# THE RURAL INSTITUTE

Home Usability and Community Engagement

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**CRAIG RAVESLOOT:** Thank you all for joining us for a presentation on housing characters, home experiences, and community engagement of people who report impairment. I just want to acknowledge our authors and support for the research that we're going to present today. As Tracy mentioned, I'm Craig Ravesloot, and I will be presenting with Lillie Greiman and Andrew Myers from the Research and Training Center on Disability in Rural Communities. We are presenting with Bryce Ward who is the associate director of our Bureau of Business and Economic Research here at the University of Montana. We are funded both through the RTC Rural and through the RTC on community living and we’re all funded by the National Institute on Disability, Independent Living, and Rehabilitation Research.

So as all of us, I think, experience, life starts at home. At least on a daily basis that's typically where we begin it. When we think in terms of community participation, we've been looking at and thinking about how central home is to people's ability to participate in communities.

We also know by way of background that people who report experiencing an impairment, they participate less. And there's been quite a lot of qualitative research, much of it out of Great Britain, that has indicated how home experience is linked to participation, that as people have more difficult experiences within their home, they tend to participate less.

But unfortunately, there's very little quantitative research that examines this that allows us to understand perhaps that a much broader level of the impact of housing and participation.

So as we think about the background, we look to this qualitative research quite a lot and find that when you talk to people about their homes, what homes should do is it should include a place of rest ‑‑ it should be a place of rest and rejuvenation at the end of the day. Unfortunately, people with disabilities often experience the home as a series of disembodied spaces or spaces that are designed in a way that may not be attentive to their physiological and bodily needs.

If we look a little at the longitudinal research on aging and disability, we find that difficulties in the home can be experienced first in terms of completing ADLs like dressing and bathing. But the intervention research that we see that comes out of aging is primarily focused on fall and injury prevention when we are looking at modifications around a bathroom in particular. In general, though, when we talk with people about their experiences in their home, the more barriers they have in their home, the more barriers they have to just getting started in community participation.

So what we're going to do today is begin to paint a picture that we have been looking at for you by looking at, basically, three different studies that we’ve conducted here at the RTC Rural in partnership with our partners at RTC and community living. Lillie Greiman is going to first present on the state of housing access from the American Housing Survey. She will describe what that is. But that is a population‑based view of the U.S. and how accessible people's homes are.

And then Bryce is going to talk a little bit about the time use survey which is collected by the Bureau of Labor Statistics. He's going to talk about time use in the home and in the community and begin to look at how in a very large dataset we can see some associations between these things and they are moving in similar directions as we would expect from the qualitative research.

And then Andrew is going to present some primary data we collected with a survey in three different locations in the U.S. that begins to tie the two together. Some of the first quantitative evidence that we know of that begins to tie together people's experiences in their homes, in particular in their bathroom, and how much they're participating in their community. So with that as an intro, I'm going to turn it over to Lillie Greiman who is going to talk about data housing access across the United States from the 2011 American Housing Survey.

**LILLIE GREIMAN:** Alright, thank you Craig and Tracy. Can you guys hear me?

**TRACY BOEHM:** Yes.

**LILLIE GREIMAN:** Awesome. All right. So, yes, as Craig mentioned, I'm going to talk a little bit about some data that we've analyzed from the 2011 American Housing Survey. And to start, I'm going to just give a brief overview of what the American Housing Survey is. It's a survey sponsored by H.U.D., the Department of Housing and Urban Development and performed every two years by the U.S. census. It provides a current and continuous series of data on housing access across the U.S. And then for this study, specifically we're using a sample like we've mentioned from the 2011 American Housing Survey that includes households with occupants between the ages of 18 and 75.

And just a note, we can talk about this more or for future research we're doing, there is going to be a complete sample redesign ‑‑ or has been in 2015 and so the new surveys that come out won't be comparable to any past surveys. And that's important because in 2009 and 2011, the American Housing Survey introduced some disability and accessibility variables into the survey.

In 2009, the AHS included the disability indicators from the American Community Survey and these asked questions about impairment and difficulty. So, for example, do you have difficulty walking a city block or climbing a flight of stairs? Do you have difficulty seeing even when wearing glasses? We can refer people to a full list of these variables if they're interested.

Also, in 2009, an actual physical accessibility question was added to the survey that we call the NOSTEP variable which asks about presence of steps at the entrance of the unit. We will report out on some data from this variable. Just to be clear, the question ‑‑ what the question is exactly is: Outside, is it possible to enter this home or apartment without climbing up any steps or stairs? Please consider all entrances and ramps that could be used.

