to think about that end of the public health model. Grace.

DR. ROGERS:

DR. LEMASTERS:

Well I was just getting back to the question that you asked about impact more broadly to stakeholders and it seems like something like reduction in highway work tragedies would be an opportunity to use these data in a toot-your-own-horn strategy, particularly right now with these budget implications. And an article in the *Wall Street Journal* or the *New York Times* or NPR, somebody come and interview on NPR to reach the administrative machine in order to show your value at a national level. There's only so many people that they're going to read an article that's being published. But if you could get a brief article in one of these national newspapers—and I'm sure you could, because this is a highly important topic and it's about getting people in the workplace and keeping people in the workplace—I think we need a—we need a strategic group, a toot-your-horn group. And could we all have a copy of that paper? We're a small group.

DR. ROGERS:

Well, I just want to make a couple of comments before we finish this segment. I don't know if, listening to Christine and Amia, whether it's the term analysis versus

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evaluation, sort of a contributonal analysis versus contributonal evaluation. Because when you're at the point of outcomes, it really is an evaluation of the contribution. So, but just something to think about and then the other part is the relationship to total worker health.

In thinking about that—because I've talked with some nurses about this—in terms of looking at total worker health and sort of all that contribution that's made there and when we think about what's going on at the work site, like with slips, trips, falls or whatever, and you design some strategy to deal with the slipping and the tripping and so on and so forth, that then really what I've said is take that information from the occupational nurse and translate it to the home. So when a worker is dealing with a fall at work and you do whatever interventions you do there, a lot of that really does go to, well you can put this in your homes as well. And that is a total worker health perspective and that's a contribution that NIOSH makes, because the intervention that is done at the work site can translate well to other areas. It doesn't even have to be the home but if you're talking about safe work driving, then at work, why doesn't that impact safe work driving, period? So that really is a total worker health perspective and it can make that connection I think would be even more valuable, in terms of the contribution that NIOSH is making. Because it's this whole thinking about total worker health is a stretch for a lot of people and how do those pieces fit together? But that may be something you want to look at for the future, because I think it's a really important contribution that NIOSH is making in total worker health but a lot of people have trouble like well what does that really mean, you know? And how does that really fit type of thing, but there are lots of fit pieces that can be a contribution.

Anyway, two short comments and then we need a break.

DR. ROGERS: I think Terry had her hand up first.

DR. BUNN: Yes, Terry Bunn. Just wanted to say I love this analysis, this approach because what you've brought up is exactly what a lot of researchers are reluctant to include in applications is the concept of attribution versus contribution. So with this contribution analysis, this really sets the precedent for being able to really look at and be able to assess and to really recognize that it is a contribution to the total effort to reduce highway work zone injuries. You can't attribute it solely to that but you can definitely say it contribute to it. So very nice, just wanted to make that quick comment.

DR. ROGERS: Charles?

DR. REDINGER: Thank you, and thank you very much for this work. This is solid stuff. Thank you to your team and I've been a member of AEA for a number of years, so I've followed some of the public health pieces in general in this. And I think as people may want to be critical of the work of the institute or of our field or even of those who do research who want numbers, numbers, numbers, well, that's not always how it happens. And in the arena of evaluation, things like this are solid and I don't

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know that it's trivial to bolster the narrative of the story of the strength of this approach. So again thank you and I think the long-term contribution of your work is going to be significant.

DR. DOWNES: Thank you.

DR. ROGERS: Okay, so we'll take a break until 10:25 and come back.

[Break.]

[BREAK]

DR. ROGERS: Okay, we're going to go ahead and start. We're a few minutes behind so we'll catch up prior to lunch. So we'll have Dr. Kilnic-Balci, who is going to be giving us a presentation on "Breach in the Protective Barrier System: Glove and Gown Interface", which I know will be an interesting topic for us because we've had some of that discussion before.

DR. KILNIC-BALCI: Oh, that's great.

DR. ROGERS: So we look forward to your presentation.

**BREACH IN THE PROTECTIVE BARRIER SYSTEM: GLOVE AND GOWN INTERFACE**

DR. KILNIC-BALCI: Thank you very much. Thank you very much for having me in this meeting. It's very timely for us because we are in the area of, you know, like deciding where we are going to go in this research, and thank you so much for including me in the agenda.

So the presentation title is "Breach in the Protective Barrier System: Glove and Gown Interface". Just the quick information about the division that I am at is the National Personal Protective Technology Laboratory. It was created by NIOSH at the request of Congress in 2001 to prevent work-related injury, illness and death by enhancing the state of the knowledge and application of personal protective technologies.

So I will start with the motivation and objective of the study and our experimental system, and I will give just one example, which is the simulation of surgical settings, and our results of that study and how we are disseminating, and directions to go and the question for the boards.

The large number of workers affected around the world during the 2014 Ebola epidemic directed particular attention towards personal protective equipment, and during the Ebola epidemic also glove and protective clothing interface was frequently brought up or reported as an area of concern, because Ebola patients were releasing so much bodily fluids and they were going through the glove-gown interface. And WHO, World Health Organisation, also highlighted the need for more studies about the interfaces in the report that they published, and also they highlighted the need for more reliable PPE with less numbers and leakproof junctions.

As we know, healthcare personnel as well as patients are at risk of contamination when healthcare activities are performed, and they use personal protective equipment. What are they using? They use gowns, gloves, respirators,

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facemasks or boot covers, and among these all, PPE gowns and gloves are the two most frequently used type of PPE in hospital settings.

And one can use a gown with the highest protection level available, which passes the blood and viral penetration tests, and pair it with a high-quality glove with an extended cuff and again, passes the viral and blood penetration test, but still that person can still experience exposures, skin exposures to bodily fluids. Why? It is because of the breach between gowns and gloves, which is the interfaces. A chain is only as strong as its weakest link. If you have watched the *60 Minutes* episode about the gown strike-through, you might remember these scenes, and we think that these are not far from reality, especially in some areas of healthcare. And there have been lots of studies done about gowns or gloves, and many new materials and processing technologies were developed to improve the barrier protection and designs of gowns and gloves, and many standards were established to assess and monitor the quality of these products. However, the studies about the interface areas are very limited.

So the interface between gown and glove is considered as one of the weakest points of the protective ecosystem but as I said, there are limited studies about the effectiveness of glove and protective clothing interface.

What is the interface? It is the juncture between glove, the open part of the glove, and the gown underneath it. And National Academies of Science, the Institute of Medicine recommended also increased research on the interfaces with healthcare personnel for personal protective equipment.

There are some manufacturers which market products with design features to eliminate the leakage at the interface. However, there is no known standard test method to evaluate the extent of performance improvement with these new designs while simulating healthcare tasks.

Existing standards are developed for other industries such as chemical protective clothing industry. However, these standards may not be applicable for healthcare personal protective equipment because they are not able to simulate healthcare tasks or healthcare settings or exposures.

And we know that healthcare personnel develop some makeshift solutions to eliminate the bodily fluid exposure through gown and glove interface. For example, during Ebola, we know that some personnel, some workers used tapes or rubber bands to eliminate this. However, these type of temporary solutions may pose a critical risk to healthcare personnel since during doffing, they may tear, so it may increase the transmission risk.

So the objective of this project is to develop a new test method with a robotic arm to evaluate the fluid leakage at the glove and protective clothing interface. And this method could be applicable for any kind of current or emerging infectious diseases that may transmit with direct contact with the bodily fluids, and we plan to share this test method with standard development organizations to establish a

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new standardized test method for assessing the fluid leakage at the interface, and also this may be added as a requirement for many other standards, performance (comes @ 00:13:27) for other PPE standards, and it might also affect the guidelines developed by lots of professional organizations such as APIC, AORN, CDC and Joint Commission.

So design of the experimental system and setting parameters. This slide is showing the factors that we identified that might affect the leakage at the interface. If you look at the main parameters that might affect the leakage at the interface, we can talk about the PPE, personal protective equipment, and—personal protective equipment-related factors—we can talk about exposure-related factors and task-related factors and environment-related factors. When we are talking about PPE, of course we can talk about the protective clothing that the healthcare worker is using. It might be a gown, an isolation gown, surgical gown, or it might be a coverall. And the glove, what type of glove that the person is using, is it a single glove, it is standard glove or extended glove, or a double glove or a surgical glove? This might be effective on the leakage at the interface. And also how the fit is, fit of the personal protective equipment, and the preconditions such as perspiration.

And in terms of exposure-related parameters, we can talk about the type of exposures, for example spray type of exposures or soak type of exposures. For example, when we are talking spray type of exposures, we can talk about the arterial bleeding or projectile vomiting or diarrhea, these type of activities show spray type of exposures. And when we are talking about soaking type of exposures, we can think about, for example, trauma or deep abdominal surgeries, when especially the person, the abdomen is very, very large, or when the person is—or labor or delivery, or when the person is immersing their hand into the basin filled with the irrigation fluid. So these type of exposures might be an example for soak type of exposures—or combinations.

And duration of exposure is also very important. If it is a short duration like two seconds, one, two seconds, or longer durations like ten seconds, or the fluid type that is exposed. For example, blood will be different than urine type of fluid because of the difference in terms of the surface tension and also viscosity-related parameters.

And when we are talking about task-related parameters, we can talk about how long this task is conducted, like if it is, for example, for isolation settings, these tasks are generally like 15 minutes. Or when we are talking about surgeries, we can think about like 60 minutes or more, longer durations. And physical stresses applied on the glove-gown interface like pressures or extensions. And what type of activity that the healthcare personnel is conducting—surgery or isolation or decontamination procedures—this will affect the glove-gown interface leakage, and also of course environmental-related parameters such as the temperature

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and humidity.

So in this project, we loaned a robotic arm from Johns Hopkins University Applied Physics Lab, and we developed an experimental chamber that houses the robotic arm. And we put like four different nozzles on the corners that are equidistant from the wrist area, and using 3D printers, we printed nozzles, and we are using a pump which allows the control of the fluid flow.

And in terms of fluid amounts, like in five seconds' spray, the total amount of the sprayed fluid is 187 ml. And in terms of the fluid composition, we can control the fluid composition to simulate different types of bodily fluids by reducing the surface tension. In this project, we used the ionized water with surfactant to reduce the surface tension to 42 dynes. Generally, when we are talking about the bodily fluids, the surface tension of the bodily fluids range between a low 30s to high upper 60s, so we can arrange as much as we want. So in the surgical settings, we are going to talk about the 42 dynes/cm, that is the surface tension of the synthetic blood. That's what we set as fluid surface tension.

So this video will show the robotic arm that we acquired from Johns Hopkins University's applied lab. This is a very unique piece actually. It was developed to improve upper extremity prosthetics in response to a growing number of injured military personnel, using DoD funds. And it is probably the most sophisticated robotic arm in the whole world, and there are, right now there are six of them used in the United States and one of them we loaned, and they are mostly used for neurorehabilitation studies. And it is anthropomorphic in look, and it has high position sensing, so we are very happy to have this.

So what have we done so far? Using the robotic arm, using the set up, we investigated the effect of many parameters that might affect the leakage. These parameters are exposure type like spray, soak or combinations. We investigated the effect of exposure duration like short durations to longer durations to 5-10 seconds, and we investigated the effect of degree of movement, and procedure or wear duration, and also physical stresses applied in terms of pressure.

And then we moved to simulating different settings in healthcare. We simulated surgical settings using three gown models, two glove materials, four glove models and also two double glove configurations, single/double glove configurations. And then we moved to simulating isolation settings, and in that one we used different levels of protection again, with different types of cuff types and again, two glove models, standard and extended glove models.

So in this presentation, I will just show you the simulation of surgical settings as an example. So as I said, these are the main parameters that affect the leakage at the interface. Now, in this application, we are setting all task-related parameters, exposure-related parameters and environment-related parameters, but we are going to change only PPE parameters. We are going to change the type of the PPE and fits as well.

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So the main objective of this study is to investigate the degree of leakage through glove and gown interface while simulating surgical settings, and these simulated surgical settings in terms of healthcare personnel activities, their arm movements, exposure types, their exposure durations and physical stresses in terms of pressures.

And we set our activity protocol by using the current literature, which was very few, actually. We were able to find only two papers about that. But we communicated with lots of healthcare organizations such as APIC and AORN, and we talked to many healthcare personnel who are expert on this. So we decided on what type of arm movements are mostly simulating most of the most common movements of healthcare personnel.

Then we set our test protocol. In our test protocol, in the surgical settings, we used one hour of duration. And in one hour duration, we divided one hour duration into four interval cycles because in the beginning of each cycle, we are introducing the exposure, like four 15 minutes of intervals. So in the beginning of the cycle, we are introducing spray, spray 5 seconds, one spray. Then the arm, robotic arm moves, and then soak and pressure, and then spray and pressure, and again soak. So four times 5-second sprays and—I'm sorry, four intervals, two 5-second sprays and two 5-second soak, and two 2 psi 10-second pressures.

So these are the three surgical gown models that we used in this study. These gown models were selected based on the—these are, first of all, these are the market's major players, but we contacted, actually we contacted CDC's Strategic National Stockpile and Ebola treatment centers, as well as Veterans' Affairs hospitals to find the most widely used surgical gown models in the market. So these are the three models that we were able to find. And as you see, the dimensions of sleeve and sleeve cuffs are varying. And by doing size, actually, in terms of size, we have one robotic arm but every company has their own sizing system, which actually makes a big problem, but when we are choosing the size, we actually choose the best for the gown.

And for the surgical glove models, we used two latex and two synthetic isoprene surgical gloves. They are all extended surgical gloves, and they are identified as 3GLV, 4GLV, 5GLV and 6GLV. And we selected the same size for all gloves, but even though you selected the same size, their cuff diameter and cuff length are varying a little. And I want to point out the grip properties as well, as you see for example 3GLV and 4GLV models, the grip is 1.5 but 5GLV and 6GLV grip is changing, 3 and 1, which we expected to see effect of these grip properties on the leakage, so I just wanted to point out here.

- DR. ROGERS: What is a grip property?  
DR. KILNIC-BALCI: Grip is like the frictional properties.  
PARTICIPANT: So what does that actually mean though? I mean, is that...?  
DR. ROGERS: Is the higher number better or worse?

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- DR. KILNIC-BALCI: High is too difficult—I mean, too difficult to bear actually, so too difficult to move. So too much friction, frictional properties.
- DR. LEMASTERS: Like picking up something, is that what you mean?
- DR. KILNIC-BALCI: Picking up something, you know, like more rough surface so that it will be not easy to wear. And the elasticities were changing. By the way, these gown models also pair together based on the manufacturers' recommendations. For example, these 3GLV and 4GLV surgical gown models, 4GLV was suggested to use as a single glove as well as 3GLV, they are suggested to use as a single glove. I'm sorry. 3GLV was suggested to be used as an outer glove, and 4GLV is suggested to be used as an indicated glove. So we paired them together to make a double glove configuration. And again, same thing for the 5GLV and 6GLV. The manufacturers suggest to use 5GLV and 6GLV as single glove models and also they can be paired together as 5GLV can be an indicated glove and 6GLV can be an outer—I'm sorry, 6GLV can be an inner glove and 5GLV can be an outer glove.
- So this is the experimental design. So we have three surgical gown models, 7G, 8G and 9G, and we have in single glove configuration—I cannot move, it's very slow. Okay. For single glove configuration, we have synthetic and latex. In terms of synthetic, we have two glove models, 3GLV and 4GLV, and latex we have 5GLV and 6GLV. In the double glove configuration, we just, 3GLV over 4GLV, and 5GLV over 6GLV in latex. So we have 18 different combinations.
- How we are conducting testing, I hope the people on the phone can see this good. So first, we are donning the PPE, but before we don PPE, there is an inner glove, inner sleeve that we put to collect the fluid. So after spray exposures were introduced by nozzles, arm is moving, and soak type of exposures are simulated by immersing the hand into a container filled with the fluid. And each interval, the arm is completing same number and same movements. We want to automatize this immersing, so this is the introducing the pressure. And after that, after the testing is completed, we are taking off the gown and cutting the gown cuff and weighing to see how much it has collected, and also weighing the inner sleeve. Inner sleeve is made of 100% cotton. So we are adding the fluid collected by the cuff of the gown as well as the inner sleeve to understand how much total fluid leakage from the interface.
- And I'm not sure if you are familiar with AAMI PB70 standard but according to the standard, the gown cuffs are not required to be water-resistant or viral-resistant. So in this project, we use the highest protection available according to AAMI PB70, which is Level 4, and all of the gowns passed viral penetration tests.
- Okay, why does the fluid leak? One of the reasons of the fluid leakage is the glove roll-downs. See, this is when you started the exposure, before you start your exposures, in the beginning of the testing, this is how the glove looks like. And after 15 minutes, it looks like this, and then 30 and 45, 15 minutes just before the

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fourth exposure, the glove looks like this. So glove roll-down is one of the reasons.

And the second reason might be that gowns are designed, gown sleeves are designed wide and baggy to provide comfort to the wearers. That's what especially surgeons want. But when you pair the gown with that baggy sleeve with a glove, which is elastic, and then you create lots of channels underneath. The gowns, generally the gown sleeves are designed with 12 inches of circumference, but glove cuffs are generally 6 inches of circumference. So you have around 6, 4 to 6 inches of extra material underneath. So as you see, there are lots of channels created here. So when you have these channels, the fluid, the exposed fluid finds its way through these channels.

And I'm going to show a video of soaking. This is a video taken with a slow-motion camera, but you will be able to see how the fluid is moving in one or two seconds. Okay, so we are starting to immerse but as soon as we start, you will see the fluid is moving. See how it is moving through the channels. Again, this is slow-motion camera so in one second, you can see.

DR. NICAS: I have a question. This is Mark Nicas. When you do the spray, where is it hitting the garment?

DR. KILNIC-BALCI: When we do the spray, it is hitting, we targeted this area, the area, the juncture area.

So in results, this is the mean fluid leakage by surgical glove configuration and surgical gown model, and when we analyze the results, the y-axis is showing fluid leakage and x-axis showing different types of gloves and also gowns. So in result, we found that the gown model is, when we change the gown model, fluid leakage is changing significantly, in single glove configurations, double glove configurations, only synthetic, only latex. In all conditions, gown model is significantly affecting the fluid leakage. And same thing for glove model. Glove model is affecting the fluid leakage. But we haven't seen the glove material, there was no general trend with the material that the glove is made of. For example, as you see in this one, 5GLV and 6GLV, they are both made of latex material but one of them resulted in the least fluid leakage while the other one resulted in the highest.

