

## Health@Home Web Series – Webinar 4: Bringing it Home: The Energy Plus Health Equation, Maintenance and Active Design

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### **Lael Holton:**

Okay, good afternoon and welcome, ladies and gentlemen. It is now 3 o'clock, we will go ahead and get this session moving along. My name is Lael Holton, I am with AECOM, we provide contract support to HUD, your community compass technical systems program. We're very happy to have you all here, and before we get started I've just got a couple of things I wanted to clear up for the day.

First, everyone's muted upon entering. This is going to continue throughout the course of the webinar. If you have a technical question or an issue, please make sure to enter that into the chat box at the bottom right. If you don't see a chat box at the bottom right, make sure that the chat icon is lit blue at the top of your interface, and that chat box will open up.

Also, submit your message when you do that to Host and Presenters, so that all of us can see that. Also throughout the course of the session, particularly towards the end we will have a Q&A period. However, there are also Q&A panels. The Q&A panel will open, and that will be the location for you to put and insert any of your questions as we move forward. I think that's the majority of the housekeeping, just make sure to designate all of your chats to the hosts and the presenters, that way we can all work together as we're going along, and we can get the information out. Okay.

So, I do think that takes care of some of the basic housekeeping, with the one exception that I wanted to remind everyone, this session is being recorded today, and will be posted on the HUD Exchange. Both the presentation and transcript, as a PDFs, will find their way to the HUD Exchange website, same location as where you went to register in the coming weeks.

So just to get us moving on today, I just wanted to go through our agenda quickly. We've done the welcome and logistics for today, we've got a health and home overview, Michael Freeberg our sponsor and principle grants monitor from HUD will be giving a little bit of overview of this project and the activities that we've been going through. Then we'll switch to Ellen Tohn, from Tohn Environmental Strategies, she will be discussing the additional, more detail into the guidance document as well as some information on keeping it well maintained later on in the program.

Also, today, Paul Francisco from the University of Illinois Urbana-Champaign is going to be joining us and discussing how to keep your home, and the home retrofits thermally controlled, as well as energy efficient. And then we have identified the need for a possible ninth principle, over HUD's eight housing principles, and that is how to incorporate active design into your retrofits. And Mary Ayala from Enterprise Community Partners will be leading that with us today.

These as I say, are our presenters that will be joining us as we go along. And then I'm going to transfer this over to Michael. Michael, it is now your turn, I'm moving and it's all yours, sir. You need to unmute, and you're good to go. There you go.

### **Michael Freeberg:**

Okay, great. Thank you, Lael. Thank you all for joining us. I just want to welcome all of you here on behalf of HUD. I'm in the Office of Environment and Energy and we are sponsoring this web series.

For those of you who've been able to attend all four sessions, you will be receiving a certificate of completion in the mail and will also be eligible for a Health@Home technical consultation from our TA providers. And we'll be providing you with some information about how to request that TA at the end of this webcast.

I don't have to tell anybody who's turned in today about the importance of healthy housing. It's never been more clear as we make our homes more energy-efficient, as we're spending more time in our homes due to the coronavirus, and the CDC, just this week, confirmed the importance of ventilation and filtration in our homes as a result of the potential for transmission of the virus through small aerosols which could be conveyed in an indoor environment.

But even before the COVID pandemic, we were all aware that asthma triggers can be found in the home and cleaning your indoor environment can have a positive contribution. So we'll be hearing more about that today.

This is the pull-up of the four sessions in this series and they are organized around the Health@Home guidelines, which can be found on the HUD website. These guidelines were prepared and assembled by a group of technical experts, AECOM, Tohn Environmental Associates and Livable Housing Inc. and the importance here is to how to best integrate these guidelines in your rehab project.

The focus is on moderate rehab, home remodeling or home repair programs. Primarily in single-family and low-rise multifamily housing, also much of this can also apply in high-rise or mid-rise multifamily housing. For substantial or gut rehab we strongly encourage and we actually assume that in many cases, you are using one or more of these green building standards, where healthy measures and criteria are built into those programs, to some degree or another. What we're going to do is really focus on, when you're not adopting one of those standards how you can address healthy housing principles.

I do want to mention before handing this over to Ellen that we have a NOFA, notice of funding availability on the street. There's \$5 million available to folks who are interested in combining weatherization resistance with HUD, Lead Hazard Control and Healthy Housing funds. This is a program that is designed to demonstrate if coordinating healthy housing and weatherization can improve outcomes in the health, safety and efficiency areas? If you are interested in this NOFA, please go to the HUD website or contact the office of Lead Hazard Control, Healthy Housing or HUD.

With that, I'm going to pass this onto Ellen Tohn who's been an expert and a leader in this space for as long as many of us can remember. She's been involved both on the technical side, but also working with local communities about how to integrate weatherization and healthy housing and energy efficiency. The One Touch program is I think her brainchild, and we've been delighted to have her, essentially be lead instructor for this series. So Ellen, over to you.