And then in 2011, the survey retained those two disability indicators and the NOSTEP question but added an additional module that was called the housing modification module. And this included a variety of questions around the use of mobility equipment, functional limitations, and then also some specific questions around accessibility features within the home. And those specifically for this study, we're going to be looking at the mobility equipment use and accessibility features.

So just to give a basic overview, we were wondering, you know, how accessible is housing across the U.S.? And it was something that was very exciting that we could do with this study. So this table shows ‑‑ compares groups, compares households that have members who use mobility equipment versus households that do not have household members that use mobility equipment. And mobility equipment is defined as using a cane, a crutch, a manual wheelchair, a power wheelchair, or a scooter.

Perhaps not surprisingly, there are much higher rates of inaccessible housing. This table is looking at lack of accessible features or rates of inaccessibility. And you see higher rates of inaccessibility for households that do not have someone who uses mobility equipment. But nonetheless, we still see some very high rates for the households that do use mobility equipment, specifically around that NOSTEP entrance question. We see 57% of these households have a stepped entrance.

71% ‑‑ this number is quite shocking to us. These are individuals in households who have mobility equipment who live in apartments above the first floor that do not have access to an elevator. 71% of individuals do not have access to an elevator.

And then specifically also for this study, we're seeing 62% of these households do not have grab bars in the bathroom. We also see high rates around inaccessible kitchens and inaccessible bathrooms and also some lacking an entry‑level bathroom or bedroom. We'll talk about those specifically a little further too and some limitations around those variables.

So moving on a little bit from just a comparison between households with individuals using a mobility device and households without an individual using a mobility device ‑‑ sorry, it's a bit of a mouthful talking about this -- we’re going to look just at the rate of inaccessible housing comparing urban and rural areas just of those households who have individuals that use mobility equipment.

So what we see is that in general we have higher rates of inaccessible housing in urban areas with a very notable exception of that elevator question again, that in rural areas we have 91% of people who are living above the first floor of an apartment don't have access to an elevator, which is a pretty shocking number. Just to go back really quick to this previous slide, that 71% that don't have access to an elevator, that represents about 600,000 households. So we're talking about a very substantial number.

I also want to note that though across the board we're seeing kind of higher rates of inaccessibility in urban areas, we're still seeing higher rates of inaccessibility overall across all of these variables, the no entry level bathroom, no entry‑level bedroom, inaccessible bathrooms, stepped entrances, lack of grab bars in bathrooms, inaccessible kitchens. We're seeing well over 50% of households in both rural and urban not having access ‑‑ these accessible features within their homes.

Moving on, we've also done a little bit of a regional comparison also looking at urban and rural areas. And this is specifically looking at the rate of stepped entrances. So having a step to enter or exit your home, either if that's just one or two steps, or a flight of stairs. We don't see a huge amount of regional variation except for in the south, we do see higher rates of stepped entrances in rural areas compared to the northeast where we have slightly higher rates in urban areas. So we see a little urban & rural variation particularly in the northeast and in the south.

And then a similar analysis looking specifically at the presence or the lack of, I mean, grab bars in the bathroom ‑‑ and, again, this is just with households with individuals using a mobility device. Again, we actually see here in general higher rates of inaccessibility in the Midwest, south, and west with the northeast then seeing that switched a little with 64% of housing not having grab bars in the bathroom in rural areas versus 58 in urban areas. But, again, we're not seeing ‑‑ it's not a huge amount of variation, and there are some limitations to exploring this data which I'm going to get into right now.

So when ‑‑ I didn't emphasize too much some of those features early on in the table, specifically the accessible bathroom and accessible kitchen because I think we've identified some limitations around the definition of "accessible" within the survey. The survey doesn't provide any objective measurement for accessibility. For example, there's no specifying of a 32‑inch‑wide doorway or outlets being 15 inches off the floor. There's no comparison that the questions provide. And there was, in fact, some cognitive testing done of these variables and what we saw was that many respondents reported that aspects of their homes could possibly be utilized by those in a wheelchair and resulted in over report of wheelchair accessibility features. This cognitive testing was done by DeMaio and Freidus. We can get that citation to someone if anyone is interested, as well.

I think this is interesting because the numbers essentially that we're reporting could then be low if we're seeing an over report of wheelchair accessibility features. Mostly this is because the question asks: Do you have a wheelchair‑accessible kitchen or a wheelchair‑accessible bathroom? And as there is no objective measurement or comparison for that, folks will say, yeah, sure. I'm sure that it is and can lead to some of this over reporting.