DR. LEMASTERS: Is that due to the gown then?

DR. KILNIC-BALCI: The gown is also affecting. You can see 7G, 8G, it is changing from that. What we are thinking right now is one of the things that are affecting is the elasticity of the glove because for example 5GLV is very elastic material. So when you put on, it is covering really tightly. Even though it's the same size, it's covering snugly, holding your wrist. But 6GLV is not that elastic compared to 5GLV. And the other reason is 5GLV, remember the grip properties? 5GLV has the highest grip of all, so 3 compared to 1 in the other ones, and this is 1.5. So it might be affecting the fluid leakage.

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So right now, we are acquiring a sensitive pressure sensing device to understand how much pressure is applied by the glove as applied by the glove as well as how much pressure is applied when we spray the gowns. I mean, spray pressure might be affecting their fluid leakage as well.

And at the same time, we are trying to understand how the surface properties of gloves as well as gowns are affecting the fluid leakage, because the roughness of the materials, thickness of the gown might be—because for example when you have a stiffer material, one of the gowns was stiffer compared to the other one, we see that the fluid leakage was higher with that one. So we are right now characterizing surface properties of gowns, both gowns and gloves, to understand how these are affecting the fluid leakage. And again, for the double conditions, it was less compared to the single conditions—configurations.

And from this graph, actually, the other thing that we were able to see is there is a significant interaction between glove and gown models, but gowns and gloves should be designed together as a system to minimize or eliminate the fluid leakage. Right now, gowns and glove manufactures, they are sourced from different manufacturers and they are not sometimes designed to work together. So we are thinking that, because what we saw here, each gown model is working with each glove material like different than others. So one glove model is better working with some gown models versus others. So they should be designed together as a system.

And out of this, we provided some recommendations for operating room personnel, and we disseminated these results, our findings, at several conferences and meetings, and also we prepared some papers to publish, submitted those papers. And our project was highlighted very recently in the AORN newsletter.

And next steps, so I showed you these simulated surgical settings and these simulated isolation settings, and now we would like to move to decontamination settings that I actually would like to get some information from you because as I talk with lots of healthcare personnel, I see that everybody is using different types of gown models or glove models. If the healthcare workers are using an isolation gown model, we don't need to even test, because what we have seen in the isolation settings, the simulation of isolation settings, if we did one second of spray, we have seen that the gown material is absorbing the whole fluid that we sprayed. So since the gown material has collected, absorbed all of the fluid that we sprayed, there was no fluid actually available to go through glove-gown interface. It was really, I mean, scary too at the same time. We thought that maybe it is because of the surface tension of the fluid, and we changed the fluid to water and then again, same thing. All of the gown models that we tested from no AAMI level to Level 3 isolation gown—Level 3 protection level—they all failed. And there is no Level 4 isolation gown available on the market right now, and we

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haven't seen this problem in the surgical settings because in the surgical settings, we used Level 4 surgical gowns, which is the highest protection available, and Level 4 gowns passes the blood and viral penetration tests so they are a more protective barrier compared to the lower levels.

So right now, we would like to simulate decontamination settings and also, as I said, we are analyzing gown and glove surface characteristics, and also the effect of the surface tension on the leakage. And then we would like to move to a comparison of a variety of protective clothing models. For example, during Ebola, coveralls were used, in United States as well, coveralls are used. So we would like to see how coveralls compare to the gown models. And also we would like to investigate the use of tapes on the fluid leakages. We did some preliminary testing, a few number of testing with the taping, and even with tapes, we have seen some fluid exposures because not all of the tapes are water-resistant. So we would like to investigate that as well.

So now we have many directions to go from here. One of the things that we can do is designing human subject testing in clinical simulated settings. And the other one is assessing the fluid leakage in real work settings, focusing on procedures that most likely occur, because there is no data about that. We don't know which procedures—I mean, it was very challenging for us to design this testing because we had no idea about what is the most common type—I mean, how much fluid we need to introduce. What is the spray, or how much soaking? It differs from one setting to another, but still it will be great to have some numbers to start with.

So these are some of the ideas, and the third one is we developed so much experience, so we have now some ideas about how to design a gown sleeve to minimize or eliminate the fluid leakage. So we are right now in the process of writing a Federal Register Notice to partner with companies or organizations to develop prototypes for a novel protective clothing design or a gown design.

So these are the directions, and these are the questions that I have for the boards if I may. So suggestions on key partnerships to pursue or thoughts on the design of human subject testing protocol. As I said, it is challenging for us because should we design simulation studies in clinical settings or should we do real, I mean for example, should we talk with the surgeons if they accept to wear inner sleeve and try to understand how much is exposed using certain gown and glove model, and then we can repeat the same testing in our system to understand if we are simulating the real scenarios? Or there are some simulation centers in clinical settings; we can use those as well. But again, we will be dependent on the parameters that we use. So these are some of the challenges. And the other questions are thoughts on other resource gaps in this area, and suggestions for raising awareness or engaging the occupational safety and health community, and how might we drive the need for a change in PPE design and use.

Thank you very much. This is our project team.

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DR. ROGERS: Very nice.

DR. KILNIC-BALCI: Thank you.

DR. ROGERS: Scary.

PARTICIPANT: It's good work.

DR. ROGERS: Terry and then Chris.

DR. BUNN: Terry Bunn. Just very, very nice research. I'm wondering, you know, just to increase awareness and to help actually not only the occupational safety and health community but manufacturers, have you considered including like red food dye in the water and in the spray, which would help visualize where those leaks are actually occurring and really prove the point, especially when you're talking gown design, if you're not Level 4, that this is a real problem, that you could actually see that, as opposed to it's not the gloves, it's actually the design of the gown. Something like that.

DR. KILNIC-BALCI: Or the material that's used.

DR. BUNN: Or the material that's used, you know.

DR. KILNIC-BALCI: We considered using red dye but it will be very challenging to—

DR. BUNN: I know it's messy, yes.

DR. KILNIC-BALCI: Yes, to clean after each test. So we did not. But we are able to see how much fluid is—I mean, if it is exposed, we can see, and we are collecting so it was the best way that we could do. But we considered, yes.

DR. ROGERS: Chris.

MS. LASZCZ-DAVIS: You know, as you were—and this is a very nice study—but did you solicit the help of manufacturers and users as you designed your study, or was this done by NIOSH alone?

DR. KILNIC-BALCI: We talked with many manufacturers. I actually presented this when we are starting the idea at AAMI, Association for Advancement of Medical Instrumentation. They have the standard, main standard about gowns, they have a gown classification standards, like Level 1, Level 2 I mentioned. So in that committee, there are so many manufacturers, the main manufacturers sit, and also end users sit in the committee. So to get their ideas, I presented there before we started, so they were involved.

And when we are designing the test also, we sent our protocol, I mean it was very challenging again. Should we use two seconds of spray or five seconds of spray or ten? So we designed something and we shared it with APIC and AORN members, and they talked in their committee too and they decided, they were agreeing on the parameters that we used in the protocols. Yes, they were involved, both.

MS. LASZCZ-DAVIS: Thank you.

DR. ROGERS: Grace.

DR. KILNIC-BALCI: Thank you.

DR. LEMASTERS: Very interesting. Well, one thing I thought about, and those of us who have worn

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these gowns and gloves, is the issue of perspiration from the body that's coming from the body outside—

DR. KILNIC-BALCI: Yes.

DR. LEMASTERS: And how that may be acting as a wick to bring in, and so you only get that with human subjects I think, unless you have a perspiring arm or something.

DR. KILNIC-BALCI: There are actually.

DR. LEMASTERS: Yes.

DR. KILNIC-BALCI: I mean not arms, but there are sweating (inaudible @ 00:42:43) available. But yes, for that, I have another study about isolation gowns, so I am in the process of right now testing the thermal comfort using different isolation gown models.

DR. LEMASTERS: And I thought about, when you talked about NIOSH driving the need for change, have you—you may have already reached out to the American Nursing Association or the American Medical Association, which I think would have a huge interest in this problem of, in surgery and contaminated blood and so forth, to try to decrease exposure of their workforce. Have you had a chance to...?

DR. KILNIC-BALCI: Not American Nursing Association, I haven't reached out to them, but it's a good idea. I can. That's a good idea. American Medical Association...

DR. ROGERS: What about the gowns and gloves that are integrated?

DR. KILNIC-BALCI: Oh yes, when we are designing, they can be integrated but I think the challenge is healthcare workers want to change their gloves more frequently. So it may not work. And the other thing is you might have a large body but small hands, so logistics would be really difficult, you know. You have to have different size, even currently size of the gloves are an issue, gowns are an issue. So combining them might be difficult. And during surgery, I think when there's a puncture, needle punctures, they want to change and if there is too much (sweat @ 00:47:16), they want to change right away. So it might be difficult to change the whole system.

DR. ROGERS: Ron and then Sharon.

DR. STOUT: It's a cool study, thanks. Just leveraging what Grace shared, I've just returned from two or three weeks in Thailand and I was reminded how different conditions are in different geographies. (Any @ 00:47:39) conditions that this study was done under...

DR. KILNIC-BALCI: Yes.

DR. STOUT: Compared to the premise that...

DR. KILNIC-BALCI: Ebola.

DR. STOUT: You're taking a look at what might happen under an Ebola outbreak. So what is the temperature and humidity, and have you thought about changing that to more disaster type realities?

DR. KILNIC-BALCI: Yes, that's a good idea. Right now, we use current laboratory temperature, which is around like 25 degrees Celsius, and the humidity was changing from 30% to even 60% of relative humidity. It can be done but it brings up the issue about thermal comfort, I understand, and perspiration. We can use—everybody can use

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Level 4 gowns but the problem would be the thermal comfort of course. This is one of the... But it can be done. We can change the environmental temperature and humidity and then we can design the same thing and then repeat the testing. Yes.

DR. ROGERS: Sharon.

DR. KILNIC-BALCI: It would be challenging though.

DR. COOPER: Well, I'd forgotten how many cases and deaths there were among healthcare workers with Ebola.

DR. ROGERS: It's a lot. It was shocking.

DR. COOPER: I'd forgotten it was so—yes. So I just wondered, if this worked very effectively, how many of those cases would have been prevented? Like there's other issues like the interface at the neck, or this is just cutaneous exposure. So I just wondered, would that have protected many of those cases or most of them?

DR. KILNIC-BALCI: That's a very good question. I think, I don't have an answer for that but I think there is not good data about how those exposures happened in West Africa, that's the problem. I sit at the WHO's committee and they don't have, unfortunately they don't have good data, have the data about how these exposures happened, and they, time to time, they invite also West African doctors, medical doctors or nurses to the meetings, and in the first meetings, I was, like it was very emotional because what they were saying—I mean, we were talking about oh, this kind of design could be done, we can change this design, that kind of material. But they said, we didn't even have any gloves to wear. So it was really, I mean, tough. And I talked with MSF, Doctors Without Borders, you know, they had some cases, and to understand how their exposures happened. They don't have good data but they are thinking that these exposures happened during—you know, like those people, those doctors are living in the same area. So when they are not working but when they are outside of the work, they are still neighbors of some people so they are pulled sometimes. They knock their—like some of the regional people, they knock their door, they ask for help. So they don't say no, and they sometimes go without proper protection. So they are thinking that it is in social life, not in the healthcare environment.

DR. ROGERS: Any questions on the phone? Chris.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis. You know, I think maybe one of your big stakeholder groups might be emergency responders, quite frankly. I mean, I've been in emergency situations and you slap these on, you tape the wrists, hope it works.

DR. ROGERS: Hope for the best.

MS. LASZCZ-DAVIS: And you know, and that's probably your biggest challenge, quite frankly, and you're going to have more variability but boy, if there were a use for studies like this, that would be there.

DR. KILNIC-BALCI: Talking about variability, variability is an issue for this study, but I mean we repeated every test I talk about like 18 different conditions, but we repeated every

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condition ten times, but there was too much variability. But when you look at real scenarios, I mean it really depends. It really varies, like how you wear. So variability exists in the real settings as well, like real clinical settings, yes, variability.

And talking about emergency responders, should we change? Emergency responders sometimes use isolation gowns I know, like sometimes they use EMS coding, NFPA 1999. Should we use, I mean like gowns, gloves, what kind of things? Or what type of exposures are they exposed?

MS. LASZCZ-DAVIS: You know, I think it's worth talking to people who spend a lot of time involved in emergency situations. Even if the test results don't end up with precise effectiveness parameters, directionally you're going in the right—you're helping a situation where people are just slapping things on and hoping that they work. And I think some—if in fact, you get an opportunity to work with emergency responders and change some of the studies to help address some of the issues they have, a great factsheet sent out to the public would be really, really helpful, quite frankly, because we deal with this all the time.

DR. ROGERS: MaryAnn.

MS. GRUDEN: MaryAnn Gruden. One of the results that struck me was that the latex gloves, single latex gloves, actually gave the highest level of protection, and we've worked so hard in healthcare to really reduce latex because of all the allergies. You know, you still have the surgeons that they're not going to use anything but, but I just thought it was interesting, better than double gloving, to really look at that because the practitioners out on the floor, it's not always (inaudible @ 00:53:24), they're using gloves all the time on the floor, you're going into isolation. So I think that's a whole other area to kind of look at, should we be double gloving if you're going into isolation or...

DR. KILNIC-BALCI: Talking about latex gloves, but keep in mind that one of the latex models resulted in the highest.

MS. GRUDEN: Right, right. Yes.

DR. KILNIC-BALCI: So really, it's not material; it is really the glove model, like the elasticity of the material, so they can do. And one thing that I found that cost is, you know that cost is very important. So talking about the failures of the gowns, the gowns or the materials, the processing technology, the manufacturing technology, it is out there but the problem is, I think the biggest problem might be the cost. That's what I see.

DR. STOUT: Ron Stout. Would you mind bringing up the graphic "Mean fluid leakage by surgical glove configuration"? I might be confused but there's an interesting story right here. If I was going to be given a choice, I know which gown I would use and which one I wouldn't.

DR. KILNIC-BALCI: 8G, right.

DR. STOUT: What is the role of NIOSH and these type of studies in that type of environment?

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- DR. KILNIC-BALCI: It seems there's an obvious protective factor for at least one of these gowns.  
Yes, true, but for example, we are looking at synthetic, for example synthetic gloves, 8G is the best, across, except latex. So 8G, when they are paired with the latex 6GLV, it is the highest. So it really depends on the material, interaction between the gown material and the glove material. So that's why I guess I said they should be designed as a system, gloves and gowns should be designed as a system so...
- DR. STOUT: And since they're not, perhaps we should disseminate this type of information more widely.
- DR. KILNIC-BALCI: Yes. How can we—I mean, other than journal papers or conferences, what do you suggest how we disseminate this information?
- DR. ROGERS: Webinars. I mean, there are lots of approaches... Mark and then Chris.
- DR. NICAS: This is Mark Nicas. On the opposite effects really of these two latex gloves, so there's a real problem here though but it tells me (inaudible @ 00:55:57) manufacturing process of the glove, we start with the manufacturers. It's kind of similar to the permeation testing that you see where you get neoprene gloves, it's the same neoprene but you get different manufacturers and they show a very great range of permeation against the same solvents. And so I would imagine that gloves—I would imagine you'd have to manufacture this as a system because gloves are always changing, and glove models are always changing, and you could never keep up with the glove combinations to go with the gown. I think the manufacturer has to manufacture a system. I would agree with you.
- DR. KILNIC-BALCI: I think the elasticity of the glove is really affecting, and also the grip properties. We are trying to understand how they are also testing, I mean the frictional, we are planning to test the friction of the gowns and gloves, and also stiffness and also elasticity, but the grip is affecting and elasticity is affecting. But the problem is when you increase the grip, you are reducing the fluid leakage, but it won't be easy to put on and put off when you increase the grip. So I don't know how they will be. But it can be optimized, like these properties can be optimized. But I can say that this 5GLV model is really difficult to put on and put off.
- DR. LEMASTERS: Yes, just in kind of the methodology, I assume, because it just makes me—when you look at it, it's like ah, was there something in the method that is accounting for that differential result? So did you try different lot numbers of the glove and also like the number of times it was tested? Was this just like one test, or was this an average of like ten tests or something?
- DR. KILNIC-BALCI: Yes, it is average of ten tests for each of them, each—so, and we used the same—we changed the lot. Lot to lot difference, there was no lot to lot difference, but we used the same lots. But just to see...
- DR. LEMASTERS: Oh, you used the same lots.
- DR. KILNIC-BALCI: We used the same lots.
- DR. LEMASTERS: Ah, okay.

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DR. ROGERS: Chris.

MS. LASZCZ-DAVIS: Chris Laszcz-Davis. It seems to me that you are at the perfect point of going back to people who would make use of this information to help you design further steps and further studies. I think about whether you go to the hospital associations—I don't know whether or not these are the right associations, but it's the professional and the trade associations I think that need to be tapped at this point. And oftentimes, it's a simple call to start the dialogue, to see what core group they have to begin that. Emergency responders, I mean there are national associations for that.

DR. ROGERS: The Joint Commission.

MS. LASZCZ-DAVIS: And many times, that's the way you start the dialogue, but you're at a perfect point where you need some additional input into actual use, I think. Because the work has been great so far but I think operationalizing it is the turning point here.

DR. ROGERS: And the Joint Commission would be...

DR. STOUT: Ron Stout. I don't know if you've worked with manufacturers. A medical school classmate of mine, Curt Hamann, runs a series of companies including SmartPractice, and he's one of the larger manufacturers of gloves, particularly for the dental and the surgical industry, and he's worked with NIH and others on latex and allergies, etc. He's always very interested in these areas. So if you're interested in working with those type of folks and I can connect you, let me know.

DR. KILNIC-BALCI: Yes, that would be great.

DR. ROGERS: So who approves these glove things?

DR. KILNIC-BALCI: Who?

DR. ROGERS: I mean who approves the standards on the gloves?

DR. KILNIC-BALCI: I think for gloves, FDA have an approved 510(k). And for gowns, for...

DR. ROGERS: I mean...

DR. KILNIC-BALCI: But they will be approving the glove, the performance of the glove, not the interface.

DR. ROGERS: ANSI? I mean somebody has...

DR. KILNIC-BALCI: ANSI has standards, yes, ANSI has standards. But these gloves are passing the viral penetration tests and the blood penetration tests.

