

# Public toilets for accessible and inclusive cities: disability, design and maintenance from the perspective of wheelchair users

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## Abstract

Design policy and regulations within our cities can significantly impact the accessibility and the social participation of people with disability. Whilst public, wheelchair-accessible bathrooms are highly regulated spaces for this reason, very little is known about how wheelchair users use them or what wheelchair users think of current design standards. This pioneering inquiry adopts an embodied approach to uncover the perspectives of powered and manual wheelchair users on public bathroom usage and design. The study encompasses twelve interviews, delving into how participants utilise accessible bathrooms based on mobility disability, support levels, wheelchair types, urinary/bowel regimes, and catheter use. A thorough analysis of individual bathroom elements (layout, toilet, handwashing, grab rails) reveals themes of safety, hygiene, planning/avoidance, and privacy and dignity. Strikingly, many wheelchair users invest significant effort in planning for bathroom use or avoid public bathrooms altogether. The ongoing maintenance and regular cleaning of bathrooms, something not captured in regulatory standards, has been highlighted as critical to the ongoing accessibility and safety of public bathrooms for wheelchair users. This points to a relationship between the design and the maintenance of public bathrooms as influencers of health, well-being, community inclusion, and the social participation of people with disabilities. The research aims to inform design regulations, standards development, and practices of designers, architects, facilities managers, developers, and planners — ensuring public spaces are designed to support more inclusive and socially sustainable cities. The findings can potentially drive innovative and inclusive approaches to bathroom design regulations that include operational and maintenance guidance.

# Introduction

## Background and rationale for the study

Design decisions within our built environments can include or exclude the people for whom a product or environment has been designed. Bathrooms are an example of a space where the influence of design can be acutely felt as exclusionary. Research undertaken by Wiseman (2019) clearly articulates the links between toilets, bodies, and citizenship in work that explores 'toiletsapes' and how they exclude people with disability in myriad ways. This research focuses on embodied explorations of toilet/bathroom experiences, describing how Australian wheelchair users experience accessible bathrooms in public areas. The designed elements are explored as implemented in current Australian accessible bathroom standards to enable the consideration of actual use preferences and the diversity of lived experience of people who use wheelchairs (both manual and powered).

Whilst this paper focuses on the design of accessible bathrooms that are designed and constructed according to Australian construction codes and legislation, the study has global relevance given the recognition of the social model understandings of disability in other nation-states despite differing legislation, construction codes or standards. Globally, the United Nations (2006) enacted the Convention on the Rights of Persons with Disabilities which, as of March 2024, has 164 signatories. The CRPD is founded upon a social model approach to disability that recognises that it is not a person's impairment that disables their social participation. Rather, it is the structural and attitudinal ways that society is organised that create a "disabling" environment and attitudes, compounded by a person's impairment (Oliver, 1990).

Central to this research is the recognition of embodied approaches to social understandings of disability. More recent extensions of social models include social relational models of disability and have been influenced by feminist critiques (Thomas, 1999; Thomas, 2004; Wiseman, 2019). These developments consider not just structural but also the "impairment effects" where the variables of disability type, support needs, and assistive technology (in this case, wheelchairs) are seen in the context of an individual's "impairment effects". For example, while individuals in this study may have a similar disability type, levels of support needs and use of manual/electric wheelchairs, their individual embodied impairment effects should be considered when investigating how they use/approach/avoid public bathrooms.

Embodied inquiry is an approach to research that privileges the lived, embodied experiences of the researcher and research participants. In embodied inquiry, the body is seen as something "*through which we experience the world*" (Leigh and Brown, 2021, p.8). Embodied approaches to disability-related research recognise the individual lived experiences of people with disability as variables of disability type, support needs, and assistive technology (in this case, wheelchairs). Of significance to the research documented in this paper is that people not only experience different disabilities differently, they can experience what is often seen as "the same" disability differently (Imrie, 2004). People's experiences, approaches, problems, and solutions will vary across gender, age, and other intersectionalities (Värlander, 2012).