So our numbers of this could, in fact, be low, and I think that's especially probably true for those numbers of households that are reporting ‑‑ households that do not have someone who has a mobility‑impaired individual within them precisely because of that lack of awareness around what accessibility is, what someone may or may not need within their home.

Additionally there are some major limitations around the rural and urban data that we're reporting. Specifically, that there are inconsistent definitions of what is "rural" and what is "urban." These Office of Management and Budget definitions that define metropolitan and non‑metropolitan areas, different units are assigned ‑‑ or were assigned rural/urban designation depending on when they came into the survey. They're following specific OMB definitions. So we have definitions from 1980, 1990, and 2000 and they are all used in there and it creates some really inconsistent data as we know that rural and urban categories and characterizations change quite a bit over the years and certainly have since 1980.

Also, a vast majority of this data is for urban areas and so we are a little limited. There's still limited data available for rural. This could improve in the 2015 redesign. I think that there will likely still be a majority urban data, but I look forward to having some consistent definitions around rural and urban and it's something we hope to explore further.

However, this housing home modification module that specifically asks about accessibility questions will not be in the 2015 AHS. The NOSTEP variable and the disability indicators will be. However, they do think that they will bring the housing modification module back into the survey in the future. So we won't be able to compare data to these results. We will be able to explore it again further.

So just a couple conclusions and some implications. I think what's clear is that a large proportion of people with mobility impairments or people specifically for this study individuals who use mobility equipment live in homes that don't meet their needs. We do see some rural, urban, and regional variation in housing accessibility. Again, though, I think some of that data needs to be taken with a grain of salt in light of those limitations. Also we have significant numbers of households with individuals with mobility impairments that have steps or even a flight of stairs at their home entrance.

Finally, over half of households with individuals with mobility impairments do not have grab bars in their bathrooms. We're going to explore some of these ‑‑ the potential implications of these findings in the next couple presentations. But I think I can say the overall take‑away from our analysis of the American Housing Survey is that, in fact, the state of housing for people with disabilities is not good.

So with that, I believe I'm going to turn it over ‑‑ or no, I'm going to open it up for some questions. So we have some ‑‑ I think a couple minutes for some questions if anyone has them. And I see that I have one about the data accessible through the census site. You can find some American Housing Survey data on the American Fact Finder. And we can maybe send out some of this stuff when we post the recording or something. I can get with Tracy about that. You can access it. That's probably the easiest way to access the American Housing Survey data. This data is publicly available but you do need a statistical software of some sort to analyze it and it can be fairly complicated. I would recommend playing around with the American Fact Finder which is just through the census website.

**CRAIG RAVESLOOT:** Lillie this is Craig, I think given the time, we will just take that one question and then move on to Bryce's presentation. But if there are other questions from Lillie's presentation, please feel free to send us those as well. With that, we will move on to Dr. Ward's presentation on time use.

**LILLIE GREIMAN:** Thanks, Craig.

**BRYCE WARD:** All right. So as Lillie just talked about many people with impairments live in houses that are fairly inaccessible. So now we want to start trying to build a link between that inaccessibility and what people do with their lives and their overall well‑being. So I'm going to talk to you about what people with disabilities do, particularly with what they do at home relative to people who don't have impairments.

It's not hard to see how you can get to a hypothesis if you live in an inaccessible home. As an economist, I will just speak economics. That raises the cost of doing various activities and, therefore, we would expect people with impairments to do fewer activities at their home than they would otherwise do if they lived in a more accessible home. Now, I'm not going to directly build the link between housing and time use because in the time use data we don't have the housing characteristics. But we can begin to see plausible pathways by looking at time use data to see, okay, what is it people with impairments do less of than people without impairments. And is that consistent with the hypothesis that their homes may be a source of some part of the barrier or some part of the reason why they spend less time in certain activities?

To do that, we're going to look at the American Time Use Survey. This is an extension of the current population survey which is done by the Bureau of Labor Statistics and where things like the unemployment rate come from. In particular, we're going to use the year 2008 to 2014 because those are the years in which the impairment question was included. So we have 87,000 different people and 2800 of whom who have reported a mobility impairment at the time of their survey. And a time use survey asks three big questions: Kind of a day diary format. It, basically, says recall yesterday and, you know, it goes throughout the day in kind of five‑minute intervals saying what were you doing, where were you, how long did you do this for. Plus ‑‑ we will see these for a few analyses. In three years, they also added what they called the well‑being module where they asked for three randomly selected activities, how are you feeling, pain, happiness, sadness, tiredness, et cetera, during that activity.