DR. ROGERS: But nothing more than that.

DR. KILNIC-BALCI: But about the interface, there is no standard about that.

DR. ROGERS: I've often asked the question too and it probably doesn't relate to this, but when gloves are put on and people wear them for a long time, I've asked this question several times and there have been no answers. Does the glove itself get contaminated and what is it contaminated with and for how long? Because I often see, like just going into a restaurant and people have those gloves on and touching everything, and they're wearing them for ever and ever, and you never want to eat anything they've ever touched with the gloves on. But I've often wondered that about, I mean in a healthcare environment as well, because people

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just put these gloves on like it's nothing and wear them like for ever, and they're touching many, many things and they're getting contaminated with many, many things.

DR. KILNIC-BALCI: I don't know any study about that but I agree with you. Like when people put on gloves, they are protecting themselves but after they are protected, they touch everywhere...

DR. ROGERS: You know, they're doing many things with their gloved hands. Anyway, it's maybe something in PPTL that is...

DR. KILNIC-BALCI: But for example, during Ebola, there was a need, if CDC—you might remember CDC's donning and doffing procedure requires around, I think, like seven times use of hand sanitizers. So there was a question if hand sanitizers are affecting the gloves, glove properties. So we did some testing to understand if it is affecting, so it wasn't really. It was effecting but it wasn't really, still those properties are within the range of the approval.

DR. ROGERS: The whole glove thing is a mystery.

DR. KILNIC-BALCI: Any suggestions about how we can design the human subject testing, I mean in the clinical settings? I contacted the University of Maryland and also Emory University. They were, as you know that they were leading during Ebola response. So I wanted to design human subject testing but I wasn't really sure if we need to really design in real clinical settings or simulated settings in clinical areas, or how we can do this. Any ideas about that? Because it's not, I mean like cuffs for example, you can simulate the cuff but it's not what we are trying to do. We can do a simulation of some kind of spray exposures, soaking exposures, but it will be still simulation. It won't be much different than what we are doing with the robotic arm.

DR. LEMASTERS: How about the chiefs of surgery? Did you contact them at these institutions? You said you contacted the University of Maryland.

DR. KILNIC-BALCI: No, chief of?

DR. LEMASTERS: Surgery. Surgery.

DR. KILNIC-BALCI: No, I haven't contacted.

DR. LEMASTERS: Yes, I would think about that, or the CEO of the hospital, but—or the chief of nursing. One of those folks that might be really interested in the protection aspect of their employees. Just pick up the phone and contact them directly.

DR. KILNIC-BALCI: When we talked with Emory University or the University of Maryland, they had some ideas about, for example they have, at University of Maryland for example, they have simulation laboratories. They have a body with organs and then you can take out organs, and you can design your study. You can just spray. But again, it will depend on the parameters that we enter. It might be even like the second step, just to validate, but should we really go for the real settings, real surgeries?

DR. LEMASTERS: I would talk with the chief. If the chief of surgery doesn't buy in, you're dead in the water. So you know, I would start with trying to get buy-in from...

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DR. KILNIC-BALCI: Chief of surgery.

DR. ROGERS: And nursing as well.

DR. LEMASTERS: Right.

DR. ROGERS: But I mean in terms of looking at human subjects, to me the first thing is really just to observe how people put on those gloves to begin with, because everybody does it differently, depending on the different story, the different situation. Because obviously in the OR, it's put on differently than on the floor, where people are just slapping them on and not much thought probably goes into how far up they pull them, etc., etc. So I have no idea, but having done that myself, there are times where you just put them on. You don't really think about it. You're just really thinking about the hand part. In the OR, it's different because you don't want to contaminate everything, much. And so just even an observation study to begin with in terms of looking at different—and different settings are different. The nursing home is quite different than the hospital than the home.

DR. LEMASTERS: And (inaudible @ 01:05:52).

DR. ROGERS: It is.

DR. LEMASTERS: Starting with being in an observation.

DR. ROGERS: Yes, just in terms of a design.

DR. LEMASTERS: And then you go from observation, you've got your foot in the door.

DR. ROGERS: You've got to first characterize how they do it, like in home healthcare, the gloves they use are just awful to begin with. They're just loose and nasty, and they don't even come up over anything. Well, they don't even wear gowns. So it doesn't even matter, but just characterizing how people actually do it to begin with would be important.

DR. KILNIC-BALCI: Yes. I did not go and watch any surgeries, but that's what I am planning to do, but I watched so many surgery videos, videos actually. So it's tough to watch as a non-healthcare worker but yes, I agree. And surgical settings is more controlled really.

DR. ROGERS: Exactly.

DR. KILNIC-BALCI: And also for example, you can think that this is probably the best scenario, best-case scenario, because we use the extended, I mean like 12 inch of glove cuff. But when you are talking about the floor, I mean if they are not using any kind of—any extended gloves, then we don't need to even test because—

DR. ROGERS: The settings are going to be so different on a regular med-surg floor versus the OR versus the emergency room versus the EMT person in the thing, the helicopter person. They're all very different, how they—and whether it's an emergency situation as well. Somebody has time to put on a glove versus like oh, got to put it on right away, that's a whole different story. So I think there are lots of areas here that need examination, just to begin with.

DR. KILNIC-BALCI: And each area, I guess they do hazard assessment so the risk, that's...

DR. ROGERS: Good luck.

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- MS. LASZCZ-DAVIS: You do hazard assessment but it might be very qualitative.
- DR. ROGERS: Yes, good luck.
- DR. LEMASTERS: Well, sometimes they do post-surgery infection rate of the patient, how many patients have infections following surgery.
- DR. ROGERS: The patients but not the workers.
- DR. LEMASTERS: Which could occur during surgery or post-surgery, but that is the only kind of health hazard evaluation I know of in a hospital setting.
- DR. ROGERS: Let me give this example, and it's not about gloves but it about respirators, which is PPE. So I'm on this IOM committee that's looking at these elastomeric things, and I come home from a meeting, my husband, who is a family physician, says to me, "So what was the meeting about?" and so I said, well, it's about these elastomeric respirators, blah blah. He says, "Is that like turtle thing you put on?" and I said, well, that's the N95. He says, "I have one of those," and I said really? He says, yes, I keep it—here's the clue—I keep it in the bottom drawer of my desk and I pull it out when I need it to wear. I said, well, how long has that been? He says, oh, I've had that one for a couple of years. And I said have you ever had a fit testing? He says what's that? So when you think about healthcare workers and how they deal with these PPE things, it's going to be so variable and a mess, frankly, how people do that because then everybody in his office, clearly none of those people are protected. Half of them came down with the flu this year even though they had the vaccine, because the vaccine wasn't so great, but still they're getting all kinds of exposures just from, poor practice. Well, they don't even know any better really.
- DR. KILNIC-BALCI: Same thing actually about the surgeons' head caps. They just, nobody washes, if it's reusable, they just put it whenever they go to food courts, like every...
- DR. ROGERS: So I think that whole looking at how people actually use stuff...
- DR. LEMASTERS: We have an Ebola outbreak going on right now and...
- DR. ROGERS: Let's take one more question and then we'll break for lunch. Chris.
- MS. LASZCZ-DAVIS: Just a real quick comment. Might we get back to Bonnie with some suggestions as to how you might advance this whole thing? I think everybody's got ideas. I'd like to give it a little bit of thought.
- DR. KILNIC-BALCI: Yes, that would be great, thank you.
- DR. ROGERS: Any questions on the phone?
- DR. MCKENZIE: Not on my end. Very, very interesting. Thanks very much.
- DR. ROGERS: Thank you.
- DR. MCKENZIE: This is Judith.
- DR. HOWARD: I would say that when you send things to Bonnie, copy (inaudible @ 01:10:32) as well so we can track it.
- MS. LASZCZ-DAVIS: Got it.
- DR. ROGERS: Okay, well, thank you very much.
- DR. KILNIC-BALCI: Thank you. Thank you. Thanks for all of the comments.

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DR. ROGERS: It's a lot of good work and a lot of really, gosh, I don't know, a good area to really focus on, will be a lot of protection eventually. So let's take a lunch break then and we'll come back... So let's come back then in twenty minutes at 1:00.

[Break.]

DR. ROGERS: Go ahead and start.

MR. GARCIA: Okay. So we're going to do roll call to make sure that we have a quorum. I can go down the list and see who's here and we can go—

DR. ROGERS: What if our conflicts have changed?

MR. GARCIA: So I see that Dr. Redinger is here, Dr. LeMasters is here, Dr. Nicas, MaryAnn, Dr. Rogers, Ron, Chris, Sharon.

DR. ROGERS: Terry is here.

MR. GARCIA: Terry also.

DR. ROGERS: She's in the bathroom listening.

MR. GARCIA: And Dr. Behm, are you still on the phone?

DR. BEHM: Hello. This is Mike Behm. Did I hear my name. I'm sorry, I can't hear you very well.

MR. GARCIA: Yes. I was making sure you were on the phone with us still.

DR. BEHM: Yes. Good afternoon.

DR. ROGERS: Okay.

MR. GARCIA: All right. So we're good. Okay.

DR. NICAS: And Judith.

DR. ROGERS: Judith?

MR. GARCIA: Oh, Judith. Okay. We don't have any public comments but so we're going to do—we're going to let Rene say a couple of things but—

DR. ROGERS: There's still going to be our public—

DR. PANA-CRYAN: So Dr. Howard told me to come here, so I'll stand. So in relation to the information that Amia was sharing with you on contribution analysis, I think a couple of you talked about cost effectiveness or cost or economic value or economic outcome. So I wanted to kind of take an opportunity to connect some dots. We recently did a study with RAND that involved three case studies to kind of understand the economic benefits associated with NIOSH research and services. So these three case studies were chosen. They're not like random case studies. They were chosen because their projects were mature, etcetera, etcetera. They were several criteria and they were different from each other. And so there were—if I can describe this, this way—sort of like clusters of related projects. So they weren't a program, they weren't NIOSH overall and they weren't a project. They were clusters of related projects. So I can send you the information so you can add it for the benefit of the Board. But they were very different. One was exposure to crystalline silica during construction, road construction, for workers working with large asphalt milling machines. The second one was exposure to cancers in firefighters. And the third one was evaluating an Ohio program to subsidize

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employers to implement engineering controls.

And so for all of these case studies, we estimated medical costs and productivity losses averted, as well as value of a statistical life estimates which, don't hurt me but this is one of the metrics we used for regulation purposes so we provided this information as well. And we also estimated preliminary values for what NIOSH spent to develop all this information and implement evaluations. So I will provide the information for the Board and we hope to present to you in more detail this work in an upcoming meeting of the Board. Thank you.

MR. GARCIA: Thank you.

DR. ROGERS: Thank you.

MR. GARCIA: And then one additional thing that I wanted to share with you guys is that we, Paul, Dr. Piacentino and I, we put together a Federal Register Notice to recruit more Board members since we are having quite a few members whose term is going to end up in December. So if you know anybody that would be interested in serving, or interested in participating in the Board, have them submit their resume to us. All the details on how to submit the information will be on the FRN, and we hope to see it come in the next week or two, so.

DR. ROGERS: Okay. Good. All right. Sarah? So we welcome Dr. Sarah for safety and health workforce training.

[Technical setup.]

**OCCUPATIONAL SAFETY AND HEALTH WORKFORCE TRAINING**

DR. FELKNOR: Thank you. It's a pleasure to be here today. My name is Sarah Felknor. And for those of you I don't know, I'm the Associate Director for Research Integration and Extramural Performance at NIOSH and oversee our Extramural Program and also our NORA Intramural Research Competition. And before I came to NIOSH I was involved with the University of Texas...the great University of Texas, ERC, and directed the Center for Occupational Environmental Health. So some of our training efforts, I've lived some of this history that we're going to be talking about. So okay, so I want to acknowledge our folks in the Office of Extramural Programs, who I'll probably refer to as OEP, because there's been a lot of data collected to try to look back and really do what I hope you'll think is a nice retrospective summary of where NIOSH has been involved in training the next generation of occupational safety and health professional for generations. Okay, so to remind us of the mandate for training, when NIOSH was established by the OSHA Act is included the mandate to provide a continual supply of occupational safety and health professionals for the US, to protect US workers. So the training mandate is in the very beginnings of NIOSH.

And when we refer to the NIOSH Occupational Safety and Health Training Portfolio or the Workforce Training Portfolio, a couple of things to keep in mind. One is that it represents 30% of the entire extramural budget. So we put a lot of our money into training. And it has two large components. The Education and

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Research Centers, or ERCs, are probably the most well-known piece of that. They were known as Education Resource Centers until 1998, reflecting the regional resource responsibility and obligation our ERCs had to provide access to, and outreach to, all the federal regions in the United States. They provide primary graduate degree training in both what we consider core and allied fields, and provide continuing education and outreach in those areas as well.

The second component, and I think less well-known, of our training portfolios are what we refer to as TPGs. These are our Training Project Grants. These are single discipline degree training programs at either the bachelors, or undergraduate or graduate level, mostly graduate. And they're in the core and allied fields of occupational safety and health. And we have a limited number of specialty non-degree training project grants that are more focused on front line workers. We have a TPG with the International Association of Firefighters. We have a Maritime Health and Safety TPG. And what you can't see behind those icons is Occupational Health Internship Program, or the OHIP Program, that's run by [ACOM]—AOAC.

PARTICIPANT:

AOAC.

DR. FELKNOR:

Sorry, AOAC. Okay. So I've divided this into sort of chunks of activity where the training program of NIOSH started and what it has now evolved to. And the early years of training at NIOSH were exclusively Training Project Grants. And they go back to the very beginnings of NIOSH in what I think might have been one of the fastest government responses, is, in 1970 NIOSH was formed and in 1971 we had 21 TPGs in 16 institutions in 14 states. By 1975 we had 39 TPGs in 31 institutions in 22 states. And by 1976 we had 44 TPGs in 35 institutions in 25 states. And it was really the success, the growth, the development, and clearly the need for training, that took the nascent, if you will, TPG program in these first five years, really of activity, and brought us to the evolution of the Training Project Grants which I'll get to in just a second.

So by 1976 our Training Project Grants had single degree programs in hygiene, medicine, safety, engineering and had a number of short term training in allied fields. And you'll see throughout this presentation that... Pay attention to what's going on in the allied fields because I also think that that's an area for us to pay attention to as we go forward with our training programs. So there's a long list of training programs including an independent study course in nursing. There wasn't a degree program in occupational health nursing at that time.

So as I mentioned, it was really the success of the TPGs that got us to the evolution of the training program and got us to this idea of Education and Research Centers, which, as I mentioned, were Resource Centers in their first many years, that were designed with the idea that they would provide regional resources and access to training to provide this steady stream of occupational safety and health professionals to enter the workforce.

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In the first year that ERCs were funded, nine ERCs were funded in nine states in five of the 10 federal health regions. Between '78 and 1985 NIOSH added a few more, five more, ERCs in 14 states in eight of the 10 regions. And between 1997 and 2011 we got to 18 ERCs in 17 states. California has two, north and south, and in all federal regions. And today that's where we are with the same, 18 ERCs in 17 states in all 10 health regions.

By 2017 the components of the ERCs were... There are some required components and some optional components. Required included a planning and evaluation core. You have to have obviously an academic training core where you have at least three academic programs in some combination of core and allied fields. Again, the allied fields are something that I think we need to pay attention to. And by 2017, reflected in I think a fairly substantial overhaul of the funding opportunity announcement for ERCs, we allowed certificate training in approved areas. Certificate training was certainly outside the initial scope of the ERCs which were graduate degree focused programs. And so now ERCs are able to provide certificate training in any of their approved academic areas. They have to have enough substantial work in that academic area to be able to offer the certificate. And they have to have the outreach core to the region.

Optional components, which are present in all of our ERCs in one degree or another, have a research training core. And this is through pilot project research training and also targeted research training which now allows support for postdoctoral training. So in the revision that we did in 2015 those were two really major changes to NIOSH's thinking about the original old paradigm of "we're going to train in medicine, safety, hygiene, nursing and you're going to give a degree and it's got to look like this." And now we're sort of expanding that to allow certificate training, largely in response to some workforce needs assessments that we've been doing over the years. And I'll touch briefly on those. We've made continuing education optional, although I think all or all but one of our ERCs continue to support a continuing education program.

The academic programs of our ERCs now include the four mother tongues of occupational safety and health and a number of allied disciplines, which, if you hold this slide up to the original TPG slide it doesn't look too terribly different. So you'll recognize some of those disciplines as well.

So that's a brief review of kind of the history where training started, how it evolved, where we are today. Let me show you where we are today. Here are 18 ERCs and here's how they're distributed or located in, across the United States. And these are our TPGs. We have 34 of them today in many states in the country. And I thought it was interesting to put the two maps side by side so you can see how a lot of... And I really should probably do this in one slide so you can see how they overlay. There are still gaps in terms of states without activity. But again, the notion and the responsibility, the explicit responsibility of the ERCs, is to provide

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that regional resource. And I'm sure, as Dr. Rogers can attest, many of our courses now offered in ERCs are online. And so they catchment area, the old idea of the catchment area being your federal health region, don't go outside it, is passé, really.

So in looking at where we've been with the development of our programs, we also wanted to a look at what have we put out, what are the outputs. So we looked back at data going back to 1977, which does cross several technological development lines, and we had to pull out a few shoeboxes and go through some old three-by-five cards and put things in piles and count them up, so we've rounded for the purpose of presentation, to get some of these data. So we're looking at 40 years of activity. Our ERCs and our TPGs have produced 18,400 graduates. And here's how they distribute in the four core areas and the allied field in occupational safety and health. Clearly the largest number of graduates is in industrial hygiene, followed, actually, by allied field as the second largest discipline area. And it's a very, obviously it's a real gamut of disciplines. Followed by safety, medicine and nursing.

And then I'm going to show you some slides about how these break down by ERCs and TPGs, to give you some idea of how the training outputs are a little different. This is the distribution of the almost 11,000—10,668—graduates over 40 years produced by the ERCs. Again, hygiene is the largest number of graduates, represents the largest number of graduates, followed by medicine, nursing, safety and allied occupational safety and health.

And then I wanted to see what it looked by decade to see what the influences were. We've done a number of needs assessments which, again, I'll get to in a minute, over the 40 years period. And I wanted to see how the number of graduates might have changed in the decade, sort of this early decade, the first 10 years. You see the four decades represented here. And there's a real bump in the 1987 to '96 decade. I guess we all had more energy in our twenties, right? So, and then it sort of stabilizes in the last two decades. And these are among our ERCs.