It is important to study bathrooms in embodied ways for several reasons. Bathrooms are places where self-care activities take place, and the ability to perform self-care tasks safely and easily in a hygienic setting is valued as a foundation Activity of Daily Life (ADL) and linked to health-related quality of life (Mlinac and Feng, 2016; Carnemolla and Bridge, 2019). There is established evidence that bathroom design is linked directly to independence, autonomy, wellbeing, and social participation (Carnemolla and Bridge, 2019; Carnemolla and Bridge, 2014; Darcy *et al.*, 2022). Spaces where toileting, handwashing, and showering take place, particularly public settings, have been under increased scrutiny in terms of their performance and design —especially given the COVID-19 pandemic that started in 2020 (Ding *et al.*, 2021). Public bathrooms, designed to be accessible for people across diverse mobilities, are highly regulated spaces governed by construction codes and standards for access and mobility that differ between countries, albeit with a global organisational presence (e.g. International Standards Organization). The evidence and data that these standards and codes are based upon have been critiqued and challenged (Caple *et al.*, 2014; Sanford and Bosch, 2013; Sanford and Remillard, 2021; Lee *et al.*, 2018).

### Policy & Standards Setting

Many developed countries have implemented accessibility standards and regulations to ensure that public buildings, including bathrooms, are accessible to people with disabilities (for example, Sweden, Italy, UK, Australia and Japan). These accessibility standards pre-date but now are typically designed to comply with the United Nations Convention on the Rights of Persons with Disabilities (CRPD) international agreement, which advocates for equal access and inclusion for individuals with disabilities. Accessibility to the built environment is required by Article 9 of the United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006). Article 9 (2) (a) highlights that one important way of making the built environment accessible is to “develop, promulgate, and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public.” In Europe and Australia, ensuring accessibility of the built environment is a key feature of the commitments made in the European Disability Strategy (2010-2020) (European Commission, 2010) and the Australian National Disability Strategy 2010-2020 (Department of Social Services, 2010) and Australian Disability Strategy 2021-2030 (Department of Social Services, 2020).

In Australia, where this research is undertaken, accessible bathrooms are governed by Disability (Access to Premises – Buildings) Standard AS/NZS 1428.1 (Standards Australia International, 2021). This is a standard referenced within the National Construction Code (Australian Building Codes Board, 2022) for public spaces – and referred to across many design guidelines in a range of built environment settings, including the National Disability Insurance Scheme (NDIS) Specialist Disability Accommodation Design Standard (NDIS, 2019). The evidence and anthropometric data upon which the current standard is based have been called into question or identified as non-existent (Department of Industry Science Energy and Resources, 2021; People with Disability Australia, 2015). The provenance of the data and decision-making about dimensions is not made public by the standards committees.

A consequence of accessible public bathrooms being such highly regulated spaces with design standards stipulating toilet and accessory position, dimension, and design to within tolerances of a millimetre is that they become ubiquitous, and the design becomes

universally unchallenged. Attached to this ubiquity of design is the assumption that wheelchair users use bathrooms in the same way. At the core of this research paper is the understanding that wheelchair users as a collective group are extremely diverse in how they select, use, prefer, or avoid using bathroom spaces. This research sets out to explore how diverse the preferences of use in public bathrooms are and what influences these preferences.

## Research objectives and significance

This research provides a deeper understanding of the suitability and performance of public accessible bathrooms and their accompanying design standards according to wheelchair users. Publicly accessible bathrooms are understood to be bathrooms containing toilets, as well as handwashing and drying equipment, installed for use in a range of public settings, including workplaces, shopping, and cultural spaces. The authors hope, through this embodied research, to challenge assumptions about how accessible bathrooms are used (and avoided) by people who use wheelchairs.

This knowledge will inform better design regulations and standards development, which will, in turn, benefit the disability community, resulting in more appropriately designed bathrooms. It will also inform the practices of industrial designers, manufacturers, architects, developers, and planners - to move towards a more pluralist understanding of how to design public bathrooms to be more appropriate, effective, and efficient for whom they are designed. The authors also hope to encourage a shift in thinking about wheelchair-accessible spaces, moving away from the reduction of diversity through the unity of the universal (Winance, 2014) towards embracing a rich understanding of the implication of diversity of use and engaging with those directly impacted by design outcomes.

## Literature Review

### Overview of existing research on accessible public bathrooms for wheelchair users

There is a relatively small amount of Australian literature focusing on the gathering of anthropometric data and the experiences of wheelchair users, even less specifically investigating bathrooms. A study of anthropometrics and spatial dimensions for occupied manual and powered wheelchairs was commissioned by the Australian Building Codes Boards in 2014 and undertaken by Caple *et al.* (2014) and included 52 participants. The outcomes of this review contributed more quantitative data describing the diversity of wheelchair users than had previously been captured for the development of Australian Standard 1428 (Standards Australia International, 2021).