**Ellen Tohn:**

Great, thanks so much, Michael, pleasure to be here. As Michael said, we know that our homes impact our health, so brief reminder for those of you who might have been on the earlier calls? Just brief, quick examples. For asthma, really 1 in 10, so 8% of adults and children in the United States currently report having asthma, that's quite a lot. And 20-40% of those cases can be linked to some home environments.

So, if you just think about that, 1 in 3 of asthma cases in the past can be linked to where someone lives. So that means, we have a very powerful lever in the way we rehab homes and develop homes to minimize asthma risk. Which for children, it's one of the leading causes of hospitalizations.

Second, radon. Seven million homes have potential radon risk, and over 21,000 deaths EPA estimates every year can be linked to radon exposure. Again, a pretty easy fix during renovations, we discussed that in one of our previous webinars. And maybe the biggest number is, when we look at seniors, 1 in 4 over the age of 65 fall each year, and half of those falls occur in the home. So it's a really significant number of trip and fall hazards in homes. And again, the way we do our rehab can make a difference. So just a few examples to make this really feel quite real.

The way the Health@Home guidelines are organized as Michael said are around the nine principles of healthy housing. We've covered everything except for the last three gears on your lovely slide here, so today we're going to talk about making sure homes are thermally controlled, have attention to active design which Mary will walk us through, and are well maintained. So we have it organized by principle, and when you open the document, you therefore see the recommendations organized by principle. Here's an example from Keep It Dry, and we give you very laconic, tersely written specs on what to do, to prevent stormwater management, leaks, moisture in surfaces just using this example.

And each of our speakers today will show you those exact guidelines for their topic, and then walk us through them. But we know that a lot of rehab programs don't think about our standards by principle. We would think about them by building component category, that's how you write your standards. And so we've done a really nifty crosswalk for those of you who like tables, and you can see for the Keep It Dry principle, each of those standards I mentioned, stormwater management leaks, we can show you that that's showing up in the site category, in roofing, building exterior, foundations and structure.

So, you can see the crosswalk, and even more importantly, if you do think about it at a component base level, we've written the standards up at a component base level, and here's an example of how that looks. So around site standard, we again provide that backwards crosswalk, which principle it applies to, we list specific activities with both a repair and a replacement standard. Which I think is a familiar presentation for many of you.

We've given you, really there's no wrong door into this, whether you think about it by principle or building component we have you covered, and we've got the same content organized in a different way. So I want to now set the stage for the beginning of our discussion about how to keep homes thermally controlled, and highlight some of what we've learned in two recent studies that I had the pleasure of participating in. One for the Department of Energy shown on the left here, HomeRX, "Help benefits of home performance." And then a related document done by E4TheFuture, Occupant Health Benefits of Residential Energy Efficiency. I want to credit my co-authors, the National Center for Healthy Housing, and also Three3 who played an important role on one of these documents.

So, what do we know about some of what Paul's going to talk about, making homes thermally comfortable? These are studies that looked at energy efficiency, and in your rehab work you may not do a full-blown energy efficiency job. We certainly encourage you to work with weatherization and energy programs. But just to put this in context, that work typically involves sealing up holes, air sealing, insulation, heating system upgrades, I'm now looking at the left column on my chart. Ventilation, venting dryers and efficient cooking appliances.

When you do all of that, you get changes in the indoor home conditions. And those are shown in the blue boxes. Warmer, drier air, we get better temperature, less moisture in the air. We see fewer moisture, just generally less moisture and mold, fewer particulates from combustion, and fewer allergens. When we do that efficiency, we lower people's bills. So working backwards up, we know when we lower people's bills, particularly in lower income households, there's less stress and better mental health, very well documented.

And the other activities to the indoor environment result in these improvements in health shown in green, and I'm going to go through a few of those in the next slide. And then not just changes in symptoms, but reduced hospitalizations and medical visits, which are on the far right. So we have pretty good evidence looking at about 40 studies, that energy efficiency can improve indoor conditions and occupant health. And when we dial down into that, just looking at a little more detail, we can see from these studies, most of which were actually done in lower income households, really aligned with some of this work.

That we see improvements generally in these respiratory and allergy symptoms, and being a little more granular, reductions in allergies. You see *asthma's* in italics here, with an asterisk. There's one study that has some mixed results, but many studies that show positive results. So on that, we think there's an improvement there, reductions in colds, sinus infections, throat irritation and wheezing.

So a variety of respiratory related issues, and then studies have also documented and one of these is Paul's actually, reductions in headaches, hypertension, thermal stress, and several studies have done quite a bit of getting folks to rate their overall physical health and mental health and showing significant improvements. And you'll see improvements in the indoor environment on the far right.

Again, the ones in italics, is radon. This was in earlier studies on radon, and Paul and I have since done several subsequent studies on radon, where it was showing not negative consequences at all, but neutral or positive consequences. So I think we can adjust that finding from these earlier reports. And we see reductions in hospitalization for asthma and respiratory health.