And then looking at discipline, graduates by discipline, by decade. So for each discipline, hygiene, nursing, medicine, safety, and allied, I've shown the number of graduates by the four decades for each of these disciplines. So you see, in hygiene and in medicine, that same peak that we saw here in that second decade. Right? There was a large number, larger number of graduates in that second decade. Occupational health nursing really actually had the highest number. In the third decade safety is kind of up and down. But take a look at allied occupational safety and health. And it's really, in the last decade, the contribution of graduates in the last 10 years of training in allied occupational safety and health has increased substantially.

And this is what the breakdown looks like by our TPGs. So it's a very different

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distribution. These are the number of graduates by discipline over the entire 40-year period with the most number of graduates are in the allied fields from our TPGs, followed by hygiene, then safety, then medicine and practically no, very few, nursing. Today we don't have any TPGs in nursing.

And the same data of distribution of TPG graduates by decade, the distribution curve moves a little to the right. And so it's actually in the third decade that our TPGs turned out more graduates comparing that to the same data for the ERCs. Keeping in mind, obviously, the number of TPGs that are producing these graduates changes, so these are just gross total numbers.

And then, again, here's the distribution of TPG graduates by discipline. Again, looking at the sheer numbers of graduates in the allied fields, I really think this is sort of where we need to... We need to keep our eye on that. And I think it might be a leading indicator of... And we'll get into a discussion about paradigm shifts. So you could see that safety graduates have been increasing steadily. Hygiene had a real increase and has dropped down. Medicine has been up and down. Nursing. Again these are TPGs. And then the greatest number in allied. So the TPGs, of that 18,668 graduates, the TPGs contributed almost 8,000 of those and about 10,000 came from the ERCs.

So another way we look at success, effectiveness, impact, in our training program is did trainees go to work in the field you trained them in? Are they working at Burger King or are they running safety programs for Shell Global? So we've been capturing employment data of our graduates since 2005. So I have 12 years of data here. And this graph shows you the percent of graduates that go to work in these—that are employed in occupational safety and health when they graduate. So the first blue bar. And the slides you have I believe in your book go to 2016. And so after I submitted those slides we were able to get the rest of our 2017 data together so I thought I'd show you that. I think the only change has been in hygiene and allied. It went from 90% to 91% so there weren't big changes. So this is 12 years of data. 91% of our industrial hygiene graduates are employed in occupational safety and health. 79 of our OHN graduates are employed in occupational safety and health. 87% of our medicine graduates are employed in occupational safety and health. 84% of our safety graduates are working in the field. And 91% of our allied graduates, again, allied, are working in the field. For NIOSH accounting purposes, if you've graduated from an OSH training program, ERC or TPG, and then go on to seek an advanced degree in an occupational safety and health discipline, you're counted as "employed," air quotes, in occupational safety and health. So that does represent—And I'll show you some breakdowns of whose in, seeking advanced training. But we consider that—employed.

PARTICIPANT:

Can I ask you a question before you go on? So in the allied field if you had somebody who was already trained in occupational health, nursing, or another

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field and then went on and got an allied sponsor maybe, or would you be counted as an allied professional in this? Or would you be counted in both places?

DR. FELKNOR: Well, for the year you contributed your employment data you would be counted in that year, so—

PARTICIPANT: But you could have people that are in those other professions that then go on and do a NIOSH-sponsored allied profession, and then would be counted in the allied even if you were already trained in—

DR. FELKNOR: Sure. So people who are trained in the allied field in NIOSH-sponsored programs could have a degree in nursing, medicine, hygiene.

PARTICIPANT: Occupational nursing or medicine.

DR. FELKNOR: Yes. Right.

PARTICIPANT: Okay.

DR. FELKNOR: Yes. And we can look into that. It's a question we haven't really considered.

PARTICIPANT: Yes. I was just curious. Thanks.

DR. FELKNOR: It would be, yes, interesting to see what their background is. Because it's hard. Allied? What's allied? It's like everything. And how do you really articulate what it means? So again, that's why I think it's something that we need to pay attention to in terms of... Because obviously there's need because people don't go—91% of them are working the field when they graduate. And this is over a 12-year period. So I think it's something that we need to pay attention to.

And then this is the breakdown of where our graduates go. So the previous slide showed you who goes to work in the field by their discipline. And this shows you where they work. So 24% of our graduates work in private industry. And 14% or 15% work for the government, federal, state, local, work for academic institutions, or work in clinics and hospitals. Only 1% go to work for "other," what's defined as "other" occupational safety and health employment. And there's that 9%. So I mentioned that we count graduates who go on to get a further degree in OSH as being employed as OSH. And they represent 9% of our total graduates.

And the last output I have to report are the continuing education outputs, again, over that same 12-year period. So this is where numbers, I think, can just be impactful. Over 12 years—and this is only from among our ERCs. We do have some TPGs that provide continuing education. It's not a program component and it's not something that they really get allocated money for. So this only captures our ERC outputs. So over 12 years—our ERCs have provided almost three million person hours of training, which sounds like a lot. That's a long course, to over half a million trainees in over 18,000 courses. And the courses are listed here in order of the number of courses offered. So safety is the most popular, if you will. Hygiene, nursing and medicine, I thought it was very interesting that those courses really kind of distribute pretty evenly in the 2,300 to 2,400 courses over this 12-year period. Hazard substance training used to be a funded opportunity that was offered through our ERCs. And that funding stopped in 2012. We have a

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- limited number of ag safety programs within our ERC portfolio. And then, here again, under “other” are the allied fields; which is really if you were to order these completely in order the number of courses would be the second most popular offering. But again, allied represents so many. It isn’t one. It isn’t ergonomics. It isn’t occupational psychology. It’s really the composite. Yes?
- DR. REDINGER: Charles Redinger. A quick question. I think I know the answer to this but just to be clear. So a course means, not the degree program or courses within, but a lockout-tagout three day thing or industrial hygiene review for certification...
- DR. FELKNOR: Exactly. Exactly. And where continuing education units of some kind, whether it’s a CME, CNE or a certificate of some kind is offered at the end of the course. Yes.
- DR. REDINGER: Thank you.
- DR. FELKNOR: That’s exactly right. This is non-degree training. And again, distributed across the main core disciplines and allied fields.
- DR. NICAS: I have a question. This is Mark Nicas. Other than hazardous substances training, would most of these be CE courses? I mean, con—
- DR. FELKNOR: Yes.
- DR. NICAS: Yes?
- DR. FELKNOR: Yes. Yes, they’d be CE courses. Most if not all of them, most of them, we’d have to pay for. You have to register. You need a faculty. You’ve got some degree-granting institution that’s providing the CE credits. They may be affiliating with another professional association to actually provide the units.
- DR. NICAS: When you had previously shown that there were some certificate programs that you do associated with these courses—
- DR. FELKNOR: No.
- DR. NICAS: No?
- DR. FELKNOR: No. So the certificate, so what, 10 years ago, maybe, Schools of Public Health started offering certificate programs in public health which in general was a course in each of the five major disciplines of public health: epi, biostat, environment, health behavior, and management. Yes, management and policy sciences. And you would get a certificate in public health. And this became a popular option for early career folks, maybe in health departments, who weren’t going to go back and get a masters. Or, they had a masters in some other and they weren’t going to go get a doctorate. But they needed that credential and training. And so we’ve seen, in occupational safety and health, that there are some certificate programs available in industrial hygiene or safety. And so that’s the certificate program that has a kind of a surrogate degree credential. These are continuing education programs that are designed for professionals who are already in the field working and need to continue their education in that regard. Okay. So you can’t talk about the ERCs without talking about money.
- DR. ROGERS: Correct.
- DR. FELKNOR: Correct. So I thought it would be interesting to look at the funding trends. And I’ve

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looked back from 2012 to '17. And these data also are produced annually in annual report that we put out on our extramural program. So this shows you the funding trends of our ERCs which, starting in 2012 at just over 24 million in 2017, were up to 28.4 million. So they've seen a nice steady increase over this six-year period. Actually and that's the most recent view of what's been a long period of, history of increase.

And then I wanted to show our ERCs up against our other sort of flagship center portfolios. So the blue bar represents the ERCs. The green bar represents the funding to our ag centers. And note that this is funding just for centers only. So this isn't any other related research projects that are directly related to ag or construction. This is just the money for the centers.

So our ag centers have also seen a little over \$4 million increase over this six-year period. And the red bar represents our National Construction Center. And that funding has remained flat and steady over this period of time. And then the gray bar represents our Total Worker Health Centers. For the first few years we had only four centers and their funding remained relatively flat, although we increased it a little bit in 2015. And then in '16 we added two more centers. So we've increased the allocation to our Total Worker Health Centers.

And there is some overlap communication between some of our ERCs and Total Worker Health. Some ERCs are developing certificate programs in Total Worker Health. Some ERCs have degree programs in Total Worker Health. And we're working to... In the revision to the 2015 funding opportunity, when we allowed training in certificate areas and we also changed the definition of sort of what we meant by core and allied fields. And so it opened up the opportunity for our ERCs to develop coherent curriculum in a concentrated area. And we were actually thinking of Total Worker Health when that revision was made, to allow that flexibility to really try to be responsive to what's been a very longstanding program. And you have a good thing going, you just want to keep it going and so you just keep it going. And it takes some energy to change what you're doing.

And so the last trending slide I'll show you is to just sort of juxtapose the research funding relative to where our ERCs and other center funding has gone over this six-year period. And you'll see that there's been—with the steady increase in funding to our centers, there's been—a decline in our investigator initiated research. It's purely a numerator, denominator thing. And the denominator doesn't change. And so when the bottom line doesn't change, and you change either the number of programs or how much you give those programs, the slices of the pie just get redistributed.

And I think what we've been trying to do as we've been watching this trend, is work with our ERCs and ag centers and well, Total Worker Health and construction, to look at within these earmarked areas, of training, ag, construction, Total Worker Health, how can these research activities that we're putting money

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into support the research agenda of NIOSH. And so I do think that our ERCs, and ag centers in particular, do a very good job of identifying the NIOSH interest, the NORA agenda items, the NIOSH strategic research items, areas that their research programs are supporting. So that's an important piece of information for us to capture. And we haven't quite captured it yet so I think we need to figure out how we can portray that information going forward.

I mentioned that NIOSH has a history of conducting occupational safety and health workforce assessments looking at supply and demand. And in fact, the first one was commissioned the year after the ERCs were first funded. So we had the first seven years of our TPGs, ERCs had been at it for a year and NIOSH commissioned a nationwide survey of the workforce looking particularly at supply and demand in 1978. In 1985 NIOSH commissioned RTI to do a study of the impact of our training programs on supply and demand. And in 2011 we commissioned Westat to conduct another national assessment of occupational safety and health workforce, looking at, not only supply and demand but also core competencies to kind of help us answer the question "Were we teaching the right things? Is there supply? Is there demand? And how well prepared are they to enter these fields?"

And I'll just briefly touch on these. These are available on the website. And Alberto, I can send you the link to these if folks are interested in looking at them in some greater depth. And they all have different versions of the same story. In '78 the study which was designed to assess demand through a survey of employers and educators, predicted chronic shortage of graduates in safety and nursing. They noted a current shortage in medicine, but that that was not expected to continue.

In 1985 a survey of academic programs and graduates found that the ERC graduation rates were expected to remain level except for a sharp decline in safety. They found that ERC graduates are easily employed, which remains true today. I mean, the percent of graduates that are employed in the field is really, I think, impressive. And then employers found a shortage of nursing and medicine graduates.

And in 2011, the Westat study—which looked at supply, demand and competencies was a national survey of employers and educators—found that the five year demand which was over the 2012 to 2016 period, would outpace supply by about 50%, especially in safety and nursing. They noted an apparent decline in funding. And this isn't borne out in the slides, but that also was about the time of the 2012 rescission where we had to go back and cut some funding based on a reduction of the whole NIOSH budget which happened in 2012.

They also noted that funding, but also lack of awareness of occupational safety and health to be one of the main obstacles to recruiting, is that people just didn't know about the field. And many of us have talked about how did you get into

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occupational safety and health? And it was “I was in the wrong room.” “I didn’t know this was the conference I was going to and then I found a career.” And or “I took a job and I had no idea what I was going to do. And then I found a degree program and found a career.” Right? So Rebecca will talk a little bit about some of the initiatives that NIOSH has going to try to address that. And it did find, the Westat study was clear, that, employers were very satisfied with the discipline specific competencies and training. So in those really core areas they were very satisfied with training. They did mention, pretty overwhelmingly, that there was an increased need for interdisciplinary training. That this siloed approach to a doc being a doc, never doing anything with hygiene and on down the line, was being challenged by current need. And that, in particular, training in management and leadership were content areas that they felt needed to be added. Yes?

DR. LEMASTERS: Sorry, do you think that these have borne out what they said as far as their findings?

DR. FELKNOR: Let me go back if I can.

DR. LEMASTERS: I’m speaking mainly about Westat, the last one. You know, demand for safety and occupational health nursing as well as the interdisciplinary training and bachelor-level employees.

DR. FELKNOR: So because we haven’t conducted any subsequent studies, I don’t know the answer to that. But I think that certainly the ease with which our graduates are hired tells us that there’s certainly plenty of demand for them. Whether it’s 50% more than they can provide, I don’t know. So I mean, there isn’t a follow-up study to really be able to answer that question.

We’ve shared the results of this pretty widely within our training program portfolio and have encouraged work in those area so—

DR. LEMASTERS: I just wondered if you’d heard anything in the field, “Well, we really do need these types of graduates,” or...

DR. FELKNOR: Yes. Ron?

DR. STOUT: Did I miss comments from Westat on physician—

DR. FELKNOR: On physicians?

DR. STOUT: On physician workforce?

DR. FELKNOR: There aren’t any up there. They did look at the physician workforce.

DR. STOUT: I note in ’78 everything is honky-dory, ’85 things are slipping. What did they say in 2011?

DR. FELKNOR: Yes. So I’ll have to look it up to get the medicine numbers for you. But the two of greatest note were a 50% outpace of supply in safety and nursing in particular. But I’ll get the medicine numbers for you.

DR. REDINGER: And I would just offer (inaudible @ 00:45:37) in the states I run about 30 clinics with Procter & Gamble and it’s a beautiful time to be an occ health nurse or an occ med physician. Most of our candidates are having three or four offers and the pay is just—

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- DR. FELKNOR: Yes. That's great.
- DR. REDINGER: It's good if you're a candidate. It's not so good if you're trying to fill the vacancy.
- DR. FELKNOR: Yes. Fill a vacancy because—
- DR. REDINGER: There's just, there's not enough—right now there's not—
- DR. FELKNOR: There are not enough graduates.
- DR. REDINGER: There's not enough certified occupational health nurses. There's not enough trained certified occupational physicians, at least my world, that fill the needs.
- DR. FELKNOR: Right. So in the years in-between the Westat study and the revision to the funding opportunity announcement for the ERCs which we made in 2015, we spent a fair amount of time in focus group conversations with our specialty program areas. And our medicine residency directors would tell us over and over and over, "I can train everybody. I just need more money. The problems with recruiting and producing more is a function of money." Obviously stipend and tuition support for occ docs is more expensive than other of the degree programs. And so there are limits within money. We did open up the pathways to medicine residency and by allowing alternative... Help me, John, remember what they are. The pathways for residency.
- DR. HOWARD: So there's the—I thought there was the—traditional pathway and there's an alternative pathway and then a complementary pathway.
- DR. FELKNOR: And complementary pathway, yes. So we allowed... Previously NIOSH had not allow funding to be used for anything other than the traditional residency pathway. And so in 2015 we opened it up to try to make it a little more competitive to bring in folks that had suitable training to go into the field. What I haven't done yet, and I think will be an important exercise, is, to answer your question, which is "How have the prediction, actually each of these studies, borne out? Some of them I know by looking at them, the ERCs did not see a decline in funding. There was a little dip. But in terms of the supply and demand predictions that were made we need to sort of map those two against each other.
- DR. ROGERS: And against cost of living. I mean, the dollar amount might not have changed. What has changed in real dollars in terms of cost of living for the ERCs. They may be getting the same money but are trying to hire professors.
- DR. FELKNOR: Sure. Yes, so relative to that question, though, and Rene can tell us whether the cost of living in the last 12 years that we showed has gone up significantly enough to where those dollars need to be adjusted.
- DR. PANA-CRYAN: We could adjust them. I mean, I don't have the numbers on top of my head. I don't have it in front of me but—
- DR. FELKNOR: Right. But we could look at that. The other question you asked is that the ERC and TPG money is restricted in terms of the percent of funding that can go to faculty and the percent of funding that can go to students. And so 70% or more of the total academic funding has to go directly to students—stipends, research, traineeships, whatever—leaving 30%, recognizing it takes faculty to run these

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- programs and the more students you have, the more faculty you need. So that may answer that question a little bit.
- DR. LEMASTERS: It's just tough recruiting students too. I mean, there's a lot of competition in recruiting students...
- DR. FELKNOR: And this is a real problem with occ docs.
- DR. LEMASTERS: From other programs that are going into, let's just say, toxicology, genetic molecular, genetic biology. I mean, the competition is fierce, right?
- DR. FELKNOR: Yes. Yes.
- MS. LASZCZ-DAVIS: Chris Laszcz-Davis. Did you guys try to do an assessment as to the business drivers for all this for the numbers or you just dealt with the statistics pretty much?
- DR. FELKNOR: Well, I'm reporting the statistics and I'd have to go... I mean, in some of the questions I think there are some questions in the Westat study—is the one I'm really the most familiar with—where questions that we asked employers got to some of that but—
- MS. LASZCZ-DAVIS: I wonder if I might just comment, add to that.
- DR. FELKNOR: Sure.
- MS. LASZCZ-DAVIS: I mean, having worked in the industry for over 25 years and for a big company, I mean, one of the things we saw was that as business decentralized and the profit centers were further out we eliminated a number of our docs and outsourced that. And what we really needed then were the generalists and the safety people who knew how to effect change within an organization. And most of our businesses in the US today are small to medium sized. Procter & Gambles, and the big guys, I mean, you guys run Cadillac shops but you can. But unfortunately I think the struggle that most American industry has is small to medium businesses so they need the generalists, they need the safety folks. But it may be at the expense of some critical core competencies too. That's a dilemma.
- DR. STOUT: If I could, I think in some respects you're correct about what's in corporate, so to speak. But the difficulty that we're finding now, with the many different companies that are running occupational health and other centers, is finding physicians and finding nurses to staff the centers, to staff the premise to come two hours onsite at one of your plants. The folks just aren't up there with the training. And many companies have gone over the last 20 years to using nurse-centered models and the COHN model was a very effective one. And candidly, there's...the elasticity in that population is giving out on us as well.
- DR. FELKNOR: So my time is up but I just want to leave you with this last slide. And I'll be happy to continue a dialogue with anyone and would appreciate your thoughts. Just some thinking about sort of where we are with future challenges and what are we thinking about. We think that the future of training, workforce training, is inextricably linked to the future of the field. Right? It's training is the chicken and it's also the egg. And so understanding that I think is very important. And being able to respond to turbulent environments, constrained resources where the need

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to demonstrate relevance and benefit has like never been greater. ERCs, ERCs are perennially up for elimination. And so the challenge to really be able to report and show relevance and benefit of training. And return on investment. We're talking to Rene and her group about strategies we might look at to show what the return on investment might be.