Questions surrounding design effectiveness, flexibility, and suitability of accessible bathrooms for people who use wheelchairs, as well as the importance of appropriate anthropometric data, are issues also faced internationally. Canadian research (Morales *et al.*, 2018) used Vicon Optical Motion Capture equipment to measure the circulation area required by a manual or powered wheelchair within a toilet stall and examined findings against the current Canadian Code of Construction, finding that circulation space was inadequate. Researchers from the Philippines worked with people with Cerebral Palsy to

design a bathroom meeting both specifications based on their anthropometric data, as well as Philippine construction standards (Alberto *et al.*, 2017).

Research by Leal-Pérez *et al.* (2018) raised concerns about the provenance of data upon which design standards are based and conducted an exploratory survey of anthropometric data of wheelchair users. D'Souza *et al.* (2011) conducted anthropometric data collection (US) of knee and toe clearances (n=158) required by manual wheelchair users. This has applications for use in accessible bathroom design but is limited to a single group of wheelchair users.

Older research undertaken in the US explored the perceptions of people who use wheelchairs in kitchen and bathroom spaces and found some accessible specifications made tasks more difficult (Vredenburg *et al.*, 2010). Research by Feathers and Steinfeld (2008) canvassed the perceptions of accessible bathrooms by a range of users, including (but not limited to) wheelchair users. This research, with D'Souza *et al.* (2011), informed the Anthropometry of Wheeled Mobility, the Florida Accessibility Guide, and the ABA Accessibility Standard (2010).

## Methodology

The importance of an embodied approach to understanding the diversity of experiences

Research about a person's experience in a bathroom is intrinsically linked to their experience of their bodies and the thoughts, feelings, emotions, and senses that arise from, within and around the body. Whether people use the toilet to urinate, defecate, vomit into, or use the privacy of space to change sanitary products, empty leg bags, colostomy bags, use catheters, or reapply lipstick, our activities in bathrooms are by their very nature embodied and, in this case, intimate experiences.

Embodied research is designed to study, acknowledge, and centre the experience and material fact of having a body. Embodied research methodologies are in themselves diverse and have been applied in scholarly fields of race and migration (Vacchelli, 2018) and disability studies (Leigh and Brown, 2021; Small and Darcy, 2011) and can document creative approaches such as those outlined by Fleetwood Smith *et al.*, (2020) who work with people with dementia. These scholarly works are also diverse in the way they describe or define embodiment. An embodied approach provides the opportunity to explore the diversity of people's individual experiences and give attention to the body and embodiment of physical spaces and their design (Edwards *et al.*, 2014).

In recognition of this intrinsic, embodied connection between people, bathroom use and bathroom design, this research adopts an *embodied* ontological approach to the research design (see Shakespeare and Watson, 2001). The broader research design includes on-site demonstrations in a public workplace bathroom followed by semi-structured interviews. The interviews were designed to explore people's lived bodily experiences in public bathrooms. The interview facilitation included physical gestures and demonstrations of how bathrooms are moved in and approached and how transitions to toilets are performed in current publicly accessible bathroom designs. In doing so, this research focuses on the diverse

characteristics and living experiences of those who participated in the project and conducted interviews for an embodied understanding of public bathroom use.

Prior to the interviews, participants underwent a simulation of bathroom use to explore their embodied response to an actual bathroom design. These on-site demonstrations added an embodied layer to the interview process and involved participants visiting a public bathroom adjacent to the interview area. The bathroom was cordoned off from the public for exclusive and private use during the interview process. Participants were connected to sensor equipment and invited to enter the bathroom and re-enact their use of a bathroom, including entering the space, moving around, accessing or transferring to the toilet pan, and hand washing and drying in an activity prior to the interview. This all took place as a simulation, with the participants remaining fully clothed. This re-enactment immediately preceded each interview and became the focus of—and prompt for—the interview process. This embodied stage preceded the interviews, meaning that participants verbally shared the re-enactment experience with the interviewer, including what worked well and what worked poorly and how it compared to their lived experience of public bathrooms more generally.

### Research design and approach

The study reported in this article is part of a larger program of research that examines innovative anthropological data collection and bathroom use by wheelchair users (Newton *et al.*, 2023). The research team partnered with two advocacy organisations, Physical Disability Council New South Wales (PDCN) and Spinal Cord Injuries Australia (SCIA). Both PDCN and SCIA committed to helping to recruit six wheelchair users each from within their membership networks, and both also provided on-site locations to conduct an embodied bathroom assessment and interview. All participants were paid for their time to participate in the interviews at a rate commensurate with the NDIS Participant Engagement Payment Policy (NDIS, 2022). One of the research team and one of the industry collaborators were wheelchair users with experience in using public bathrooms and a professional and technical understanding of the National Construction Code and Australian standards for access and mobility.