Reductions in emergency room visits comes from a national evaluation of the DOE weatherization program. Better control of asthma comes from a study that I'll say a little bit more in a moment about, and we have many studies as I mentioned on the overall physical and mental health.

So just to give you one study in particular and then I'm going to right on time, turn over to Paul, I hope. This was a study in Washington state for high risk children with asthma that was out of control. It's very well documented that a three visit community health worker protocol can make the asthma better under control. We don't usually get rid of asthma, we just make it a condition that doesn't interrupt going to school or work or sleep, and it's under control.

So, half the kids got that, and half the kids got the community health worker plus an energy efficiency with some additional rehab. Which is shown here, the energy kinds of work I described in my first slide, which now, for most programs also comes with bath fans. But you can see a few other rehab activities that were also done here, spending about \$4,000 per apartment.

So, what did that actually yield? What you'll see here is the orange bars showing the improvements in indoor environmental conditions with just the community health worker. That's just the female character shown there, and the orange bar, 28% and 29% reduction in moisture and mold conditions.

But when you add in energy efficiency with that very modest little repair, more than doubled the reductions in mold and additional improvement in moisture. And most importantly, that lead to improvements in asthma under control.

A year after the work was done, there was a 48% improvement for asthma out of control. Way more kids had asthma under control. And there was a 23% added benefit for clients who also got the weatherization energy efficiency work, on top of the community health worker visit. So just to dial into a specific study, we do feel quite confident that energy efficiency can improve health benefits.

So, in terms of what it means to do energy efficiency, I'll turn over to my friend and colleague, Paul Francisco with whom I've done many studies and written guidance. He has at appointments at the University of Illinois, Champaign-Urbana, and Colorado State University, and Paul will teach us about thermal comfort.

**Paul Francisco:**

Okay, thank you very much Ellen, and thank you to the hosts for having me. So yeah, we're talking about Keep it Thermally Controlled, there's also... Now being referred to as Keep it Comfortable.

And why does it matter, in terms of health, why does energy efficiency matter in terms of health? Well Ellen just talked about some data. But I'll give some additional context. If we even just think about extreme conditions, extreme heat. In 2017, the CDC said that kills about 600 people every year. Which is more than all of the other severe weather events combined, such as hurricanes and tornadoes. And about 40% of the people who were killed by extreme heat every year are older adults.

Then we've got cold. Even though extreme heat is more than all of the other severe weather events combined, cold, even if it's not extreme cold, actually corresponds to about 63% of all the temperature related deaths in the country. This is also from the CDC. As I said, it's not necessarily extreme cold, but it stresses the body. And so it may lead to some other issues.

Additionally, thermal stress is linked to reduced productivity, such as balance and cognitive function, decision-making. It's linked to reduced learning and it may increase susceptibility to other issues as well. And that is something that we're certainly faced with now, especially as we're going into... With the wintertime, and then there's all this concern about coronavirus and maybe we need to increase ventilation? But we can't just compromise our thermal comfort, because that may increase our susceptibility.

Ellen showed this document already that talked about the benefits of home performance on health. When we do a house, we don't just think of one specific piece, but we look at a house in a holistic manner. We see that it can really help on many of the Keep It principles. Of the nine Keep It principles, it directly impacts Keep It Dry, Keep It Ventilated, Keep It Contaminant Free. It can also have benefits on Keep It Pest Free. And of course, home performance is really focused on keeping it comfortable, and thermally controlled.

So, the concept behind home performance and keeping homes comfortable, thermally controlled, is a two-step process. It is not just about installation, and it's not just about efficient appliances. What we want to do is first, reduce demand as much as possible. If you reduce demand, you gain control over your space. And so we want to reduce the demand as much as we possibly can in a reasonable fashion through primarily air sealing and installation. And once we've got that control, to where we don't

necessarily have hot spots and cold spots in the home, we can now... Whatever we still need to supply to keep the home thermally comfortable, we want to supply that as efficiently as possible.

Through high efficiency heating systems and cooling systems. And good controls that mean you're not just running it when it's not needed, but with things like setback thermostats that really allow you to save energy at certain times when you're not really needing to keep the house as much of a normal temperature as when you're in the space.

So here are the Health@Home guidelines for Keep Thermally Controlled. I'm not going to go through them here, you see that there are these numbers, 8.1-8.7. in following slides, I will have those sections referenced, I'm not going to point that out every time, but that's what those numbers are going to mean in following slides. I'm not doing it in this order, I'm doing it more in the order of demand followed by supply, and then moving on past that.

We'll start with Reducing Demand - Air Sealing. Air sealing is extremely important. It is considered really one of in weatherization, three major demand reducing measures. The three major demand reducing measures are air sealing, wall installation and attic installation. Now when it comes to air sealing, a lot of people are first thinking about windows and doors. You feel drafts from those, it's something people are always thinking about, they see the windows and doors. Sometimes you see daylight around the windows and doors, you think that may be that they leak, and while we certainly do want to consider windows and doors, because they are absolutely sources of leakage, it tends to be that's what's most important are much larger leaks like chases and soffits.