Changes in nature of work, workforce, workplace challenge these existing paradigms. And I mentioned that briefly before. We've designed a whole training portfolio that's 45 years old that is really built on the traditional paradigm of occupational safety and health. And bringing new paradigms in I think is also a challenge, and an opportunity for us. Where we're especially paying attention to this core and allied piece. NIOSH has been regulating, if you will, what the core disciplines are and that you must have at least two of the core. And then you can kind of do whatever you want to have your ERC and "maybe NIOSH should let the market figure that out" is a question that we're asking ourselves. And the issues of supply and demand, competency training versus discipline training. The change in CEPH, the way the credential body for schools of public health have completely upended the structure of how Schools of Public Health are organized by discipline to flipping it to a competency-based structure, since most of our ERCs are in Schools of Public Health, is also something that's important for us to pay attention to.

- DR. STOUT: Could I offer just one more "and"? I'm sorry for being so passionate. This is Ron Stout again.
- DR. FELKNOR: Yes, would you knock it off?
- DR. STOUT: No.
- DR. FELKNOR: It's a little late for passion.
- DR. STOUT: There are not enough—using the occ med physician, there's not enough occ med docs out there.
- DR. FELKNOR: That's true.
- DR. STOUT: And as I recruit from the ERCs the occ med docs that are there need more Total Worker Health wellbeing informatics training. So I think it's an "and." We need more occ health training platforms and we really need to rethink about the focus of occ health, I would argue.
- DR. FELKNOR: And many of our medicine programs will tell us they have trouble finding good candidates. So it's really a conundrum. And we think some of that's how much time in the medicine school curriculum is devoted to occupational medicine, like bzzz, that's it. So where that is, how we kind of intervene in that to help with that, because that's a cycle that's really an important one I think for us to try to figure out.
- DR. REDINGER: It'll change. This year kids coming out of your ERCs programs are getting multiple offers, \$220,000, \$230,000, \$300,000, kids straight out of training.
- DR. ROGERS: That's too much money.

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DR. FELKNOR: Where are they going? That's where I want to go.

PARTICIPANT: That's too much money for a kid.

DR. REDINGER: They're making more than us old-timers.

DR. ROGERS: Anyone else?

DR. STOUT: A quick question. So one of the slides or statistics—you don't need to find to slide, but—on the total graduates for the period of '77 to '17 there are more IH grads. And so I'm going to speculate that, well, there are just more programs for industrial hygiene. But why is that? I mean, was it just that at certain periods of time folks in the IH field were successful in developing programs? I don't think this is correct, but someone at AHI may say, well, because industrial hygiene is the most important piece of the four legs. But any interpretation on it?

DR. FELKNOR: Well, I have a thought about it. I mean, but I know occupational medicine goes back to Ramazzini so I did get him in to the conversation. But I'm not sure, I don't know enough of the history of what is known today as occupational medicine, when did it really start as a field versus when was industrial hygiene recognized as a field. And I don't know the answer to that, yes.

DR. ROGERS: Medicine was in the Forties. I mean—

DR. NICAS: This is Mark. I'll speculate. Because I think it was the advent of the OSHA Act and that had regulations that needed to be met legally. And the regulations for industrial hygiene and safety. They weren't in medicine. No one required you to provide medical services. They didn't require you to provide occupational health nurses. I mean, there were some medical surveillance issues. But it was legal requirements.

DR. ROGERS: But nursing dates back to 1911. I mean, that's actually 1888 to be specific, in the States. But I mean, the first nursing courses were offered in the New England region in 1910-11, around that area. Yes, so they've been around a long time. But the growth of it has just been, over time, and I think with the OSHA Act as well, that's been important. Any questions on the telephone? Thank you, Sarah.

DR. FELKNOR: Okay, you're welcome.

[Applause.]

DR. ROGERS: So we have a final presentation. Rebecca?

**SAFE-SKILLED-READY WORKFORCE UPDATE: RESEARCH FOR YOUNG AND TEMPORARY WORKERS**

DR. GUERIN: And I will apologize ahead of time. It's ragweed season in Cincinnati so I'm—

DR. ROGERS: Ah, are you okay?

DR. GUERIN: Yes. No, I'm fine. It's just allergies. So it's my stuffiness. But I'm very happy to be here. And thank you very much for this opportunity to talk to you today about preparing the emerging workforce for safe and healthy employment. And I'm the Coordinator at NIOSH for the Safe-Skilled-Ready Workforce Program which is housed in the Education and Information Division in Cincinnati. And as a social scientist at NIOSH I'm part of a small but mighty group of researchers.

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We borrow from a lot of fields including education, economics, psychology, health education, health behavior, anthropology and others, to really examine the collective and individual factors that contribute to workplace safety and health and the decisions that go into those at both an individual and an environmental level. And NIOSH has long recognized the value of social science to the mission and the vision of safer, healthier workers. But luckily we're not alone.

So Dr. Lance Collins who is the Dean of Engineering at Cornell University published an impassioned plea a few years ago in *The Washington Post* in which he talked about the need and the importance for social science. And there's so much emphasis on the STEM disciplines these days which are also incredibly important but we need social science. And in order to tackle the global challenges that we face, Dr. Collins contended that technical fixes alone are not enough. We need to bring transdisciplinary and interdisciplinary science to bear on these complicated issues that face us as a global world.

And Sarah highlighted it, but in the field of occupational safety health as the workforce continues to change and evolve, and the nature of work continues to change and evolve, the importance of social science will continue to be very relevant and important to the work that we do at NIOSH. So with that plug, I'll try and give you a brief overview. In my presentation I'm going to talk about the Safe-Skilled-Ready Workforce Program. And some of you have already been introduced to it. And I'll be able to give you some updates on our activities and some of the research that's ongoing under the program. And hopefully I'll have a lot of time to take your questions and your input and feedback on how we can move forward and where we go from here.

So the Safe-Skilled-Ready Workforce Program was launched in 2013 and shortly after in the fall of that year we introduced it to the Board of Scientific Counselors. And I'm happy to report in the intervening five years we have a lot of accomplishments to report to you. And the purpose of the program was to really build on more than 30 years of effort at NIOSH aimed at protecting young workers, who we've known for a long time, from the surveillance data and from the research, are a highly vulnerable group. But the idea was also to expand into other areas where we might be able to apply the lessons that we've learned through our research and activities to other vulnerable workers.

So the goal of our program is that before joining the US workforce for the first time or starting a new job, all workers will have the foundational knowledge, skills and abilities they need to stay safe and healthy at work and to contribute to a safe, healthy and productive workplace.

So what are these foundational knowledge, skills and abilities? So again, as social scientists we love our models, we love our theories, so we created a foundational framework of competencies. We call them the "8 Core Competencies." They're grounded in the "health belief" model. And they include the ability to understand

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the short and long term effects of job injuries and illnesses, to identify job hazards and control methods, to understand worker rights and responsibilities on the job, and to communicate about safety problems at work.

So these are the foundational, again, competencies we believe that everybody needs, every individual needs, before they enter the workforce or before they start a new job. And we say that they're fundamental in that they serve as the basis for advanced skill development. So in no way do they replace the skills that you learned through on-the-job training or through apprenticeship programs or other programs. They complement those skills. They're portable in that they crosscut all industries and occupations so that's not just about one job or one set of skills. And they're also transferrable which means that they apply across social and cognitive domains anywhere in life where risk-based decisions are made.

So what we did is we looked across the vast literature and programs out there right now, initiatives, to skill up the American workforce. I'm sure everyone has heard a lot about that, about employability skills and work readiness, the middle skills gap. And what we found is in the frameworks and the initiatives that are out there, what's really missing from the discussion is workplace safety and health.

And so we say these are the missing life skills from these frameworks.

And the new administration is very, is focused right now on expanding opportunities for apprenticeship programs and other employability programs. So it's just really critical right now, as it always has been, to make sure that occupational safety and health is at the table at all of those discussions, and part of all of the programs and initiatives that are aimed at preparing the emerging workforce. They also need to be safe and healthy.

So the goals of our program are to promote the competencies in various avenues and in different areas. And I'll talk about some of those. To develop, maintain and evaluate workplace safety and health training and curricula. To conduct intervention and evaluation research. And to translate our research to practice, as well as our practice to research. So we see this as a very iterative process. We're already learning from our field work and taking what we learn from the field and applying it to our research and such. And so goes the cycle.

We have, as I mentioned, a number of areas of focus in terms of the groups that we focus on. So young workers is our traditional area of focus. And now expanding into looking at other vulnerable groups, including contingent workers and some other workers that I'll talk about. And we have partners. I feel that's something we've done really successfully as a program, is building very strong partnerships across industry and all sectors of the economy. And I'll be able to highlight just a few of those today.

So with that, I'm going to talk to you a little bit about young worker safety and health. So this is the main area of the research portfolio that I lead. And what are we talking about when we talk about young workers? So generally they're defined

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as those workers under the age of 25. So between the ages of 14 and 24. But a subset of younger workers are what we call “adolescent workers.” So they’re those workers under the age of 18. By law you’re not supposed to be working if you’re under—formally, in paid jobs, obviously there’s a lot of informal work, under—the age of 14. But we know from the research that already very young children are being integrated into the workforce at 12 and 13 years old. And they’re not captured in our injury statistics.

And workers that are between the ages of 14 and 17 have special legal protections, under both State and Child Federal Labor Laws. And they’re a particularly vulnerable group and that’s why we focus on them. And I’ll talk about that a little bit more. But in the United States more than in any other industrialized country, work is really a formative part of the adolescent experience. So most teenagers work—you can see almost 80% to 90% of them will have a job before completing high school. They mostly work—in restaurant jobs but in other retail sector jobs and office jobs. You can see the distribution in this pie chart. Sorry about the small text there. And the research tells us that work really has positive benefits for working adolescents. So it’s an opportunity for young people to learn skills, to develop autonomy and independence, and build self-efficacy.

But we also know from our research that young workers have risks when they go into the workforce. And so in this country every minute a worker under the age of 25 is injured on the job. And we know that young people between the ages of 15 and 17, when we look at the surveillance data, are injured at twice the rate of adults over the age of 24. And these burdens are incredible in terms of both the social cost but also the economic cost.

And what we have to remember is that we have our statistic but behind the statistics are the stories of the young people whose lives have been altered by workplace injuries. And so this is Mallory and she’s featured in one of the NIOSH videos that we have. And Mallory was just 16 when she went to her summer job. And she was injured so seriously that she has a debilitating injury that really affected the entire course of her life and has also affected her family members. And as a mother it’s very compelling when her mom gets on there and talks about how this has really changed her daughter’s life and the future prospects that they’ve had for her.

And what’s all the more tragic is the fact that these injuries can be predicted and prevented. And Dr. Steven Lacey, who is the former, or the outgoing, president of the American Industrial Hygiene Association, one of our partners—I’ll talk about that partnership—also published a commentary, an impassioned plea, in *The American Journal of Public Health* in the fall talking about this problem, this persistent public health problem of young worker injury. And he said we send out kids off to work almost every day and most of them are very much unprepared for the hazards and the risks that they will face.

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So there are a number of contributing factors. We know this. There's a pretty extensive body of literature at this point, epidemiological and other literature, about why young workers suffer this increased rate of injury. Some of it, it can be contributed to their unique physical development and cognitive maturational factors. Their exposure to physical hazards, so in the case of Mallory she was using an unguarded machine and she stuck her hand in there and was entangled. Their inexperience, their lack of job control, the lack of supervision and training. These are all well documented factors in the literature as to why these young people suffer injuries. As well as the lack of understanding of their legal protections that they have. And also the lack their parents have of those legal protections.

And so all of these factors have led a number of public health practitioners and researchers to advocate for the inclusion of workplace safety and health education in the school context, so that all young people get it as part of their formal schooling before they enter the labor force.

And this approach has been successful in France. So there was a study that was released just last year that indicated that workers, young workers, who received basic OSH education in secondary school when they went off to work, suffered two times fewer injuries than their peers who had not received this basic foundational training. So we think this is an approach that we should be trying in the United States and that can work here for us too.

And so that brings me to how we're trying that. And that is through a curriculum that we've developed with many, many partners and stakeholders over many years. And it's called the "Youth at Work Talking Safety Curriculum." It's available free of charge from the NIOSH website for download. It's fun. It's interactive. It's based on all the best science for knowledge transfer and training effectiveness, teaches our core competencies. It's aligned with a number of the education standards, including the National Health Education Standards from CDC and the Common Core State Standards. And we did key informant interviews with district leaders with school districts, 36 school districts across the country. And what we found from them is that if your curricula are not aligned with these state standards, which the school districts are held accountable for, and teachers are held accountable for, it's a nonstarter. So we wanted to remove this barrier to the adoption of our curriculum. And that's why we did this.

So we have customized versions for all states and territories to reflect the state specific child labor laws and resources. We also recently published several Spanish language editions. So the curriculum contains six 45 minute lessons and we have supplemental lessons. Everything is laid out step-by-step for teachers. They can just follow the steps and get through the curriculum. And I'll talk about why that's so valuable. It also has an online assessment tool and digital badge which I'll talk about. And it is evidence- and theory-based.

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So we worked with about 15 stakeholders and partners over about two years. And we worked with NOCTI which is a nonprofit organization and they develop competency tests for industry. And we worked with them to develop an assessment tool for the curriculum. And this was in response to needs from our stakeholders who say, “Hey, you have do you have a test? We would really use this more if we could have a way to assess our students.”

And then what we also did is we’re trying out in this new technology that a lot of community colleges are using and career technical schools and it’s called a “digital badge.” So my little daughter is eight years old and she’s in Girl Scouts and she’s got her little brown vest. And she comes home with her badges and we iron them on. So it’s exactly the same concept. It’s just a digital badge instead of a physical badge. It contains metadata. It shows, it provides a visual acknowledgement of a student’s learning. And what’s really valuable is to employers. Now some school districts are even requiring these electronic portfolios with badges that shows their learning so they can take them to an employer. An employer can look and say, “Hey, you’re somebody who’s got skills in all these areas.” And we’ve done some formative research with employers and what we’ve found is that employers were more likely to hire young people who already had a foundation of safety before they came into the workforce.

So in terms of building an evidence base for this program, we are just wrapping up a four year intervention and evaluation study in the Miami-Dade public school system which is the fourth largest school system in the country. We were invited into Miami-Dade subsequent to a presentation Dr. Howard gave. They got very excited about the curriculum and said, “Hey, we want to be the first in the country to be doing this.”

So in that picture in the middle there is their superintendent, Alberto Carvalho. That’s the Board of Education. We went down there and sign an MOU with them. And they have adopted the curriculum and implemented it in the eighth grade science classes. So it’s now a part of their mandatory science training for all eighth grade students across the district. And we also did some research around this implementation and around the effectiveness of the curriculum. And we’re just starting to publish some of our results so we’re using some techniques like structural equation modeling. And this paper was just published in *The Journal of Youth and Adolescence* last month about some of our initial results from the Miami research.

So overall what we found is that after the implementation of the curriculum, so students got it from their eighth grade science teachers, that they has statistically significant increases on measures of occupational safety and health knowledge, self-efficacy, their attitudes toward occupational safety and health, as well their intention to use these skills either in their current job—and we found that a number of kids are already working at those ages—or in future jobs. And I’ll talk

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about that a little more, but that was a really exciting finding.

So like Amia, I'm also an evaluation nerd. So another part of the research that we're doing is called, is translation research so specifically implementation research. So what we wanted to know is, the teachers, what was their fidelity to implementation of the curriculum. And by "fidelity" what we mean is adherence to the model as we designed it. Because what happens is, if you have a program failure, if you haven't monitored your fidelity to the implementation of the curriculum or whatever the program is, you don't know if your program failed because there was a problem with your program or it failed because it was not implemented properly. So you want to look at that and control for that.

And what we found was something which I found really exciting, which was it didn't matter if teachers were a PhD or a BA. It didn't matter how many years they'd been teaching. It didn't matter how many years they'd been in our study. And it didn't matter what their sex was. That, if they followed the NIOSH recipe, if they followed the guide, if they implemented our curriculum with integrity, with fidelity, they got the best outcomes from their students on those measures.

So practically speaking, what that tells us is when we go out to school districts and we say, hey, here's this curriculum, don't worry. You don't have to be a NIOSH professional. You don't ever have to have seen an SDS before in your life. Just follow the NIOSH recipe and you're going to get good outcomes and good results from your students. They will learn. They will retain this.

So something that we're always looking at is kind of that—I'm a big fan of logic modeling and so looking at those logic models and you know, that distal terminus is always reduction in injuries and illnesses. And that's something that we're always working towards, but we need to show the intermediate outcomes of our programs and the effectiveness of our training because it takes years, sometimes decades, to look at moving the needle on morbidity and mortality.

So we use models and theories from the social sciences, including the theory of planned behavior which is probably the most widely used in health promotion research. It's supported by a huge evidence base in school-based interventions, and prevention programs and such, as to its effectiveness. And what it tells us, what this model and their theory tells us, if you can change a person's attitude, you can change their self-efficacy, you can change their norms and you can change their intention; that intention is highly predictive of actual change in actions once they're in a supportive environment. And we say that's always key. The environment has to be supportive. So the workplace has to be safe. So we are able to move the needle on intention and we're showing that in our research. And so it's a very exciting finding and a very exciting intermediate outcome that we're able to show through our research.