And in particular, what we are going to compare people with mobility impairments, their time use, people without mobility impairments, as you probably understand, people with mobility impairments differ significantly than the general population. For instance, 90% of them are out of the labor force. 74% of them don't report living with a spouse or partner. They're older. They're more female. So to do this analysis in a way that gives it a little bit of meaning, we're going to do this in the framework where we're going to control for person characteristics, family characteristics, location, regional characteristics, and when during the year and during the week did you do your time diary.

So for those of you who like to do empirical work, because our dependent measures, the number of minutes that you report doing this or whether you did this are skewed with lots of zeros, we do this in generalized linear method with a poisson distribution because we have count data with lots of zero.

So overall what do we find? This is just the big picture in terms of the biggest categories of activities. What do people with mobility impairments report doing less of relative to people who don't report mobility impairments controlling for the various things that I just discussed? And the quick, easy way to interpret this chart is ‑‑ so the red line, if the dot is at the red line,that means that people with mobility impairment report doing essentially the same amount of these things or doing them at the same rate. To the left of the line, they report doing less of it. To the right of the line, they report doing more of it.

You see for most things people with mobility impairment report doing less of it. And the things that they report doing more of, personal care and leisure and sports, are essentially, that's sleeping and watching TV. That's, basically, what those two categories are predominantly made up of. But they report pretty much doing less of everything else except for eating and drinking which perhaps, unsurprisingly, they report spending about the same amount of time doing.

Now zooming into what we do at home, in particular, what we call household activities, housework‑type stuff, people without mobility impairments report spending 50% more time or 47 minutes per day on household activities than people with mobility impairments. And this applies to every single subcategory of household activities, you know, people with mobility impairments are substantially less likely to do kind of maintenance and repair stuff, substantially less likely to do lawn and garden care, to leave the house for anything related to household activities. They're also fairly less likely to do housework, food prep, and even household management. So, again, this is a relatively consistent with the story that housing matters. These are the things you do around the house and they report spending less time doing them.

Now, is this because of their impairment or is this because of their house? We can't separate that out. At least it's consistent with the notion that people find it difficult to interact and do things around the house.

Also, consistent with this is we use the well‑being module and we say, okay, for the people for whom we see the well‑being questions asked when you're doing household activities, do your report increases in pain, fatigue, stress, happiness or meaning around doing household activities? And so we can put this in a regression framework. Essentially what we're going to do here is compare people to themselves for the other three activities ‑‑ the two activities they report. So essentially, you know, on average, I report doing household activities versus something else, how much does my overall report of pain, fatigue, stress, happiness, or meaning change when I'm doing household activities? And the top line, that, basically, reports the change for people without mobility impairments, right? For people without mobility impairments we see a .06 standard deviation increase in pain, a .07 standard deviation increase in fatigue, .17 decrease in happiness, and .09 decrease in meaning. For a non‑impaired person, doing household activities it's slightly painful and slightly tiring and not associated with a lot of happiness or meaning.

Going down to the bottom category where we have the household activities times mobility impairment, essentially we're going to do an interaction term. This represents the change relative to the people without impairments in terms of what people with mobility impairments experience, right? So, for instance, with pain, people with mobility impairment have an additional .07 standard deviation increase in pain. So you add that to the top row and so for a person with mobility impairments, you get a .13 standard deviation increase in pain when we're doing household activities, .15 increase in fatigue. But interestingly, doing household activities makes them slightly more happy, although that’s not statically robust. But it is reported within an actual increase in meaning. So, kind of the overall picture is, again, consistent with the notion that doing things around the home is more costly for people with mobility impairments. They report higher pain and fatigue, but interestingly it also is associated with greater meaning and potentially more happiness.

So now let's get into another area of things that we do at home which is kind of personal care activities or resting, so I'm going to add some other low exertion things that people tend to do around the home. If you look at this, it kind of looks like, okay, people with mobility impairments spend about 10% more time in total on kind of personal care activities and 15% more time on resting. So essentially you're getting a little bit of additional time in health‑related self‑care and resting which is mostly TV and sleep. But they're slightly less likely to spend time grooming. This overall average, though, masks some interesting, underlying findings, which is people with mobility impairments are less likely to report any time spent grooming but when they do report grooming ‑‑ so conditional on saying that was my primary activity at some point in the day, they spent a longer average time.