There are a whole lot of homes where there may be a basement, and then some shaft that's got plumbing, or a duct, or a chimney. And it's open all the way up to the attic. In which case, you just have this huge bypass going from the basement to the attic, so that's one example of a much larger bypass. So just to put this in perspective a little bit. There's that metric called ACH50, I'm sure many of you are familiar with this. ACH50 is basically, "What is the flow that's required to move through a house to depressurize it by 50 Pascals, and then normalize it by the volume of the house? So how many air changes per hour would you get if the house was depressurized by 50 Pascals?"

In new homes, the code requires, depending on your climate zone, 3-5 air changes at 50. Colder climates in winter, the requirement is 3. Warmer climate zones, such as in Florida, the 5 would be the maximum allowable ACH50. When you look at retrofit situations. For example, in Illinois, the average weatherization client. Low on income, Illinois Home Weatherization Assistance Program client, is more like 20 air changes at 50. That's the average. There are some homes that are double that, in fact the leakiest home I've measured was four times that. It was basically, it barely even had walls at that point.

So one of the things about this, is it shows that we can have some extremely larger leakage levels in many homes and in fact in 2010, a National Evaluation of the Weatherization Assistance Program found also the average client from that 2010 evaluation had about that same 20 air changes at 50.

So, the 20 air changes at 50 corresponds to about 4,000 cubic feet per minute at 50 Pascal depressurization. Every 1,000 CFM 50 corresponds to about 100 square inches of opening. So if you have 1,000 CFM 50, you can think of a 2 foot wide window, so 24 inch wide window being open about 4 inches. That corresponds to about 1,000 CFM 50. So then the average weatherization home is 4 times that. So we're talking about that same 2 foot wide window being open 16 inches.

The point here is that while we certainly want to be looking at doors and windows for where there may be issues related to leakage, that's probably not going to be enough to get your house to be tight. You're still going to need to go find other big leaks, and that's one of the major reasons people use blower doors so that they can identify those big leaks and use the blower doors to guide their air sealant.

And weatherization typically will reduce leakage by 30-40%. Some homes get a lot more. Some homes are already pretty tight and it might not seem much, but they didn't need very much. When you get really leaky homes, sometimes you can get 60, 70% reductions in air leakage.

So again, don't ignore the doors and windows. Caulk as is mentioned in the Health@Home guide. It may help reduce drafts and influence comfort. It'll also help keep it dry. The caulk a lot of times is used to help keep water from getting in, so it's not just about thermal comfort, it is also about Keep It Dry. A lot of time sash locks on windows are not working very well, so there's a big gap where... If it's a double hung or single hung window, where the [inaudible 00:28:07] sections of window meet, they may not work very well and causing some pretty big drafts, and those are very easy to fix, very inexpensive and easy to do.

Weatherstripping and door sweeps can shut drafts off. One thing to keep in mind is people might complain about their windows being drafty, that's not always the case. You can think about just sitting next to a really large window. And you can feel how that window is cold. Because the window is cold, it has these convected currents, and so you might feel the cold, you might feel air movement, but it's not necessarily going through from outside. It may well be going vertically up and down the window. So that's something to keep in mind that just because you feel air moving at a window, does not mean it's a leak. But it might be a leak, and so you do want to evaluate those windows.

Okay, moving onto another part of reducing demand, insulation. So insulation also improves your ability to condition the home, it's giving you back control. Now we think primarily about insulation, about reducing heat loss through the building sections, whether it's the wall or the attic, through the ceiling. And so we reduce that conductor heat loss. But one of the other benefits of insulation, especially when it's installed properly, is that it can improve the temperature of the wall.

People respond about 50:50 to air temperature and surface temperatures. So if the surface temperature is cold, we're going to lose heat through radiant heat transfer to those surfaces. So we insulate those surfaces, it warms up those. Or when we insulate the wall, it warms up those surfaces, reduces our body heat loss to those surfaces. Also by increasing the surface temperatures, and reduces the chance for mold growth. Mold growth on surfaces is a combination of higher humidity and cold surfaces. So if we can warm up those surfaces, it will reduce our chance for mold growth and therefore we're also having an impact on Keep It Dry, Keep It Contaminant Free.

So, one key about insulation is that it actually has to be in contact with a surface. If there's an air gap between the insulation and the surface, like if it's in a wall, and there's a gap within the wall? You're going to have air currents within the wall, and you're going to sacrifice a significant amount of warmth of that insulation. Another thing to keep in mind with insulation in terms of health in homes, is that not all insulation is the same. Some insulation is loaded with chemicals, and it is good to focus on insulation that has lower levels of chemicals. There's a Healthy Buildings network that has a list of considerations, and so you can go look at Healthy Buildings network or recommendations of more environmentally friendly, less chemically laden insulation that may not have formaldehyde, for example. Which is a concern in some spray foams.