We also have an intervention and evaluation study going on in the Oklahoma City Public Schools. So we've been working with partners and stakeholders there for

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many years. They were so excited about this curriculum, and about this idea of preparing the emerging workforce for safe and healthy work, that they took it to their state legislature and passed a bill. Governor Mary Fallin signed into laws this bill in April of 2015 requiring the teaching of occupational safety and health education grades seven through 12 using the NIOSH curriculum.

And so now what we're doing is we've been invited into the Oklahoma City Public Schools to build a model intervention that can be replicated throughout the state as a way to respond to this new legislation. And so what's exciting about the research here is the curriculum can be used in middle schools or high schools, so in Miami it's middle school. Here we're using it in high schools, in ninth grade business technology classes. And this is the first opportunity we've had to conduct a randomized trial. So we currently have, it's going on right now, they're collecting data as we speak, I hope, it's a block randomized trial. And we have a six month follow-up. The follow-up is what's going on right now. Human subject research is very messy. If anyone has been watching the news, our teachers were on strike for a while in Oklahoma. So we're back in business. We weren't sure if we were going to get that follow-up but it looks like we are.

And so this is something, so having a randomized trial, there are almost no randomized trials in effectiveness training for young worker safety and health education. And there are very few, really, in the training effectiveness research as was borne out by a systematic review that was conducted a few years ago. So this is a really exciting opportunity for us and we can't wait to get our data crunched and out.

So as I mentioned, something that we do well is partnerships. We have a very strong partnership with the American Industrial Hygiene Association. I'm so glad Chris is here today so she can also provide some background or some information from her perspective. And so what we did is we partnered with AIHA to develop a one hour training that AIHA members could go out into their communities, into schools or church groups or Boy Scouts, Girl Scouts, whatever, and just present on the issue of workplace safety and health. But we say this is kind of the Trojan horse to get into the schools but really a bit part of it is to introduce kids to careers in industrial hygiene and in occupational safety and health. And I should say also a part of our curriculum—I forgot to mention this—is about careers in OSH. So we do have a lesson on careers in OSH in the curriculum.

And so we know anecdotally that several hundred members now have used the curriculum. But so many are so excited about this idea of workplace safety and health and protecting young workers that they want to repeat the experiment in Oklahoma and build model legislation that can be enacted in other states. And so a number of AIHA members went to their state legislators in Texas and they got a bill successfully passed in September of last year requiring the integration of OSH

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into public schools there. And there are a number of efforts like this ongoing in other states.

We also have a longstanding partnership with the American Federation of Teachers. They have millions of members nationwide. They helped us to align our curriculum with the Common Core standards. They've trained numbers of teachers across the country on our curriculum. We're currently working with them to bring Talking Safety to the Chicago Public Schools which is even a bigger school district than Miami. So that's a huge opportunity for us. They've made our lessons available on the Share My Lesson website where they have more than a million users. And they also released a resolution in the fall regarding protecting the next gen workers. And in that a major component of that resolution is the implementation of Talking Safety. Not only in the career technical schools, but in all schools. And this is one of the ideas that we're very passionate about, that there's a natural fit in career tech, sure, but everybody works and so everybody needs this foundation of workplace safety and health in all schools.

We also have very strong partnerships in government. We work closely with OSHA as well as the Department of Labor and the Employment Training Administration. We worked with them to integrate health and safety into their Foundational Building Blocks model as a foundational building block. so what these competency models are used for is in the one-stop career training centers and the apprenticeship programs, and these really delineate sort of the basket of skills that individuals need in different industries.

And I just read a report the other day that was released by the White House, again about this issue of expanding apprenticeships. And in it, it said, that they would be using these competency models going forward to create new apprenticeship opportunities and look at the kind of skills that apprentices need when they go into these various industries. So the fact that we have health and safety now in that competency model is really critical.

So I mentioned that we are also expanding into looking at other vulnerable populations. So one of the areas that we're looking at is how does our research translate to other vulnerable groups such as contingent workers, who very often are young and also inexperienced, and share some of the same vulnerabilities but may not necessarily be. So my colleague, Dr. Menger-Ogle, Lauren, is, she's currently on maternity leave, but she heads this part of the portfolio.

So we define, we use the Bureau of Labor Statistic's definition of contingent workers as "persons who do not expect their job to last or describe their job as temporary." Dr. Howard published an excellent overview of nonstandard work arrangements in The American Journal of Industrial Medicine in 2017. I highly recommend everyone take a look at that if you're interested in this issue. So there's a number of sort of subcategories of contingent workers.

Temporary workers, and that's an area that we're looking at, are considered those

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workers that are placed by a temporary staffing agency onto a host jobsite, whether or not the job itself is temporary. And what we see from the data—and there really aren't a lot of studies out there, but what we see—is, mostly from the Workers' Comp data, that contingent workers, temporary workers face increased risks for occupational injury in most industries. And you can see that this is actually data from Washington State. And a number of contributing factors, you'll recognize those from the young worker presentation in terms of inexperience, being new to the job. These dual employment situations create confusion about who is responsible for safety and health training. And they tend to be concentrated in hazardous jobs. And I don't remember what that last one is. Oh, job insecurity. I couldn't see it.

So in 2015 NIOSH and OSHA released joint recommendations on protecting temporary workers. And part of these recommendations, later came some follow-up bulletins and OSHA released one about safety and health training. And what they say is that there's sort of a dual responsibility for occupational safety and health training. So the site employers are responsible for the job specific, site specific, training. But that the staffing agencies—so these are the staffing agencies that place temporary workers on the site—are responsible for general occupational safety and health training. But it's not clear. What does that mean? What is that general training? What does it consist of?

And so that's part of the research that we're doing in this world and in the formative research, is looking at both the workforce development sector—so these are workforce investment boards—and also at the temporary staffing agency itself. And we're doing some formative research with partners at Workforce Tulsa and the National Association of Workforce Boards, as well as with the American Staffing Association, and Staffmark which is a large staffing company, to understand what the training needs are of workers that, either are trained through or placed through these entities, and also what are the current training practices or what would be the future training practices of these entities. And what would that look like? Is it online training? Is it in-person training? How long? What does it contain? And so that's all part of the formative research that we're looking into right now.

We also have some focus on other vulnerable populations. And I'm going to speed through these because I think I'm running out of time. But we've partnered with the Labor Occupational Health Program at UC Berkeley to create a curriculum for workers with intellectual and developmental disabilities. This is a population that's at very high risk for occupational injuries. And there's almost no comprehensive safety and health training out there for this group. So we've created this training with them and it's currently being used and evaluated by LOHP.

We've also done some outreach. We part of the NIOSH Tribal Collaborations

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Team. And we've partnered with the Chickasaw and Choctaw Nations to tailor the curriculum for the needs of American Indian youth. We've also collaborated with an organization called WeRNative to promote the competencies for American Indian youth. And so we continue to look at the special needs and the vulnerabilities of some of these subpopulations of an already vulnerable population.

And so there's been a lot of interest, domestically in our programs, in our interventions but as well as internationally. We got to travel to Brazil a couple of years ago to work with a partner organization—we have a memorandum of understanding, NIOSH does, with SESI and we worked with them over several days to adapt the Talking Safety curriculum to the Brazilian context. So this was an incredible opportunity and they're already using the curriculum in some of their schools there in the south of Brazil.

So what's next? So right now we have a very exciting opportunity to partner with the OSHA Training Institute to develop a new OSHA 10 training that incorporates the Talking Safety curriculum that's interactive. If anyone has taken the OSHA 10 it is not interactive. So really, to make it something that we know that we can apply lessons learned and our research knowledge to the OSHA 10, to make it something that's going to be engaging and that people are going to remember when they walk out...young people, what they learned. So we're working with OSHA right now on that and a number of our partners in the technical trades to develop some customized modules in construction, healthcare services, culinary arts and others.

We continue to conduct our research studies; our implementation, translation, intervention research. And we're also looking at this exploration of overlapping vulnerabilities, so this is... A number of other researchers at NIOSH are looking at this too, but what happens at the middle of that Venn diagram, when you're both young, you're a contingent worker, you're a Hispanic worker, and you also work for a small business. So that compounding of vulnerabilities and how do we address the needs of these workers.

So this is where I hope you'll have lots of ideas for me in terms of—I should put the caveat at the top—given limited resources we need your input. So we're really, really, though, looking for ideas. I feel like we're really great with the push side of the program. But creating that pull, especially from the business community. And that's what we've been trying to do with the digital badge and some of our other partnership, is really creating demand among employers, like hey, I want young people to come in who already have this skill set. I want schools to teach this. Because that's actually what happened in Miami. It was an employer. It was the County who said hey, a lot of kids are getting hurt. You guys got to teach this before they're coming to work for us because they're getting hurt on the first day. And so really creating that pull in the business community.

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Everything that's on this slide and then some is—we could use your input. Measuring outcomes and impact. We would love to follow these kids longitudinally. Again, given limited time, resources, it's very difficult, especially in Miami where you have a school district that spans 2,000 square miles. That's how large the school district is. And they go off after eighth grade and they completely scatter. There are a lot of families who move around quite a bit, a lot of transient families. So how are you going to follow these kids for five, six, seven years when they're in formal jobs? It's just very difficult. But can we look over time? And that's something that we're looking at right now, is just getting baseline data and looking to see if we can see trends over time where our curriculum has been implemented in terms of the injury and illness stats.

So I'll stop there and but really quickly I wanted to thank my entire team. I couldn't do it without them and their dedication and motivation. And not listed on the slide but very essential to our efforts, is Dr. Andrea Okun who's now retired from NIOSH but comes back as a contractor. Nobody leaves NIOSH. So she's tried to retire but she's been just such a huge champion for this work for 35 years and so we're trying to... Many came before me and hopefully many will come after me to carry this torch. And Dr. Howard and the Institute, Dr. Kitt, Dr. Felknor, everyone, for your support internally for this work. thank you. I'll go back to this slide.

[Applause.]

DR. BUNN:

Terry Bunn. Well, excellent. I was not aware of you guys doing, developing this curriculum so I think it would be—I can't imagine it would not be an easy sell. To reach all of the schools, just based on the type of person our Governor is, you might want to approach like the National Governors' Association. I think a presentation there. School Superintendents' Meeting would be a good association to also reach with that. And then also like you say here, engaging the business community. I know in Kentucky, Toyota sponsors "Alive at 25" that is out of the National Safety Council. So I think that that would be a very, very easy sell for them, or similar large companies, to sponsor the implementation of the curriculum in the schools. And maybe even provide a token incentive for schools who adopt the program. It's Procter & Gamble. We have—well, not only Toyota but—Ford. And also health insurance companies would be a big one.

DR. GUERIN:

That's a good one. And also we've thought about Workers' Comp insurers too.

DR. BUNN:

Like Humana and Aetna. Yes. Yes, and Workers' Comp.

DR. GUERIN:

Yes. That's a great idea. Thank you.

DR. ROGERS:

Have you done any work with the school nurses?

DR. GUERIN:

It's so interesting that you ask that. We have not yet but we know from the research that school nurses are huge champions for these type of school-based preventions.

DR. ROGERS:

You should. And it's a pretty large group across the country.

DR. GUERIN:

Mm-hmm. Thank you. And part of it is we're right—I should say a lot of the work

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that we're doing right now is the dissemination so this is a great timing for these suggestions. We wanted to have a really strong evidence-base for the curriculum because the first question is: Well, does it work? So yes. And is it evidence-based? Yes, it's evidence-based. We can now say that because—

DR. ROGERS: Because Alive at 25 is not so you could—I mean, that whole thing with evidence, yes. Easy sell.

DR. GUERIN: We know the buzz. The questions we got right away: is it aligned with the Common Core? Is it evidence-based? Is it easy to teach? Is it free? And so we can say, "Check, check, check, check."

DR. ROGERS: Charles?

DR. REDINGER: Thank you. Charles Redinger.

DR. GUERIN: Hi Charles.

DR. REDINGER: So thank you for all this work, Rebecca.

DR. GUERIN: Thanks.

DR. REDINGER: And everyone on your team.

DR. GUERIN: Thanks.

DR. REDINGER: But two quick things.

DR. GUERIN: Sure.

DR. REDINGER: One is, even with the AIHA example, I was on the Board when this was evolving in AIHA. And I don't think the message in AIHA is what you just gave the Board.

DR. GUERIN: Oh, interesting.

DR. REDINGER: It's about promoting industrial hygiene. It's about the profession. So it's not to say they're not connected but there's parallel things going on here, and I think as far as us impacting the workforce, I think it's a different conversation within AIHA. So that's one place to look. And at our conference next week I may get Steve off to the side and twist his ear.

DR. GUERIN: Get Steven off to the side and say hey, remember, this is also supposed to...

DR. REDINGER: So the second thing is, back to this whole piece of different professional organizations and whatnot, disciplines. For instance, in the State of Massachusetts my wife is on the school committee in our small town and every fall she goes to—and I can't remember the name of the organization but in Massachusetts they all get together, all the school committee folk and superintendents get together for this thing, for a conference, so that would be a place...

DR. GUERIN: That's a good one.

DR. REDINGER: And I even—and this is different but I think it's important and I may actually twist my wife's ear and see about getting on the agenda there if that would be—

DR. GUERIN: That would be wonderful. And we have very strong partners at the Massachusetts Department of Public Health and they were part of the developers of the original curriculum. And they've been involved in the assessment development and then the reissue of the curriculum. So I could connect you as well with those folks.

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- DR. ROGERS: Sharon?
- DR. COOPER: Sharon Cooper. Having devoted a lot of my career to the epidemiology study of injuries and illnesses in young workers, I'm just so excited to see the progress here in a global way. And so congratulations. That's very exciting. I didn't hear you mention today anything specifically about young agricultural workers that might have a little bit of different needs.
- DR. GUERIN: Ah, thank you. Thank you. And I was making a note to myself to mention that, so thank you for bring that up. So the rules for agriculture are very different, as many of you know. It's an entirely different world. It's an entirely different animal. So it's critically important. And one of our goals is to develop the same program for the ag side. We just haven't gotten there yet. But it's just so important. And what did is we did integrate. So we have some case examples in the study that the kids go through and they talk about what happened, how could this have been prevented. So we do have some examples in there in agriculture. And we tried to put some ag content into the curriculum just so it was there. But it's not the complete. We don't cover the child labor laws in agriculture or—
- DR. COOPER: Worker protection standard, obviously.
- DR. GUERIN: Right, right, and so... Absolutely. But thank you for bringing that up. I meant to say that this is for non-ag jobs.
- DR. COOPER: And I was going to also suggest maybe some faith-based partners. And maybe for children who aren't in school, that may be another way to reach them.
- DR. GUERIN: Interesting. Yes.
- DR. ROGERS: Grace.
- DR. LEMASTERS: Very interesting Rebecca. And I was also thinking about, have you thought about the school itself as a workplace? I mean, that the kids are in the school, they're bringing money to school in terms of sports, in terms of like I was thinking the schools for the creative, performing arts, acting, dancing, technical training that they go through. It seems like it would be interesting to look at the schools you have been in, the before and after, did the schools themselves have changes in their rate of injuries in the school after the students took the course? And that would be another. Not only is it preparing them for when they leave, but while they're there. That's their job, going to school. Right?
- DR. GUERIN: That's a really interesting comment and the Europeans are far ahead of us. They have a whole model. It's called this "whole school" model. And it's basically this idea of the school as a work environment. And it's more focused on the teachers and those who work in the schools and not the kids themselves. But certainly those examples that you bring up about that being sort of a microcosm of the work world for kids themselves is a great idea. And we do—
- DR. LEMASTERS: Playground safety. You know...
- DR. GUERIN: Yes. And this is one really interesting study, only one that I've found, in the prevention literature about playground safety. And we kind of use that as a

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corollary for some of the work that we do. And then also we do have an activity in the curriculum where the kids go through and they can go through the lab or really any environment. They can go to the lunchroom. And they point out hazard... They make a note of the hazards that they detect, and then they're supposed to write a memo to the principal of how you can address the hazards that we saw, so there was a...whatever the case is.

DR. LEMASTERS: You should go back and look before and after injuries at the school.

DR. GUERIN: That's a great idea—yes, no, we had never... So that, specifically, we haven't done. But I think it's a great idea. And we're actually going to be down in Miami doing some, just kind of our exit interviews with them so that will be... I'll take those questions to them and see if that's something that we could gather.

PARTICIPANT: (It @ 01:39:26) should be there.

PARTICIPANT: And the Workers' Comp among the teachers would be interesting to look at as to how it might affect the teachers.

DR. ROGERS: Interesting. Any comments from the phone? No. Okay. MaryAnn?

DR. SCHULTE: Yes. This is Paul Schulte. I just wanted to mention one thing. One of the issues we've faced is that the school system in the US is decentralized and controlled locally. So it's difficult to develop an overarching plan. And we're looking for strategies to address different school districts that have their own control approaches. And that's why we're trying these different kinds of activities in different states. So if you have any suggestions along those lines that would be helpful.

DR. GUERIN: Thanks Paul. MaryAnn?

MS. GRUDEN: I think this is wonderful work that you've done.

DR. GUERIN: Thank you.

MS. GRUDEN: I'm really excited to see it.

DR. GUERIN: Thank you.

MS. GRUDEN: I have a little bit of a different twist. You were talking about like education at all levels. I think it's a great foundation. And my background is in healthcare so I'm sitting here thinking about we have all these healthcare workers who think about the patient first and not their own safety. And all the problems that we have like we talked about earlier, I think it's wonderful to have that foundation and then if we could build on it at each level. We still have many diploma schools of nursing, believe it or not. And so they don't even hear about occupational health or... And I don't know in other curriculums, but I think if you look at it you could certainly build on that through the future. And that would also help change the culture of safety in healthcare because we need a lot of work on that.

DR. GUERIN: So that's our "phase whatever." I don't even know. But one of the areas that I would love to expand into is community colleges.

MS. GRUDEN: Community colleges.

DR. GUERIN: And we know right in Cincinnati, we have Cincinnati State and healthcare is their

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biggest program. And we've had some initial conversations with them. It's just it's really, for us, a resource issues to have somebody who can lead the charge on that. But absolutely. And we think there's a lot of need and a lot of ability to, again, adapt these foundational competencies for different workers, different age groups, different contexts. So thank you.