This research reports on the qualitative part of a mixed methodology project on accessible bathrooms and wheelchair users' experiences and perspectives. The qualitative interpretive study involved 12 interviews with wheelchair users (8 x manual wheelchair users and 4 x powered wheelchair users). The project explores participants' perspectives on widely implemented, public, accessible bathroom design (as regulated by the Australian National Construction Code and Australian Standards for Access and Mobility) and discusses design features, including toilets, grab rails, toilet paper, handwashing equipment, and entrances/exits. The data logic model illustrated in Figure 1 below is applied firstly to report how participants describe interactions with each bathroom element, and then secondly synthesise these individual experiences with design elements to identify how these shape the preferences and concerns of wheelchair users in public bathrooms.

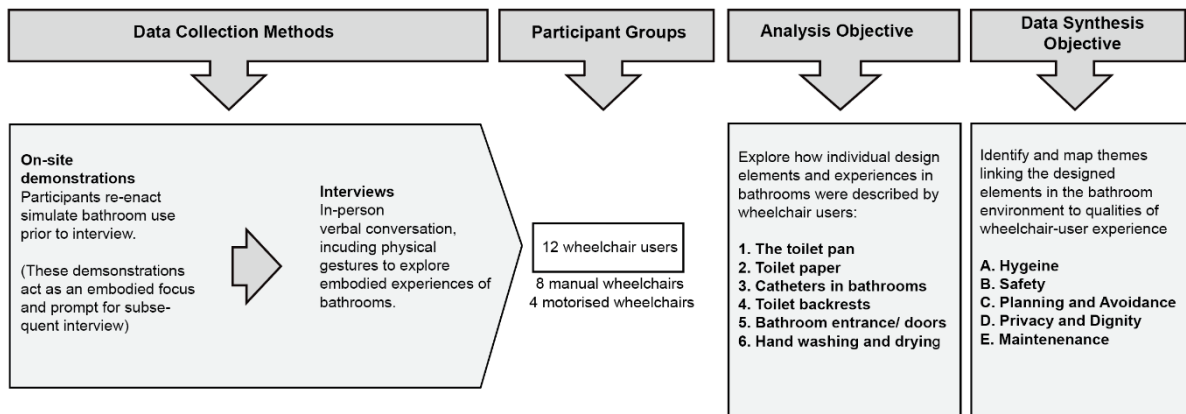


Figure 1: Data Logic Model establishing the structure of the data elements. Illustrates how initial analysis of the individual bathroom design elements is then synthesised to identify qualities of wheelchair user experience. Source: Figure created by authors.

## Data collection methods (interviews)

The research engaged with participants in an embodied way by first asking participants to re-enact their typical physical movements and interactions with design elements in a public bathroom environment – including the toilet itself, grab rails and hand washing/drying practices. Following this physical demonstration by participants, the participants took part in an interview where their perceptions, preferences, and reflections on their past experiences of public toilets were explored through conversation and gestures.

One-on-one in-depth interviews were conducted based on a guided set of questions about public bathroom use. The authors developed the interview questions in collaboration with industry collaborators who had experience with the Australian Standards Committee for Access and Mobility (AS1428 Pt1-6). Additionally, two people in the core research team are wheelchair users. The interviews took between 40 minutes to 1 hour each. Interviews were recorded and transcribed. Two Authors (withheld anonymity) then coded and verified the codes using Nvivo software and analysed the transcript content thematically.

## Ethical considerations

Ethics approval for this study has been provided by a university human research ethics committee (withheld for anonymity).

## Results

### Mobility disability types, support levels, wheelchair types, and other relevant characteristics

All participants were wheelchair users. Of the 12 people who participated in this study, 8 used a manual wheelchair, and 4 used an electrically powered wheelchair. Seven of the participants were female, and five were male. All were over 18 years of age. Seven participants reported using a catheter. A total of 10 hours of interview audio was transcribed and coded.

As illustrated in the data logic model in Figure 1, this results section documents how participants use, perceive, and describe how they interact with each bathroom element to demonstrate the diversity of interactions with a ubiquitous bathroom design. Interview data was coded according to each bathroom design element discussed. This gives insight into design performance, tensions, inadequacies, and important features of a wheelchair-accessible public bathroom, according to participants. Following this section, the data is synthesised in a way that reveals experiential themes that sit across multiple design elements within the bathroom.