Here are a couple of insulation installations that were not done very well. You can see on the little picture on the left where you've got a bad, going over the joists in the attic, and there's big gaps underneath, there's nothing preventing that cold air from getting underneath the insulation, you're just not getting the benefits. With the picture on the right, with the walls, you see how the insulation has been pressed into the wall. So when you put up the dry wall, there's going to be a big gap. You will not get that R19 that is advertised.

Now, in retro applications we typically are not using batts so much, we're using a lot of loose fill. Especially in attics and walls. For attics, we just blown in a lot of cellulose, and one of the great things about that is that it can find all those little nooks and crannies and so you don't have the big gaps that you might with the bad insulation. In the walls, because you've already got the walls up in the retrofit application, you don't want to tear the wall apart to put in batt insulation, so we tend to do dense pack cellulose that has both advantages for insulation, as well as for air sealant, by having that dense packed, it really does and can cut off a significant amount of air leakage that might be going through those walls.

When you do have open walls, such as you will have in knee walls, and crawl spaces and basements. Or if you're bringing the attic inside and finishing at the roof, a lot of times that's where you will use batts or foam. You want to make sure that the spray foam is not loaded with some of the more problematic chemicals, but one of the nice things about it is it's really resistant to gravity pulling it down. Gravity will pull batts down, but once the spray foam is in, it'll usually stick pretty well.

If you are using batts, you really need to have something, some kind of facing as an air barrier. Fiberglass or cellulose insulation is not itself an air barrier, but if you have paper or vinyl, then that can create that air barrier so you don't have air going through the insulation and compromising some of that effectiveness.

So here we've got, on the left and right pictures its spray foam being used, on the wall or in a rim joist cavity. And then the picture in the middle shows vinyl face batts in a basement wall.

Crawl spaces, something I see in crawl spaces all too often is where people have put insulation on the walls with the idea that you want to bring the crawl space thermally inside, keep the plumbing warm, keep the ducts warm. But then they put vents in in order to, they think, keep it dry. But what you've done is you basically have open windows throughout the crawl space through the insulation, and it's not doing very much. So you either want to have... If you're going to have a vented crawl space, you really need to insulate under the floor as it's shown in this picture. Usually that's done with batts, although it can be done with spray foam, if it's batts it has to have strapping to hold it up. If you can get away with not having vents, then perimeter insulation is much better, which can be the vinyl faced batts that I showed in the previous slide, or spray foam insulation, again trying to have it be more environmentally friendly.

Okay, so those were demand side reductions, demand side energy efficiency for thermal control. Moving onto the supply side, that's where, how are we heating or cooling our homes? Well first, one of the things we want to do, all too frequently, systems get oversized. And the idea is, "But we want to make sure you've got enough capacity." Oversizing equipment for the most part doesn't lead to good outcomes. It increases cycling losses, which relates to efficiency losses. If you're in a situation where you're trying to dehumidify, oversizing an air conditioner will really compromise your ability to dehumidify the air.

The one exception to oversizing is with heat pumps. If you're allowing the heat pump to run all the way to cold temperatures, you can still get some improved compressor efficiency out of that, which reduces your need for more expensive fuels. And so it can be really beneficial to let the heat pump run as far as possible. In which case, oversizing can be a good thing.

And then we've got When Supply Met Demand. And that's our trying to supply the heating or cooling, but if they have a lot of heat loss, they're increasing demand. First the air conditioner has to put in more space conditioning in order to keep the building thermally comfortable. Ducts outside the conditioned space, measurements of many studies over the last 30 years have shown that many duct systems outside the conditioned space such as crawl spaces and attics have 10% or larger leakage. It can be 20-40% energy penalties. Even worse, for heat pumps, these really need to be sealed properly.

And ducts are nasty places, people don't like to go there, and that's part of why they stay troubled. But that can oftentimes be the single largest source of energy savings in a house. So they do have to be sealed properly, mechanical fasteners to keep the sections together, and then mastic duct tape does not work as you see in the picture on the right. The heating and cooling thermal cycling will cause the duct tape to fail, and it could fall off.

The picture on the left shows where they didn't use mechanical fasteners, they just assumed friction would work, and it didn't. We've talked about demand, we've talked about supply and then when supply meets demand, all these trying to give you more control over the thermal comfort in your home, the ability to deliver thermal comfort in the home. And to do it as efficiently as possible, programmable thermostats help with the efficiency.

And Energy Star appliances, and one thing to keep in mind is, health in our homes is not just about what happens in our homes, it also influences what happens outside of our homes. So when we use these efficient appliances, including things like refrigerators and cooking appliances that are Energy Star, that are therefore efficient, that reduces how much energy we need to generate, how much electricity we may need to generate. We still have a lot of our electricity is generated using fossil fuels.

Which means that, when we're generating that electricity, that is being put into the air, the combustion products are being put into the air. So to the extent that we can reduce how much energy we need, how much electricity we need, we can be reducing how much contaminant we're putting into the air outside, which could eventually find its way into our homes.