If we focus just on people outside of the labor force to kind of narrow our comparison. 73% of people without a mobility impairment report spending at least some time with grooming as a primary activity during the day. Only 64% of people with mobility impairments report spending some time grooming during the day. However, conditional on reporting spending time grooming, those out of the labor force who report no mobility impairment report a total of 51 minutes in kind of washing, dressing, and grooming. Whereas people with mobility impairments report spending 58 minutes washing, dressing, grooming. Essentially if you average this out across the whole year, if these are representative averages, the total amount of time spent washing and grooming is the same. But the allocation of it across days is different. People with mobility impairments report spending, you know ‑‑ doing washing, dressing and grooming on fewer days but it takes them longer.

Also, consistent with the notion that houses matter, people with mobility impairments are less likely to report leaving the house. Again, so focusing on the people out of the labor force. 77% of those outside of labor force report that they leave the house on diary days. Only half of people with mobility impairments report leaving the house on a given day. They are also less likely to report spending time in kind of meaningful social and recreational activities. 61% of people outside of the labor force with no mobility impairment reports spending some ‑‑ at least some time in social recreational activities on their diary day. Whereas only 48% of people with mobility impairments do. Again, consistent with the notion it's more difficult for them to leave the house.

Putting it all together, it's easy to see that ‑‑ you know, I think most of us recognize that, you know, washing, dressing, and grooming are complementary. They go right along with leaving the house and engaging in social and recreational activities. And consistent with this, we see the vast majority of people who leave the house or engage in social and recreational activities report that they spend some time grooming. So, again, focusing on those outside of the labor force. Only 22% of those without mobility impairment report leaving the house without spending some time in washing, dressing and grooming. And 21% report engaging in social and recreational activities on a day in which they didn’t report any grooming time.

The numbers are slightly higher for those with mobility impairments, suggesting that they're more willing to go out and engage in these activities without reporting time dressing, washing and grooming. Again, the vast majority of people report that they spend time washing, dressing and grooming before they leave the house or engage in social recreational activities.

So what does this all mean? So these facts are consistent with but not definitive proof of a very simple economic story which is that people have a certain capacity to do things, i.e., effort is scarce. Every activity has an effort price, and that effort price is the function of both my personal characteristics, what are my physical limitations, but also environmental characteristics, right? People with mobility impairments may have less capacity for effort and may have higher prices for activities.

So we see them engaging in more time resting and watching TV and sleeping and less time engaged in activities, particularly those with high effort prices like leaving the house or engaging in household activities, right? Therefore, to increase activity and participation amongst people with impairment, we need to increase capacity or lower prices. This may be done through both changing the person but it also may be done through changing the environment, i.e., the home. And with that, I will open it up for any questions.

**CRAIG RAVESLOOT:** Thank you, Bryce. This is Craig. At this point, I'm not seeing any questions coming up. So I think that what we can do is just move on to Andrew's presentation next.

But before doing that, I just want to highlight briefly that the American Housing Survey and the American Time Use Survey are both large surveys that capture many, many people. So what we see is what we might expect, many households that have people with mobility impairments have some significant access problems. And that even when we look at something like the bathroom, you talk with people that work a lot with people with mobility impairments in the bathroom often provides challenges. The American Time Use Survey begins to connect the dots that perhaps how much time I spend dressing and bathing and how many minutes that takes me, those are kind of indications of that effort that Bryce is talking about.

So we're beginning to build a case for this. But there's no dataset ‑‑ no large national dataset that puts the two together. What Andrew is going to do is talk a little bit about if we ask people about couple of these of these things together, meaning what their experience in the bathroom, what do we find in terms of participation. So while this is a much smaller set of people, it's a set of folks that we collected data from across the country. I will let Andrew introduce that.

So, Andrew, thank you very much.

**Andrew Myers:** Thank you, Craig. This is Andrew. Can everyone hear me all right?

**CRAIG RAVESLOOT:** We hear you great, Andrew.

**Andrew Myers:** Awesome. We often think of the home as a place should be safe and secure, a place of rest and relaxation where we recharge our bodies and minds. However, as Craig and Lillie have shown, the general design of homes is not well‑suited to needs and abilities of people with mobility impairments. We also know from Bryce's analysis that people with mobility impairments spend much less time bathing and grooming and engaged in social activities. So as Craig mentioned in this section, we begin to bring these elements together to explore how experiences in the home are linked to community with two guiding questions: How much do people with mobility impairments exert themselves in the home? And how does exertion relate to community engagement?