- MS. GRUDEN: Thank you. Yes.
- DR. GUERIN: I'll be tapping you for help with our OSHA 10 healthcare module.
- DR. ROGERS: Any other comment?
- DR. MCKENZIE: This is Judith McKenzie. I'm sorry I missed a part of your talk, but it's very interesting and very important. And I see that there is a curriculum and you may have talked about dissemination but if a business wanted to take it and run with it, would they just get it off the web? Like how would that work?
- DR. GUERIN: So Judith, this is Rebecca. So yes, it's available for download. I believe in my slides there's a link. I can send out, we can send out another link. So you can just go in there—
- DR. MCKENZIE: I see the slide, yes.
- DR. GUERIN: You can just go and download the curriculum for your state or for any state. It's been—Actually I just looked at our web metrics. I think in the past few years, three years maybe, it's been—downloaded about 25,000 times.
- PARTICIPANT: Oh my gosh.
- DR. GUERIN: So we don't know.
- DR. MCKENZIE: Excellent.
- DR. GUERIN: I account for about 24,000 of those downloads so I'm not sure about the... Obviously it's hard for us to track, of who downloaded it, who is actually using it. But yes, anybody can download it, anybody can use it. And so we know there are many people out there using the curriculum, schools using it. We had a meeting with the Virginia Department of Education and they said oh, yes, everybody uses Talking Safety. And I said oh, yes. Yes. Like, everybody? Who is everybody? So we could use some help with contribution analysis of really who's using it. It's very difficult for us to know. But it is out there. It's in the public domain, free. And we maintain it. We keep it... We update it. We've been trying to do quarterly. It's stuff to stay on top of quarterly but at least twice a year we're updating the versions to reflect changes to minimum wage laws and across 54 versions. Now we have Spanish versions. It gets a little tricky but—
- DR. MCKENZIE: That's great. Thank you.
- DR. GUERIN: Thank you, Judith.
- DR. ROGERS: So I had one question that really relates to sort of a combination of this and that. And so if a community college... It's not an option for a community college to apply for a TPG.
- DR. GUERIN: I don't think there's any restriction on a—it has to be an accredited degree program, allied. That large allied field is an allowed area.

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PARTICIPANT: Does it have to be a four-year degree?

DR. GUERIN: I don't, I don't... I'm searching my database here.

PARTICIPANT: Why would it?

DR. GUERIN: I don't think the FOA... I think the FOA says "eligible institutions of higher education."

DR. ROGERS: No, I bring that up because community colleges really are virtually zero in occupational safety and health education. But a lot of people attend community colleges. And it would be nice. And but the degree thing, I mean, the academic certificate programs are not degrees.

DR. GUERIN: That's true.

DR. ROGERS: We need degrees. So I've often thought about that for the last few years why—

DR. GUERIN: There might be some opportunities for collaborations with our ERCs and their local community colleges to have some kind of a shared pipeline of students who would start at the community but finish up at the university with a certificate.

DR. ROGERS: Or just get the associate degree at the community college level. That's what I'm thinking. I mean, that is a degree program.

DR. GUERIN: Yes. I don't think there's anything that says it has to be a four-year college.

DR. ROGERS: Okay. There we go. My next job.

DR. GUERIN: Yes.

DR. LEMASTERS: Just to answer—this is Grace LeMasters again. Just to answer Paul's question, Paul Schulte's question, I just have one comment. One system of the school system that is not totally diverse but are numerous is the Catholic school system, parochial school system. And you hit a couple of arch dioceses, you might be able to get buy-in from a huge number of parochial schools. Public schools are so diverse. You have to go to individual school systems and kind of guess by city. Catholic school systems, you might be able to reach a whole lot through one cardinal.

DR. GUERIN: It's a bishop.

DR. LEMASTERS: Yes, a bishop.

DR. GUERIN: I'm familiar with those bishop schools.

DR. LEMASTERS: Yes. Yes. So anyway—

DR. GUERIN: It's an interesting... Yes, it's not... We haven't looked at the parochial schools even though I'm a product of them.

DR. LEMASTERS: Yes. Right in front of my face.

DR. ROGERS: There are probably many products here.

DR. GUERIN: Right. Right. But thank you, thank you. And in Cincinnati, I mean, you can't escape them. Right?

DR. LEMASTERS: Exactly. That's why I was thinking it would be a good place to start.

DR. GUERIN: More churches than Starbucks I say.

DR. ROGERS: All right. Any other comments, though, or questions? Phone? Okay, that brings us to the end. And thank you.

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DR. GUERIN: Thank you.

DR. ROGERS: Thank you very much.

DR. GUERIN: Thank you.

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

DR. ROGERS: And thanks, everybody for coming.

[Applause.]

DR. ROGERS: And I just want to express my thanks for being Chair and working with Alberto and Paul and a number of staff that I've always worked with. Gosh, I'm thinking I've done two terms and six months. I was so... After my first term I agreed to another and then six months. And Roger is here, and just as a funny thing when I was first asked to be on the Board of Scientific Counselors—do you remember that, Roger—it took like two years, three years, before HHS would, before they were ready to sign off on everybody? Well, see, I had never even been on the Board and I get a call from Dr. Howard saying would you be Chair of the Board of Scientific Counselors? And I said, I've never been on the Board of Scientific—do you remember that? And he says to me, because I had been Chair of the NORA thing, he says to me, well, if you would do it I won't have to train another person. I said, okay. And so that's kind of how it came. But I've enjoyed my tenure here. It's been great working with so many wonderful people, really. It's great. I mean, all the staff are great and I appreciate all that, so—

DR. LEMASTERS: Well, you've been a great Chair too, so.

DR. ROGERS: Thank you.

[Applause.]

DR. ROGERS: It's always fun. It's always fun.

DR. LEMASTERS: You're great. Well, one other thing I saw on the future meeting dates, do we have any idea about that?

MR. GARCIA: So we are toying with two dates. Maybe September 20 or September 27.

DR. LEMASTERS: Okay.

MR. GARCIA: I think that Pauline is probably going to canvass you guys—

DR. ROGERS: Sooner rather than later, yes.

MR. GARCIA: I think that, to check with Dr. Howard's calendar and those are two days that seemed to be available so far.

DR. LEMASTERS: So you'll write to us.

DR. ROGERS: Safe travels.

[END MEETING]

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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
AIHA	American Industrial Hygiene Association
AOHP	Association of Occupational Health Professionals
ASSE	American Society of Safety Engineers
BSC	Board of Scientific Counselors
CDC	United States Centers for Disease Control and Prevention
DART	Division of Applied Research and Technology
DOE	Department of Energy
DOL	Department of Labor
DOT	Department of Transportation
EPA	Environmental Protection Agency
ERC	Emergency Response Center
FACA	Federal Advisory Committee Act
HELD	Health Effects Laboratory Division
HHS	US Department of Health and Human Services
HRSA	Health Resources and Services Administration
IRB	Institutional Review Board
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
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment

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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: Seventieth 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 – May 15, 2018**

<b>Time</b>	<b>Topic</b>	<b>Presenter</b>
8:30 am	Welcome and Introduction Meeting Logistics	Alberto Garcia DFO, NIOSH
8:40 am	Agenda, Announcements, and Approval of Minutes	Dr. Bonnie Rogers Chair, NIOSH BSC
8:50 am	Director’s Opening Remarks	Dr. John Howard Director, NIOSH
9:20 am	Using Contribution Analysis to Evaluate Research Impact	Dr. Amia Downes Program Evaluation Specialist, NIOSH
10:00 am	Break	
10:20 am	Breach in the Protective Barrier System: Glove and Gown Interface	Dr. Selcen Kilinic-Balci Senior Scientist, NPPTL, NIOSH
11:30 am	Lunch	
12:30 pm	Public Comments	Alberto Garcia DFO, NIOSH
12:45 pm	Occupational Safety and Health Workforce Training	Dr. Sarah Felknor Associate Director for Research Integration and Extramural Performance
1:30 pm	Safe-Skilled-Ready Workforce Update: Research for Young and Temporary Workers	Dr. Rebecca Guerin Research Social Scientist, EID NIOSH
2:10 pm	Summary & Wrap-up, Future Agenda Items, Meeting Dates, Closing Remarks	Dr. Bonnie Rogers Chair, NIOSH BSC
2:30 pm	Adjourn	

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Appendix B

**Board of Scientific Counselors  
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**Budget**

Dr. Howard will present the most current budget information at the time of the meeting.

**Organizational and Personnel Announcements**

**Cincinnati Reshaping effort is underway.**

**Chuck Geraci, Ph.D.**, CIH, has been appointed NIOSH Associate Director for Emerging Technologies, effective April 15, 2018.

**Long time senior advisor to the director and former Associate Director for Mining, Lewis Wade, passed away on Sunday, April 22, 2018.**

**Retired:**

**Allison Tepper** has retired as HETAB Branch Chief; Doug Trout is the new Chief of HETAB

**Kevin Ashley, Ph.D** has retired from DART/CEMB after 26-years of Federal Service. For the last 6-years, he has been the Managing Editor of the NIOSH Manual of Analytical Methods (NMAM).

**CAPT Eileen Birch, Ph.D.** has retired from DART/CEMB after 30-years of Federal Service in the U.S. Public Health Service. Eileen retired as the Team Lead for DART's Aerosol Research Team.

**Debbie Lipps** has retired after 42-years of Federal Service. Debbie ended her outstanding federal career as Secretary for the Deputy Director of the DART/OD.

**Bernice Clark** has retired from DART/EPHB after 30-years of Federal Service. Bernice ended her outstanding federal career as Program Operations Assistant for the Branch Chief in DART/EPHB.

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**Thomas H. Connor, Ph.D.** retired after 17-years of Federal Service. Tom spent most of his career as a Research Biologist in DART/BHAB.

**Joe Fernback** retired after more than 30-years of Federal Service. Joe analyzed field samples by both optical microscopy and electron microscopy, as well as by X-ray diffraction at DART/CEMB.

## New Programs and Initiatives

### NPPTL

#### Evaluation of NIOSH Certified CBRN Air-Purifying Respirators against New Chemical/Radiological Threats

Seventeen years ago, NIOSH, in partnership with other federal agencies, performed a hazard assessment of the most probable Chemical, Biological, Radiological and Nuclear (CBRN) agents that would be used in a terrorist attack to develop the NIOSH CBRN Respiratory Protective Device (RPD) Performance Standards. NIOSH has a functional role to support the CDC's preparedness and response efforts by providing information about the selection, use and capabilities of RPDs in the event of a CBRN terrorist attack or a large scale domestic incident such as a radiation release from a nuclear power plant or a naturally-occurring infectious disease outbreak like Ebola. NIOSH had not evaluated NIOSH certified RPD capabilities to protect against newly identified hazards since 2001. Over the past two years, under an Office of Public Health Preparedness and Response (OPHPR) funded project, NIOSH has collaborated with federal partners to assess evolving chemical and radiological hazards identified in current Department of Homeland Security (DHS) Hazard Assessments, and is determining whether current test representative agents in the NIOSH CBRN Air Purifying Respirator (APR) Standards adequately simulate the newly identified chemical threats. This evaluation will provide CDC and the responders the confidence that NIOSH RPDs can provide the necessary protection against any new CBRN threats, or identify the need to modify the current NIOSH CBRN RPD Standards to protect against these newly identified threats.

## Division of Surveillance, Hazard Evaluations, and Field Studies

NIOSH researchers recently authored an article (Bertke et al, 2018) that updated the mortality experience of NIOSH's boat builders' cohort. This study examined exposure to styrene used in reinforced plastic in two boatbuilding facilities and its effects on cancer mortality. The study found an association between duration of styrene exposure and increased leukemia mortality. This study was published in time to be considered at the March IARC Monograph meeting

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investigating the carcinogenicity of styrene. Studies of workers in this industry are considered most informative due to high styrene exposures and lack of confounding exposures.

The HHE Program has released the 2017 Annual Report. The last 3 years of Annual Reports are available at <https://www.cdc.gov/niosh/hhe/annualreports.html>

The NIOSH Health Hazard Evaluation Program has conducted a number (eight completed or in process) of evaluations concerning work-related exposure to opioids. Worker groups evaluated have included first responder groups as well as other ‘non-first responder groups.’ Among first responders we are trying to learn more about potential exposures and resultant health effects. While NIOSH has interim guidelines for emergency responders related to fentanyl and its analogues (<https://www.cdc.gov/niosh/topics/fentanyl/risk.html>) based on the best available data, currently available data are limited. Information gathered from field studies and other activities may be helpful to first responder groups across the country and to NIOSH as it routinely reviews current guidance. The HHE Program has also performed evaluations of other groups who are not first responders (Medical Examiner’s office, Transportation Security Screening workers), who may have the potential to be exposed to opioid drugs in the course of their work.

NIOSH recently reestablished monthly surveillance of health-related workplace absenteeism using population-based data from the Current Population Survey (CPS). This surveillance system provides health and economic impact measures during an influenza pandemic and health situational awareness during the inter-pandemic period. It can also be used to evaluate the impact of pandemic control measures and to inform future pandemic preparedness and response planning. Monthly surveillance reports are routinely shared with the Community Interventions for Infection Control Unit (CI-ICU) within CDC’s Division of Global Migration and Quarantine.

With colleagues from Indiana University, NIOSH researchers recently co-authored a review article in the American Journal of Public Health (AJPH) suggesting consideration of occupation as a social determinant of health. The article was part of a special section featured on the cover of the March issue, and included an invited editorial and two accompanying essays by a former OSHA administrator and the Safety Director of the United Steel Workers. AJPH also posted a podcast featuring the authors. The review article is in the top 5% of all research outputs scored by Altmetric.

High blood pressure and high cholesterol are more common among workers exposed to loud noise at work according to a NIOSH study published last month in the [\*American Journal of Industrial Medicine\*](#). NIOSH researchers analyzed data from the 2014 National Health Interview

Survey to estimate the prevalence of occupational noise exposure, hearing difficulty and heart conditions within U.S. industries and occupations. They also looked at the association between workplace noise exposure and heart disease. The analysis showed: Twenty-five percent of current workers had a history of work-related noise exposure; 14 percent were exposed in the last year. Twelve percent of current workers had hearing difficulty, 24 percent had high blood pressure and 28 percent had high cholesterol. Of these cases, 58 percent, 14 percent, and 9 percent, respectively, can be attributed to occupational noise exposure.

## Division of Applied Research and Technology

### Engineering Controls and Nanotechnology

DART recently published three new Nanotechnology Workplace Design Solutions (WDS) documents. These documents represent the release of important risk management guidance for companies that produce and use nanomaterials. They provide helpful recommendations on minimizing exposures during common processes and tasks:

- 1) *The Workplace Design Solutions: Protecting Workers during the Handling/Weighing of Nanomaterials*- <https://doi.org/10.26616/NIOSH PUB2018121>
- 2) *The Workplace Design Solutions: Protecting Workers during Nanomaterial Reactor Operations*- <https://doi.org/10.26616/NIOSH PUB2018120>
- 3) *The Workplace Design Solutions: Protecting Workers during Intermediate and Downstream Processing of Nanomaterials*- <https://doi.org/10.26616/NIOSH PUB2018122>

### NMAM Methods

- New method 8318 – 2,5-hexanedione in urine. This method can be used to measure for exposure to hexane.
- New method 7405 – Alkali metal cations Na<sup>+</sup>, K<sup>+</sup>, Li<sup>+</sup>
- Update to the NMAM Web book that included chapters and methods published since the original publication of the Web book.

### Healthy Work Design and Well-Being Program (HWD)

DART convened the 2018 International Symposium to Advance Total Worker Health<sup>®</sup>, which featured more than 100 presentations and workshops examining opportunities to improve the safety of work and enhance the health and well-being of the workforce; as well as hosted several

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webinars addressing the health and safety effects of nonstandard work arrangements, human fatigue factors, hours of work and sleep, and interventions for aging workers.

DART published studies on work arrangements, job stress, and Health Related Quality of Life (HRQL) and the impact of parental access to paid sick leave and children's access to and use of healthcare services, presented on HWD priorities, including the taxonomy and impact of work arrangements, at national and international conferences (e.g., Work, Stress, and Health 2017; State of the Science), and organized a roundtable of academic faculty, practitioners, human resource and business managers, professional society leaders, and researchers to advance capacity building and workforce development in the area of [Total Worker Health](#)<sup>®</sup>.

During Sleep Awareness Week, NIOSH promoted its recommendations on sleep and time change via the NIOSH website and NIOSH social media channels (Twitter, Facebook, and Instagram). On Monday March 12, NIOSH HWD researchers also participated in a Twitter chat organized by National Healthy Sleep Awareness Project. Check out #SleepWorksForYou.

### **Oil and Gas Extraction**

DART researchers attended and presented research results at the NIOSH NORA Oil and Gas Extraction Sector Council meeting in Denver, Colorado. Other NIOSH Divisions were also well represented. Other council members include representatives of OSHA, industry, insurers, and industry organizations including the American Petroleum Institute (API), the Association of Energy Service Companies (AESCC), the national Service, Transmission, Exploration and Production Safety (STEPS) network, and the International Association of Drilling Contractors (IADC). Presentations included progress in achieving NORA Council goals, emerging hazards, updates on current research activities, the NIOSH web page on Fatalities in the Oil and Gas Extraction (OGE) Industry (FOG) database, <http://www.cdc.gov/niosh/topics/fog>, and priorities for future research in worker safety, health and cross-cutting issues in the industry.

### **Meetings and Collaborations**

DART researchers participated, along with members from DSHEFS, Center for Workers' Compensation Studies (CWCS), and the Ohio Bureau of Workers Compensation, in an Exoskeleton Workshop. This session included demonstrations of Exoskeletons, current academic research, and information from end-users.

DART researchers attended the NIOSH/University of Kentucky (UK) summit at the Club at UK Spindletop Hall in Lexington, KY. The summit was organized to discuss a variety of research topics of interest to both NIOSH and UK faculty primarily from the departments of Environmental Health and Epidemiology. The topics included reproductive health, cancer

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surveillance, worker compensation records, opioid health effects, ergonomics, engineering controls, and chronic kidney disease.

## Division of Safety Research

### NIOSH and CPWR Create New FACE Report Database

The NIOSH [Fatality Assessment and Control Evaluation \(FACE\)](#) program and CPWR investigated selected work-related fatalities, collecting information not captured in other data sources - including safety management, training programs, use of engineering controls, personal protective equipment, and recommendations for preventing similar incidents. CPWR coded 768 fatality cases in construction that were investigated and reported between 1982 and 2015 into a searchable database.