So, in summary, I think I'm just about right on time here. Thermal comfort is important for more than just being comfortable, it's for health, performance and learning. Air sealing and insulation can really reduce the need for space conditioning, and help maintain comfort in the home, help you be able to maintain the comfort in the home. Properly sized space conditioning systems optimize the ability to deliver comfort. Don't oversize the system because that will actually impede your ability to deliver comfort. And don't forget about the ducts.

The ducts are like the veins, the arteries that are going through our body, that's how you're getting what you need from one place to the other, when those are compromised then this can amount for both comfort and energy. You can have entirely cold sections because the air isn't getting there in the winter. So don't forget about that. And I believe that is everything.

**Ellen Tohn:**

Great, thank you Paul. I'm so thrilled to have Mary Ayala join us. She's the Program Director with Enterprise Community Partners. We already mentioned there being communities criteria in one of the slides. Mary's work focus and centers on how housing can be used as a platform for health promotion, both in affordable housing development and cross-sector partnerships. Before joining Enterprise, she came from a healthcare setting which I think is a pretty unique window on this. So let me hand it off to Mary.

**Mary Ayala:**

So, thank you, Ellen. I'm excited to be here today to talk with you all about active design. I thought I would start off with discussing the definition of what active design is. An active design is when design decisions are made to increase the frequency and/or duration of physical activity.

The design decisions that are made within your building are going to influence how often people are moving around and participating in physical activity. And we know that physical inactivity is linked to a lot of major chronic diseases that exist across the United States. As Ellen mentioned, in my experience working for a healthcare system, we saw that health means obesity, hypertension, heart disease, stroke, cancers. These are all things that are influenced by physical activity, and these are needs that consistently come up in the communities across the United States as we are probably all working in.

Just to provide a little bit of background on how effective physical active design features can be. The evidence base illustrates that actually just increasing your staircase usage to two minutes a day can burn enough calories to prevent annual average weight gain. And common and frequent stair use is actually reduced to... To a reduced stroke risk and decrease in all-cause mortality. All right.

Just wanting to highlight that Healthy Housing, that active design is Category 9 of the Healthy Housing guidelines and the HUD guidance. So today I'm going to walk you through what Enterprise has learned through our pilots and our different work around active design. We've chosen to include active design in our Enterprise Green Communities criteria since 2015. And as a part of this inclusion, we've worked with developers across the country with different pilots, specifically around active design. And along with that, active design, incorporating help in the development of affordable housing. I will draw on examples of these pilots. Okay.

So, let's get into the first one. As I talk about the pilots, I'm going to speak about three different key pieces or different strategies that you can utilize to ensure that you're touching on the appropriate physical activity strategies within your development to match the needs of your residents and the first way of doing that is actually by engaging residents or community stakeholders. You'll see that theme throughout all of these examples.

One of the pilot participants we worked with said, "Residents are experts at what they're experiencing." And I think it's as simple as that. Studies illustrate that when you do engage with your community to select the strategies that you're going to utilize within your development for active design that those strategies are more likely to be utilized by residents. Additionally, you build trust with residents, and relationships with community stakeholders. And you also see that it lends credibility to the selection of strategies that you choose. And we have had developers come back to us to indicate that because they have done that community engagement, and have that data, that they've been able to receive grants to pay for some of their active design features.

So, the first development I wanted to highlight was a LGBTQ-affirming affordable housing development that focused on seniors in Seattle. And they wanted the active design elements that they incorporated to fit into the culture of the community that they were trying to build, and offer opportunities to an aging population with a varying degree of mobility. So the first thing they did was host a design charrette. And in this design charrette they were able to lift up a couple of major themes from the community stakeholders. And that included the want to incorporate character and the kind of culture that they were hoping to exhibit within their building into the active design features.

Additionally, they offer a variety of opportunities for physical activity that would lead to various mobility levels of residents. And then have opportunity to incorporate culture, art, music, and performance at the design element. So taking that feedback, they were able to design for things that met those needs. And one of those was actually incorporating an interior space for performances. And that space was connected to a stairwell, that I'll talk a little bit about in a second, that incorporated the culture of the community that was going to be living there.

A couple of additional things, they had raised beds in the exterior space, and they ensured that they had wide edges so that people could sit next to the raised beds and do the gardening, rather than having to bend over, which can be difficult on many people's backs and discourage use of these design elements that are incorporated. But to touch quickly on the staircase, this was the big element that they focused on. They realized that, in a seven story building they probably weren't going to have people use the stairs to always access their units, but they could have one feature staircase that could be incorporated into some of the arts and cultural activities that were going to take place on-site as well.

So, they decided to design this grand staircase that was kind of like overly exaggerated and would be a feature point that people would want to use, and that people would use for grand entrances when they were going to be performing as well. So moving to the next strategy, it's really around, how can you activate existing resources, community and site spaces, and local partners that are near your site? And I think that this is very applicable, whether you're building a multifamily building or single family buildings. It's really important to understand the space that's around you, the community that's around you, and how you can incorporate the building that you're focused on, to have access to those other community amenities.