So to explore these questions, we developed a self‑report survey with input from a team of center for independent living which we refer to as CILs, advisors from there to assess home usability, health, and community participation. This survey included some basic demographics such as age, sex, education, income, among others. Some descriptive characteristics of the home which we will get to shortly. We also measured exertion within the home using the BORG exertion scale which was measured as a percent of maximum exertion. We also will be looking at the number of social and recreational activities reported in the last seven days. This survey included a number of other measures as well, but these will be the ones we're going to focus on in this presentation.

So we used a random sample of approximately 2500 addresses and zip codes surrounding local CILs to look at home usability in three urban communities. There were 33 zip codes from Atlanta, Georgia. 25 zips from Fresno, California. And 30 from Indianapolis, Indiana. We used Dillman's methods to send out these surveys. This involved sending postcards to random addresses and asking if someone in the household could answer yes to at least one of the six ACS impairment questions, which I will get to soon, and would be willing to complete the survey. If they responded yes, we would send a survey along with a small cash incentive. And we also would follow up with reminder letters and extra surveys if needed.

We have so far collected 170 surveys. Here we're looking at some basic sample demographics. 62% female, mean age of 60 with a range of 23 to 95. 62% white, 25% African American, 13% Hispanic/Latino, 5% Asian, 3% American Indian, and 6% other.

Looking at education, many people ‑‑ 36% had college and only 22% bachelors or higher. 81% are not employed. And 57% have a household income of less than $20,000. So we're talking about a fairly poor population here.

Looking at impairment and health, as I mentioned some of these come from the American Community Survey which Bryce touched on earlier. So that sort of gives us some comparison across different datasets. 69% say they have some type of walking difficulty, errand difficulty 45%, people who have difficulty doing errands such as visiting the doctor's office or shopping, 38% people have a dressing difficulty, which is bathing or dressing, 36% have a memory difficulty which is difficulty concentrating, remembering, or make decisions.

27% have a grasping difficulty, 22% have a hearing difficulty and 17% have a vision. And only 15% in this sample have no impairment. And that's not representative of the larger community because we're selecting from people who had already indicated having some type of impairment from the postcard.

Looking at equipment, 40% use a cane which is by far the largest group, 27% use a walker. 15% use a manual wheelchair and 14% use a brace. There were a number of other equipment uses as well, but these are just the more prevalent ones.

Looking at health, this is a rating of perceived health. So it's 33% say they perceive their health as very good and 39% as fair. So the perceived health is not super great but it's not incredibly terrible either.

This is graph showing the percent of maximum exertion by activity for people with a mobility impairment in orange bars and people without a mobility impairment in blue bars. People with mobility impairments report higher level of exertion in every activity throughout the home. You may also notice that cleaning and bathing appear to be the most demanding tasks, this is especially true for bathing where people with a mobility impairment report using 34% of max exertion which is over three times more than people without.

So let's take a closer look at what's going on in the bathroom.

Can he everyone hear me okay? I'm getting some messages about sound.

**CRAIG RAVESLOOT:** You're good. Just keep talking into the mic.

**ANDREW MYERS:** Okay. So this is a chart of the percentage of people who reported having the specified bathroom characteristic. These data indicate that most people have really basic access and use of their bathroom. 97% of people with a mobility impairment can enter the bathroom. 90% can open and close a bathroom door. 95% can use the sink. For people with no mobility, those numbers are only slightly higher. So not a whole lot of difference going on there.

But we start to see some larger differences when it comes to using the toilet and the shower. Only 72% of people with a mobility impairment can get in and out of the shower, comparing that to 93% of people without a mobility impairment. 50% of people with a mobility impairment need shower bars and 41% reported needing toilet grab bars. And so grab bars are really a common assistive equipment which is used in the bathroom. Let's take a closer look at how grab bars and exertion may be related to each other.

This graph shows the percent of maximum exertion for people who need shower bars versus people who do not, both for people and without mobility impairment. For people with a mobility impairment who need shower bars, they report almost 40% of maximum exertion while bathing. By contrast, those who do not need shower bars but also have a mobility impairment report on average about half as much at 19% of max. So not having but needing grab bars in the bathroom could be one explanation for these higher rates of exertion by individuals with mobility impairment.

But one of the important questions here is does this matter? Is exertion related to other aspects of daily life? And if so, how?

This table shows the results of a GLM regression analysis of bathing exertion on social and recreational activities. There's a lot of information going on in this slide and I'm sure Bryce would love to answer any technical questions you may have. But the story is actually fairly simple. It shows that a one standard deviation increase in exertion is associated with a 35% decrease in the likelihood that an individual reported engaging in any social or recreational activity during the prior week. The only control that was statistically significant was mobility impairment. And without controls, there is a 61% decrease in social and recreational activities for each standard deviation increase in bathing exertion.