NIOSH collaborated with CPWR and published two papers in 2017 [describing the database](#) and the [analysis of fall fatalities](#). In April 2018, the findings were used for a new NIOSH-CPWR co-branded infographic [Fall Protection Saves Lives](#) to support this year's National Campaign to Prevent Falls in Construction. The [FACE database](#) is available through the CPWR website and is free for anyone to download.

In February 2018, a manuscript on nonfatal injuries to law enforcement officers was published online in the [American Journal of Preventive Medicine](#). The manuscript appears in print in the April 2018 issue. This was the first study to measure all types of nonfatal injuries among LEOs on a national scale. The authors found a significant upward trend in assault injuries. Reports on the manuscript were picked up by [Police One](#), [Safety + Health](#) magazine, [OHS online](#), and [officer.com](#). It will be featured in the May issue of [Research Rounds](#). A follow-up study and analysis are both planned.

## Education and Information Division

### Nanotechnology

The NTRC and the NIOSH Office of Communications hosted an edit-a-thon in honor of National Nanotechnology Day. Wikipedians from across the Midwest gathered to work with NIOSH scientists to expand and improve Wikipedia articles about the emerging work-place safety and health issues of nanotechnology, advanced materials, and additive manufacturing. NIOSH's Nanotechnology Research Center coordinated the event and collaborated with the Manufacturing and Engineering Control Programs to provide a broad perspective. For more information, visit <https://en.wikipedia.org/wiki/WP:NANO2017> [October 19].

### **NIOSH Customer Satisfaction Survey**

The NIOSH Customer Satisfaction Survey has been approved by the Office of Management and Budget (OMB). The goal of the NIOSH Customer Satisfaction Survey is to collect stakeholder feedback on the effectiveness of NIOSH products and their dissemination. NIOSH conducted earlier versions of this survey in 2003 and 2010. The contractor developed the online survey instrument with input from NIOSH staff and is in the final stages of obtaining cooperation from partnering organizations to recruit their members for participation. Data collection is expected to begin September - October 2018.

### **NIOSH Pocket Guide to Chemical Hazards: Update and Redesign**

The NIOSH Pocket Guide to Chemical Hazards (NPG) celebrates its 40<sup>th</sup> anniversary in 2018. The Pocket Guide continues to be the most popular document NIOSH produces. To celebrate the 40<sup>th</sup> year anniversary, NIOSH is planning to update all versions (hard copy, web, and app) and reprint the hard copy, adding new content including more chemicals and skin exposure information. In addition to reviewing, evaluating, and updating the essential information in the NPG, NIOSH has developed new proposed layouts and sizes for the print version, and has sought feedback about these new designs from stakeholders and key audiences who use the NPG. This feedback will factor into the redesign of the new anniversary edition.

The NPG provides descriptive information such as recommendations for exposure limits, protective clothing, and first aid measures for 677 chemicals commonly found in the work environment. Workers, employers, and occupational health professionals use the NPG to control workplace exposures to chemical hazards and as a reference in emergencies. Fire fighters, for example, use the NPG to prepare themselves for chemical exposures they might face during responses to emergency scenarios such as an explosion, fire, or chemical spill.

### **NIOSH Safe-Skilled Ready Workforce program**

The NIOSH Safe-Skilled Ready Workforce (SSRW) program is engaged in multiple research activities to promote foundational OSH knowledge and skills among vulnerable populations— young and contingent workers—who face a high risk of OSH injury and illness. Recent activities include:

- A large-scale evaluation of the Talking Safety curriculum in the Miami-Dade Public School System, the fourth largest U.S. school district. Results indicate that the Talking Safety intervention had a positive, significant impact on approximately 4,000 eighth grade students'

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OSH knowledge, attitude, social norms, self-efficacy, and behavioral intention to enact workplace safety skills.

<https://www.cdc.gov/niosh/talkingsafety/>

- Guerin et al. [2018]. Using a modified theory of planned behavior to examine adolescents' workplace safety and health knowledge, perceptions, and behavioral intention: a structural equation modeling. *J Youth Adolescence*, March 2018.
- A partnership with the American Federation of Teachers (AFT), with 1.7 million members in more than 3,000 local affiliates nationwide. Since 2013, AFT members have trained teachers on the Talking Safety curriculum. The on-going AFT/NIOSH partnership will be further advanced by the recent AFT resolution to protect Next-Gen Workers, which calls for the expansion of the Talking Safety program to all K-12 locals and their districts.

<https://www.aft.org/resolution/protecting-next-gen-workers-health-and-safety-education-young-workers-21st>.

- Formative research with workforce development organizations, including the National Association of Workforce Boards, to better understand current OSH training practices and needs in the workforce development sector.
- Formative research with staffing companies and other organizations, including the American Staffing Association, to better understand current OSH training practices and needs in the staffing industry.

### **Emergency Preparedness and Response Office**

In April, NIOSH (EPRO and DSHEFS/HETAB) released new guidance for healthcare personnel to prevent occupational exposure to illicit fentanyl and its analogues (also referred to as illicit fentanyl). These drugs pose a potential hazard to healthcare personnel who could come into contact with them during the course of their work in hospital and clinic settings. Healthcare personnel who could potentially be exposed to illicit fentanyl include nurses, nursing assistants, physicians, technicians, therapists, phlebotomists, pharmacists, students, and trainees. The guidance includes recommendations for establishing work practices when illicit fentanyl is known or potentially present; implementing training where illicit fentanyl is reasonably anticipated to be present; using personal protective equipment when illicit fentanyl products are visible; and how to perform decontamination when individuals or items are contaminated with

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illicit fentanyl. The guidance is available on the NIOSH Fentanyl Topic Page at <https://www.cdc.gov/niosh/topics/fentanyl/healthcareprevention.html>.

## Health Effects Laboratory Division

### Mold Immunotoxicology Research

Mold contamination in various sectors can result in occupational exposure to aerosolized fungal particles. Workplace mold exposures can become extreme particularly after hurricane-associated flooding as was observed following Katrina, Sandy, and more recently, Harvey. The accompanying media coverage has resulted in broad public concern regarding potential adverse health effects of fungal exposures. To date, the immunotoxicological consequences that follow workplace exposures remain uncharacterized for many occupationally relevant fungal species.

Fungal exposures were nominated to the National Toxicology Program (NTP) for investigation to address the knowledge gaps. Through an Interagency Agreement with NTP, HELD researchers were selected to address this issue because they developed a state-of-the-art exposure system that simulates natural exposure by aerosolizing dry fungal spores and delivering them to mice housed in a multi-animal nose-only exposure chamber.

HELD is utilizing this exposure system to test a series of fungal species for the NTP. Subchronic inhalation exposures (13 weeks) using *Aspergillus fumigatus* and, most recently, two strains of *Stachybotrys chartarum* (black mold) have been completed. Repeated exposures to spores derived from these species showed the major tissues effected were the larynx, lung, and bronchial lymph nodes. The lungs of *A. fumigatus* exposed mice demonstrated allergic inflammation that was dependent on the viability of *A. fumigatus* spores. In contrast, mice repeatedly exposed to *S. chartarum* showed that allergic mediated responses were dependent on the strain and the production of fungal fragments.

These early studies are showing varying pulmonary immunological responses between species and strains. Unexpectedly, pulmonary arterial hyperplasia has been consistently identified in mice repeatedly exposed to all tested fungal strains to date. This is a unique histologic finding highlighting the potential for fungal exposures to modulate cardiovascular endpoints, such as pulmonary hypertension and right ventricular dysfunction. This rather striking finding is the focus of current research efforts.

The results of this cooperative research between NTP and NIOSH are providing an improved understanding of the pulmonary immunotoxicological and the pathological responses associated

with sub-chronic exposures to fungi using a model that better replicates worker exposure to mold.

### **National Personal Protective Technology Laboratory**

#### **Effect of Stockpiling Conditions on the Performance of PPE that Protect Workers for Bloodborne Pathogens and Infectious Airborne particulates**

NIOSH's National Personal Protective Technology Laboratory is assessing the effect of stockpiling conditions—such as temperature, humidity, light exposure, and storage time—on respirators and surgical gowns. NIOSH established a PPE Stockpile Partnership with members consisting of federal agencies as well as hospital, city, county, state, and federal stockpiles. Input from the Partnership and a Federal Register Notice to the public was used to categorize U.S. stockpiles into one of three categories based on the facility's ability to meet the manufacturer-recommended temperature and humidity storage conditions: 1) meets recommendations; 2) may meet recommendations; and 3) unlikely to meet recommendations. Eight collaborating stockpiles have been identified that represent all three facility categories. Across all eight facilities, 12 air-purifying respirator (APR) models—11 N95 filtering face respirators and one elastomeric cartridge filter—will be evaluated. Only five of the collaborating facilities stockpile Level 3 or Level 4 surgical gowns with a total of four different models available for evaluation. For APRs, tests will be conducted to evaluate filtration performance and fit. For gowns, tests will be conducted to evaluate performance. Respirator and gown samples from all collaborating facilities will be collected by August 2018. Filtration performance results have been obtained for 8 models of respirators from 5 facilities to date. IRB approval for fit testing is being sought with testing expected to begin in May 2018. Surgical gown testing will begin in June of 2018.

#### **NIOSH Respirator Approval Program Action Plan**

The NIOSH Respirator Approval (RA) Program performs a critical function within the occupational safety and health community by ensuring the integrity of the respirator supply in the U.S. It is imperative that this Program continue to ensure confidence in all approval decisions while also providing consistent and efficient service to support the timely introduction of new and improved devices to market. The RA Program Action Plan was developed over the last year by a team of NPPTL experts, and provides a detailed analysis of the NIOSH respirator approval process. Sources of input to the effort include: 1) stakeholder perspectives; 2) analysis of current workflow steps and decision logic; 3) analysis of “active working time” and “wait time” for each step; 4) exploring other federal and private sector conformity assessment programs; 5) previous external reviews that included recommendations for this Program; and 6) an independent review

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conducted by a NIOSH Doctoral candidate. The Plan contains 10 Topical Action Areas and 29 specific Action Items. A number of the Plan's components have been initiated, including eight actions recommended by the International Safety Equipment Association (ISEA). The actions are categorized as internal to NPPTL, NPPTL working with manufacturers, and NPPTL working with NIOSH leadership. The 2018 priority actions internal to NPPTL are identified below:

1. Continue development of workflows, decision logics, work instructions, standard operating and test procedures, and critical checklists for all aspects of the process;
2. Develop process documentation to support coordinated approval effort with the Food and Drug Administration (FDA) for respirators used by healthcare workers;
3. Shift to a staffing model where all staff performing application handling/processing/reviewing activities can perform all roles (i.e. initial review, quality assurance review, and final review); and
4. Establish a schedule for evaluating and updating, as needed, all standard test procedures to ensure the RA Program is aligned with current technologies and equipment

**National Framework for Personal Protective Equipment Conformity Assessment – Infrastructure Published in November 2017.** <https://www.cdc.gov/niosh/docs/2018-102/default.html>

This Framework is the product of collaboration among the NIOSH representatives and a broad cross-section of members of the PPE community. This group's multi-year effort; (1) identified and analyzed national and international conformity assessment (CA) programs and requirements, (2) investigated injury and enforcement surveillance databases, (3) researched and gathered PPE standards, and (4) developed a risk-based approach to conformity assessment resulting in this Framework. The recommendations in this document are intended to serve as foundational principles for various types of conformity assessment programs for occupational PPE. They are not requirements for how these programs must, or will, function. Conformity assessment activities should be tailored to the needs of product users, suppliers, and regulatory authorities. They should result in products that protect workers who rely on PPE; facilitate trade, fair competition, and market access; be cost-effective; and provide assurance of conformance.

### **Respiratory Health Division**

In partnership with staff from several federally funded black lung clinics in Virginia, investigators within the Surveillance Branch identified a large cluster of the most severe form of

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coal workers' pneumoconiosis, also known as progressive massive fibrosis, among current and former coal miners in Southwest Virginia. Their findings were published in the *Journal of the American Medical Association* in February 2018.

A report was published in the January 19, 2018 *Morbidity and Mortality Weekly Report* documenting asthma mortality by industry and occupation in the United States from 1999 to 2016 ([https://www.cdc.gov/mmwr/volumes/67/wr/mm6702a2.htm?s\\_cid=mm6702a2\\_e](https://www.cdc.gov/mmwr/volumes/67/wr/mm6702a2.htm?s_cid=mm6702a2_e)).

The last two weeks of March 2018, Surveillance Branch staff provided free confidential health screenings to miners in Kentucky and West Virginia using RHD's mobile testing unit in support of the Coal Workers' Health Surveillance Program. This is the first of seven such trips that are scheduled between March and August of this year.

Field Studies Branch researchers published the first ever described cluster of idiopathic pulmonary fibrosis among dental personnel in the March 9, 2018 *Morbidity and Mortality Weekly Report* ([https://www.cdc.gov/mmwr/volumes/67/wr/mm6709a2.htm?s\\_cid=mm6709a2\\_e](https://www.cdc.gov/mmwr/volumes/67/wr/mm6709a2.htm?s_cid=mm6709a2_e)).

## Total Worker Health<sup>®</sup>

### 1. Total Worker Health Publishes 1<sup>st</sup> Ever Edited Volume

A TWH Edited Volume is now in production and is slated for publication Fall 2018. Titled Total Worker Health: Integrative Approaches for Safety, Health, and Well-being, the book will feature over 460 pages, from 63 authors, and 17 chapters. American Psychological Association (APA) is the publisher. Editors include Hudson, Nigam, Sauter, Chosewood, Schill, & Howard. The volume will be the foundational, definitive writing for this field, a handbook for practitioners, and a textbook for the growing number of courses, certificate programs and degrees are launching around the country.

### 2. TWH just wrapped up the 2<sup>nd</sup> International Symposium to Advance TWH: Work & Well-being

The symposium was held May 8-11, 2018 on the Bethesda, NIH Campus. Featured 4 days, > 100 presenters, >20 hours of CEUs provided pending. The meeting featured 48 Presenting Partner organizations and keynotes from the US Surgeon General, Dame Carol Black, Blue Zones' Tony Buettner, and Harvard' Robert Waldinger. The symposium also marked the launch

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of ISSA’s Worldwide Vision Zero Harm Campaign in the Americas. There were 6 pre-conference workshops, 50 posters, and more than 50 concurrent sessions offered.

**Western States Division**

**NEW Fatigued Driving Prevention Tips for Oil & Gas Employers and Workers**

Motor vehicle crashes cause over 40% of work-related deaths in the oil and gas extraction industry. Driver fatigue is a factor in some of these crashes. NIOSH has developed fact sheets that identify factors linked to fatigued driving and provide recommendations for keeping oil and gas workers safe on the road.

**Video: Protecting Oil and Gas Workers from Hydrocarbon Gases and Vapors- Now available In Spanish!**

NIOSH researchers have demonstrated that workers at oil and gas extraction sites could be exposed to hydrocarbon gases and vapors, oxygen-deficient atmospheres, and fires and explosions when they open tank hatches to manually gauge or collect fluid samples on production tanks. These exposures can have immediate health effects, including loss of consciousness and death. This video describes the hazards associated with manual gauging and fluid sampling on oil and gas production tanks and describes steps that employers and workers can take to do this work safely. [https://www.cdc.gov/spanish/niosh/docs/video/2017-158d\\_sp/default.html](https://www.cdc.gov/spanish/niosh/docs/video/2017-158d_sp/default.html)

**Social Presence Statistics**

**NIOSH continues to expand its presence on social networks.**

<b>Social Media and Public Outreach Accounts and Services</b>	<b>March 2017</b>	<b>March 2018</b>
Facebook	126311 likes	133634 likes
Twitter	@NIOSH account 325665 followers	@NIOSH account 324576 followers
Instagram	956 followers, 547 posts	1462 followers, 1104 posts

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YouTube	196 videos, 417901 views	212 videos, 557546 views
LinkedIn	437 members	691 members
Website Views	1750994 site views in March 2017	1418905 site views in March 2018
eNews Subscribers	63963	70069
TWH Newsletter Subscribers	70164	76745
Research Rounds Newsletter	62005	67480
Science Blog	Total blog entries: 397 Total comments: 6636 Blog site views (March 2017): 49136	Total blog entries: 470 Total comments: 7560 Blog site views (March 2018): 41468

**NIOSH Publications**

February 2018:

NIOSH Program Performance One-Pagers

- [Northeast Center for Occupational Health and Safety Agriculture, Forestry and Fishing](#)
- [Central States Center for Agricultural Safety and Health](#)
- [Southeast Center for Agricultural Health and Injury Prevention](#)
- [Upper Midwest Agricultural Safety and Health Center](#)
- [Pacific Northwest Agricultural Safety and Health Center](#)
- [National Children's Center for Rural and Agricultural Health and Safety](#)
- [Western Center for Agricultural Health and Safety](#)
- [Great Plains Center for Agricultural Health](#)

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March 2018:

- [Oil and Gas Employers: How to Prevent Fatigued Driving at Work](#)
- [Oil and Gas Workers: How to Prevent Fatigued Driving at Work](#)
- [Preventing Hearing Loss Caused by Chemical \(Ototoxicity\) and Noise Exposure](#)
- [Workplace Design Solutions: Protecting Workers during Nanomaterial Reactor Operations](#)
- [Workplace Design Solutions: Protecting Workers during the Handling of Nanomaterials](#)
- [Workplace Design Solutions: Protecting Workers during Intermediate and Downstream Processing of Nanomaterials](#)
- [Fishing Safety Success Story: My Life Vest Saved Me](#)

April 2018:

- [Filtering out Confusion: Frequently Asked Questions about Respiratory Protection, Respirator Reuse and Extended Use](#)
- [Filtering out Confusion: Frequently Asked Questions about Respiratory Protection, Fit Testing](#)
- [Filtering out Confusion: Frequently Asked Questions about Respiratory Protection, User Seal Check](#)
- [Bibliography of Communication and Research Products 2017](#)

**Certification Statement**

I hereby certify that, to the best of my knowledge and ability, the foregoing minutes of the May 15, 2018, meeting of the NIOSH Board of Scientific Counselors, CDC are accurate and complete.

August 8, 2018

Date

/Bonnie Rogers/

M.E. Bonnie Rogers, DrPH, MPH, COHN-S  
Chair, NIOSH Board of Scientific Counselors