I was going to lift an example from Artspace, located in Hastings, Minneapolis. It is a six story building, but they were located close to a lot of trails and one trail actually goes out to the Mississippi River. So they were really interested in seeing how they could incorporate and connect with those community spaces.

But they do not have a lot of budget to actually incorporate many additional active design elements. So through their charrette, they realized that they could use the budget item that they had incorporated in their project around art, and hiring local artists with this commitment to active design. And so they referred to this when they spoke to us as their aha! moment, and they were able to incorporate art into things like bike racks, with outdoor play equipment, and hire artists to design those features of the property, that could be used both for physical activity and to promote local artwork.

Another way that they did this was actually hiring local artists to put their art in exterior spaces, that would lead from the property to the trails that were nearby. Another example is in Brooklyn, New York, where they wanted to activate an existing stairwell. But they were limited on the types of design changes they could make due to fire codes. And so one of the things they landed on was actually having a community mural painting.

And so, they had residents participate in the process of painting murals along the stairwell, to both promote social connection, and encourage use of the existing stairs, because people were able to walk by their own artwork when they used the stairs. I thought that was a great example.

To take it into the single family space, you'll see that this is an existing sidewalk, this is a location in Atlanta, Georgia, where they utilized the space next to a sidewalk within the community to integrate a playscape for children. And then the last area that I wanted to focus on, is how you can encourage or extend use, reduce barriers and promote safety.

And I'll focus on two areas, one is really on encouraging use of outdoor spaces. I think I originally set this up so that you would start off by only seeing the playscape and the river. Because we worked with a group in Hammond, Louisiana who was planning to have a playground on site. And when they engaged with the residents, a lot of community members lifted up that there had been several drownings within their community, and they were very worried about the proximity of the playscape to the canal.

And so, the developer and the residents were able to come to a solution to that, by actually adding a natural bamboo fence that would prevent children from accessing the canal and increase use of the playscape. Other things have come up very similar to that, like not having enough lighting for the fall and spring, when you can still utilize playscapes later in the evening but when there's no lighting, people don't feel safe in doing so. Additionally, things like adding water fountains actually increases the duration that people will stay and play. Having areas to sit that are under shade. The list can go on and on, and how you can actually add to existing elements to activate places that already exist.

I think another important population to focus on are older adults. And designing for the needs and barriers that we have found with older adults. And this is both within single family residence and multifamily residence. A lot of the pictures I had were from multifamily, but a lot of the needs are the same. We'll hear time and time again from older adults that they feel isolated in their units, and are often times don't want to leave their unit for a variety of reasons. And some of that can be related to wayfinding. Lighting, not feeling comfortable with the actual type of ground or flooring that is utilized.

So, it's just really important to take all of these things into consideration, so that you're both encouraging mental health and physical activity. As you'll see, when people are navigating spaces and they have limitations, they're very aware of where benches are located, and how they're going to find their way back. So having things like clear signage, I think within multifamily there's a lot of ways that you can do that. You can have wayfinding, you can have maps, you can have murals on different levels of the building, you can allow each unit to have a place that can be personalized so that folks can recognize their door and where they're supposed to enter.

On a single family unit, similarly, offering opportunities to personalize the space so that it is very recognizable is very important. Additionally, the type of landscaped surface that's being used, both internal and external, you want to think about things like pea gravel being very difficult to navigate. You have grass which is a little bit better, and then concrete of course is a more stable surface to navigate. Lighting and the direction of the lighting, so that it's actually lighting the pathway versus. To ensure that people can feel comfortable navigating in that way, and that goes single family, multifamily as well. And then the last thing I would mention is even on the internal spaces, wood, carpet and tile, those all have a different risk for falls and trips, and that's something that older adults are aware of, and take into account when they're navigating their apartment.

There are obviously a lot of different strategies that can be incorporated in a unit or in a household to make the interior space more navigable. And we list a lot of those in our Aging in Place Design Guidelines, which are right here. So, I just wanted to reiterate that resident engagement, activating existing spaces, and reducing barriers are the three strategies I really wanted to highlight. And there are a couple of resources on the next few slides for folks who are interested in learning more. I encourage you to look through those, and once again, thanks so much.

**Ellen Tohn:**

I want to encourage folks to put in the chat any comments and questions that you have for Paul, Mary, or I, and we'll have a few minutes to do them. I don't currently see any questions there, so I have some in my back pocket, but I'm hoping we'll hear from you guys.

The last principle is Keeping It Well Maintained. And primarily we direct you to a really wonderful resource developed by the National Center for Healthy Housing, which is a Healthy Homes maintenance checklist. And we've given you the link to it here, these slides as Lael said will be emailed to you with a link within two weeks of the completion of this webinar, we anticipate.

The way that that document looks, is it gives you the areas of your home, yard and exterior, exterior roof, walls. And for each of the seasons, spring, fall, or whether it's annual, we suggest what needs to be done. This might be a great handout for you to use with your customers, clients, anyone you're doing rehab so that after you've left the rehab project that homeowner, occupant has an idea on what they're supposed to do. So this is just an example of what the two page document looks like.