So to wrap up a little bit on this section, just some ‑‑ just a quick summary on the three major points here, are that people with mobility impairments exert themselves in the home more than people without mobility impairments across all home activities. Exertion while bathing is apparently related to perceived need for shower bars and the level of exertion bathing is also related to the number of social and recreational activities.

And so with that, I can go ahead and open any questions that anyone may have if we have time.

**CRAIG RAVESLOOT:** I don't see anything specific coming up, Andrew, for your presentation. So I think what we will do is continue on and wrap up and then open up for any questions that may come up for the end of our presentation here.

So just by way of summary, I think the story that we're beginning to see emerge ‑‑ this isn't something that we can really say is proven at this point because we're looking at different datasets, but we're looking at evidence that all seems to be pointing in the same direction which is that many people live in homes that are not accessible. That's widely acknowledged and understood, especially among the independent living and disability community.

We also then know from the time use survey that people spend their time differently as we might expect and differently within their home, that they're spending less time doing household activities and, in fact, when they are doing things in their household, those things are actually related to a higher level of meaning than what is experienced by people without mobility impairments. I think that's an important finding.

But overall they're less likely to bathe. And associated with that, they spend less time outside the home than people without mobility impairments. That's kind of our kind of conceptual link. So that when we got to asking people directly with our survey about how difficult are these things within your home, as the time use survey might suggest, most things are more difficult. People experience them as taking more effort or they exert themselves more within their home. And when we get to the bathroom, we find that, in fact, how much they're exerting themselves in the bathroom is linked to how much they're engaging in social and recreational activities.

So that's kind of the story we're beginning to put together. We are hoping to get additional funding so we can unpack this a little bit further and really come to some more firm conclusions about the relationship between these kinds of things. So with that, I see a couple of questions emerging here. And so I'll go ahead and read those.

Here's a question for you, Andrew. And that is: How do levels of exertion compare between all people who desire shower bars compared between those who have them versus those who do not?

**ANDREW MYERS:** Catherine, are you looking for this slide right here?

**CRAIG RAVESLOOT:** I think her question is more specifically about those who say they need shower bars, how does exertion compare? Versus those who do not say they need shower bars. I think, Andrew, that's what this slide is presenting, if I understand Catherine's question.

**ANDREW MYERS:** Yeah.

**CRAIG RAVESLOOT:** Catherine, maybe you can follow up -- we're not quite getting it.

And then another question ‑‑ I'm just going to move on to ‑‑ comes from Bob Liston who asks: How can this information be used at the local level from a policy perspective? It's a great question. From my perspective, we're presenting this information today to let folks know kind of what we're seeing emerging. When I start to think about kind of the practice or policy implications, for me I like to see a little firmer connection. But let's just for the moment say that when we are able to tighten this up a little bit with the more controlled study, that we find that, in fact, this is the real deal, that people are participating more when they have better bathroom access. I think that from a research perspective, we would like to be looking at other outcomes that may be of interest. And we suspect that might include things like health outcomes or secondary condition outcomes.

So from research we've done in health and independent living, when people are participating more, they tend to report better health. And that seems to be ‑‑ that seems to be something that we can see causally so when their health improves, they participate more. And it probably moves back on itself.

So from a policy perspective, if we are able to tie this together a little bit better, I think what we can say is making those home modifications matter is not just for convenience. This matters overall. And probably part of the price that we are paying socially for the healthcare people who have mobility impairments are related to the fact we don't have them in the right places. Their homes are not facilitating community access and a more active lifestyle, such that -- it would probably be enormously cost effective for us to do something about that. So that's where we would like to take this, but I don't know that we're quite there yet to be able to say that.

**LILLIE GREIMAN:** Craig this is Lillie. I think I can address Catherine's question really quickly. Can you hear?

Mostly, Catherine ‑‑ we'll share a link to some of this information, too. We have some more detailed about these results online, and we'll share it out as a follow‑up to the Webinar for those ‑‑ for everyone else on the line. But we do have ‑‑ we do see that ‑‑ so across individuals reporting impairment and no mobility impairment, we see higher levels of exertion in both those groups for folks who need ‑‑ say they need grab bars. But the levels of exertion are considerably higher for people with mobility impairments. And actually this is on a poster on the outside in the hallway. We'll share this for everyone who can't see the poster outside in the hallway of our offices. We'll share the link for everyone. I just wanted to say I think we can get ‑‑ we can go into a little more detail in some of our write-up online as well.

**CRAIG RAVESLOOT:** Great, thanks Lillie.

A question from Glen White. Bryce mentioned pain, fatigue, and stress as factors affecting engagement. What are your thoughts about depression as a possible co‑variate? And so looking back at that information that Bryce presented, an indicator of that that might be consistent with I think the hypothesis you are suggesting Glen is the tired feature. The pain, fatigue, depression we know tend to go together. Depression is not something collective in that well‑being module but tired is. So it's a pretty fair hypothesis that depression is playing a role in this, whether it's a direct role or how that's functioning -- we've got other work that we've looked at using ecological momentary assessment that's beginning to unpack how that occurs. But I think that's a little outside of what we're talking about today. But I think it's a fair hypothesis that pain, depression, and fatigue are going together in this and understand how that affects participation and how the experience of one affects another, that's a piece that we'd sure like to get to help individuals with disabilities and practitioners understand how pain, depression, and fatigue are affecting participation and how those three in time co‑vary together.

And then another question here: Is there a role for homebuilders and remodelers to proactively play in improving home environments?

**LILLIE GREIMAN:**  I can maybe address this a little bit.

**CRAIG RAVESLOOT:** That's certainly an issue. And I would think others would bring in the architects and people who do the design of buildings.

Sadly, I think that homebuilders have been keen toward fancy trends and what people like in terms of homes with front porches and steps and those kind of things. But I think that from a policy perspective, it would sure be good to see some of this kind of data being put into that discussion so that these homebuilders are seeing the effects and can sell homes on the basis of visitability and usability rather than just potentially design and those kinds of things. That's just off the top of my head.

**BRYCE WARD:** I would add that its market driven. These are demand‑driven things. Either you have got to change how people think about what homes they want to buy or you have got to at the policy level make it so that building codes force people to do more on these things.

**CRAIG RAVESLOOT:** Okay. I have another question that's come up from Anna Jones. Occupational therapists are also very skilled in home assessments and making recommendations to promote independence in the home.

Yeah, absolutely. We presented this information at the national association of research ‑‑ rehabilitation research and training centers earlier this year. One of the participants there, Roger Smith, really highlighted that these kinds of data are really needed by occupational therapists to build a case for more funding for that kind of home assessment and for helping people to make their homes very useful. That's a really good point, Anna. I appreciate your being with us today and raising that point for us.

**LILLIE GREIMAN:** I just have one quick comment I wanted to make about homebuilders and connect it previously to the comment that Bob Liston made about how this can have an impact more locally. So a lot of this, yes, it's based on regulation. The vast majority of the housing are single family homes which aren't impacted by a lot of current policy around fair housing and other things. And a lot of times those building codes are mandated a lot at the local level. So that would be maybe where there would be some chance for advocacy around some of these issues. Unfortunately, we can't get super local with the data. We could kind of start to look regionally.

But I would say that there's some efforts that can be done at the local level working with building associations and cities and local governments and things.

**CRAIG RAVESLOOT:** Thanks, Lillie.

Just a couple other comments and then it looks like we're coming to the top of the hour. One is by Martin Blair who comments that it seems this data has strong implications for aging in place initiatives. And so we would completely agree with that. As mobility impairments is certainly going up significantly with age, getting people into the right places as they're aging, if they age into mobility impairment, which not everybody does, that has strong implications.

And then Sarah Halstead has indicated poor populations rarely know where the resources are to make their homes more accessible. That's absolutely true as well and we were doing some work in that area and hope to get additional funding to look at the effectiveness or the implication of a home usability survey or home usability intervention for improving participation outcomes. So we think that if we can help do some relatively simple things including some bathroom interventions we can probably detect the effect on participation given consistency across some other variables. So we are hoping to derive some funding to look at that too. So we appreciate the comments.

She also notes that rural building codes are very difficult to enforce. That's absolutely true as well. In fact, a lot of rural places don't even have anything besides electrical building codes in terms of how things are monitored in rural areas.

All right. Tracy?

**TRACY BOEHM:** Hi. Thanks, everyone. This is Tracy again. There are a couple of other questions coming through, but we are at the top of the hour. You can still submit those questions, and we can certainly follow up with you personally if you want to. Otherwise, to respect people's time, we will officially say that you are free to dismiss yourself from this Webinar. But we really thank you for your participation, and we look forward to staying in connection with all of you as this work progresses further. And we're happy to answer any questions or provide any technical assistance as requested from all of you.

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