So, I think it's that point I'm going to hand it back... Again, questions in the chat or the Q&A box. So Lael, do you want me to pose my questions, or do you want to go through your slides?

**Lael Holton:**

Pose your couple questions, Ellen. And if we get a couple more that come in while we're talking through those, then we can bring those up. But right now, you go right ahead.

**Ellen Tohn:**

Yeah. So Paul, I was just curious, you showed a lot of insulation stuff and these folks who are doing rehab jobs, they're not necessarily energy experts. What are the one or two things that you see done wrong all the time on insulation that if you were monitoring a rehab project you would say, "Always make sure you do a manual." Great. Insulation or air sealing, what are two pieces of advice you might give to a rehab specialist, or someone running a rehab program?

**Paul Francisco:**

So, for insulation, I would say that the two things that I would be most attentive to, one is do you really get it to be even across. Like, if you're doing attic insulation, is it even across the whole attic, or is it kind of mounded in some areas?

Because if you have places that are lower than others, you're going to lose some of the effectiveness. So you're really trying to make sure that it's fully covered. And then the other thing is, making sure that you have not got the insulation, assuming it's something like cellulose too close to things that can get hot like chimneys. You really need to have protection so that you don't cover over, or come into contact with things that could get really hot, and create a fire. Definitely not a healthy thing for a house.

In terms of air sealing, have you really filled the whole gap? And is it suitable material, so it's not going to get damaged by insects or rodents or something like that? Or by just thermal stresses, so have you used the right material, and really filled the entire gap, not just still leaving some cracks here and there.

**Ellen Tohn:**

I just have one more question, Paul, that's come in on the chat, I'm just going to read it. It says succinctly from Joanne, "In our community we have a development of a post-war single family homes where the ducts were installed under concrete on the lower level. Over time, they have deteriorated and allowed water seepage and mold growth. What's an effective way to deal with this?"

**Paul Francisco:**

Once they put ducts inside the concrete, it is really difficult to deal with that. It is not a cheap thing to deal with. It really ends up needing to be somebody going into the concrete and getting rid of the material that's had a lot of problems, and get in material that's better.

The other option would be to abandon those ducts. Seal them off in some way, and try to put ducts somewhere else. I realize that's not going to be a very happy, satisfying answer. But ducts that are within the concrete just... If they aren't done right the first time, it's going to be really difficult and it's unfortunate.

**Ellen Tohn:**

Thanks, Paul. We have one question for Mary. All right. So Mary, I'm just curious thinking about the single family context, and I was thinking about what you said about gardening and lighting and also access to open spaces. Do you have advice for if I'm doing single family rehab projects over and over again, is there anything I might want to just think about incorporating and thinking about? Resources where you can go for an easy walk in your neighborhood, or improving outdoor lighting so people might be able to make sure they don't trip and fall coming in, or thinking about whether it could be in budget to do a little raised bed on the gardening? But curious what your thoughts are on a single family or townhouse project?

**Mary Ayala:**

I think all of those ideas are great ideas, and really if... I don't mean to sound like a broken record, but if you're able to engage the residents and understand where they really put their values and the things that they're interested in, I think that can really help guide what you might want to spend your extra budget on. And that's something that we try to incorporate over and over again in our Enterprise Green Communities, is that when you can match health needs to the community or to the residents, then you're going to be using your resources a better way. So if it's resident populations even in single family or town homes that wants to garden and would be interested in that, then I think it's a great use of resources. But let's let the residents drive what they want.

**Lael Holton:**

Thank you, Ellen, Mary, Michael and Paul, for participating today, and for all of you for attending. We've got a couple of slides here to close off. One of the questions out there was that if other courses are completed through listening to recordings, do you still get credit?

Yes, and I've got a slide on that here in a moment, and you'll be able to find out how to do that. But just for a moment, I just want to highlight, we do have some select on-call direct technical assistance that's available to everyone to incorporate the Health@Home standards from the guidelines document and

everything we've discussed into your current rehab standards. It's relatively limited, but please, if you do think you'd like to have your rehab standards and specifications taken a look at, then send an email request over to [energyaction@hud.gov](mailto:energyaction@hud.gov) by October 31st in order to get that through.

And here's what I'm talking about with the recordings, you can use the stuff that's on the website linked here. This presentation will be up within about two weeks. The other webinars should already be up there, there's both the webinar presentation slides and the recording that's there for you to review. Once you've reviewed all of them, please make sure to send an email to this [communitycompasstraining@AECOM.com](mailto:communitycompasstraining@AECOM.com) that gets directly to me, and we will make sure you get credited for attendance at these sessions.

At this point in time, we have concluded our session and we have concluded our series. So we would like everyone that has gone through this with us, thank you very much. For those of you who have attended one or a couple or several, thank you for coming all along the line. And have a great afternoon, a great rest of the week, stay safe and we would love to speak to you all very soon. That concludes our session for today.