Design elements discussed in this section include:

1. The toilet pan
2. Toilet paper
3. Catheters in bathrooms
4. Accessible toilet backrests
5. Bathroom entrance/ doors
6. Hand washing and drying

### 1. The Toilet Pan

Each of the interviews began with a discussion about the focal point of the public bathroom, the toilet pan itself. Within the participant group, there was diversity of mobility and limb strength, which influenced how people interacted with the toilet in a public bathroom. As discussed, this is an example of the embodied “impairment effects”, which recognises both the group characteristics based on the disability type, support needs and assistive technology but also the individual variation that these groupings will have.

Three out of the 12 participants did not transfer onto a toilet when using a public bathroom. Instead, they reported emptying their catheter from their wheelchair or not using the toilet at all. The remaining 9 participants who did transfer onto a toilet when using a public bathroom reported transferring in diverse ways. Some spoke about weight bearing during a transfer onto a toilet by either using hands on the toilet seat to lift and transfer, requiring considerable upper body strength:

*I find toilet seats aren't stable, so they move around on a toilet ... I'm one of the people who do actually transfer onto a toilet all the time. So if a toilet seat is moving, then that can be really dangerous for me in transferring, because I ... don't weight bear through my legs at all, so I'm only weight bearing through my arms. (Participant 10).*

Transferring in this way means having to use the toilet seat as a pseudo-grab rail. Toilet seats are not designed for this use, and the type of forces and stability required. If the toilet seat is not secure, transferring involves a significant risk of falls:

*Yeah, I don't use any of those grab rails or anything. I just put my hand on this toilet seat ... one hand on the wheelchair and swing over. So, it's good to have a toilet seat that's fairly stable. ... actually, the toilet seat is quite important. (Participant 2)*



*[The toilet seat is] difficult to grip ... when you have that sliding thing under your hand, and then you've got your hand around on the actual bowl of the toilet seat, it's like ... you'll not have such good stability. (Participant 2)*

Participants who grip the toilet seat to transfer come into direct contact with the toilet — the seat and the porcelain bowl — raising issues around hygiene.

*You make contact with [the toilet seat with] your hands when you're getting on and off. (Participant 5)*

A recurring theme in the interviews was that wheelchair users often have to get much closer to the toilet bowl and seat than a person who does not use a wheelchair. Wheelchair users also have to touch the seat more often and have their faces closer to the bowl when approaching and transferring. A person who does not use a wheelchair may have the option of standing whilst urinating or can turn around with their back to the toilet bowl before sitting down.

A wheelchair user who transfers onto the toilet has to face the toilet in a seated position and lean over the bowl closely (*some embodied imagining here of having your face close to the bowl of a public toilet*). This highlights the importance of a clean toilet and the general standard of maintenance for public facilities.

*[For me, the toilet seat] is actually a handle, because when you've only got two hands, and you're not using your legs, all those [grab rail]s and stuff, they're useless, because how are you going to reach a [grab rail] over here to swing on to the toilet? You're actually going to have to grip the toilet (Participant 2).*

Grabrails or handrails installed around an accessible toilet are not always useful to all wheelchair users.

*I just use the side of the toilet and then my wheelchair to transfer – so both of them are at the same height. So, I hardly use the grab rail. I think you might find that a lot of people in chairs transfer that way. (Participant 9)*

*... but if you put the handrail on the wall, it's not really useful ... The only contact I would have really is still the toilet seat, just to hold onto that to transfer. (Participant 7)*

## 2. Toilet Paper

Toilet paper type and the location of the toilet paper holder/dispenser were discussed in all interviews. If the toilet paper was out of reach, people had to plan to have it ready before they transferred:

*I find that irritating, and often where the toilet paper roll holder is not close enough to the toilet, so you've got to think, forward plan that as well. (Participant 12)*

There was great variability in paper-type preference – some people found toilet rolls easier to dispense and tear off and don't like the single-leaf dispensers:

*... it'd be good if it was, like, you could pull down as much as you needed and then rip it off. That would be fine. Not one at a time because, yeah, there are times when you've got to hang onto the toilet roll and then pull it like everybody else. (Participant 4)*

Furthermore, for people who only have one hand to dispense the toilet paper, it could be difficult to tear off the roll.

*... They normally have those big rolls, I think, so you have to be fairly dextrous to get the toilet paper out of one of those ... I don't really have any balance. So, yeah, if I was accessing one of those big rolls, I'd be using one hand. (Participant 2)*

The position of the toilet paper in relation to the toilet is critical for safety, and many participants commented that the toilet paper dispenser is often very low to the ground.

*It's too low. I don't understand what the deal is, but the toilet paper for some reason you are sitting on the toilet and then the toilet roll is down and I don't have good core strength. (Participant 10)*

*... trying to get the paper out is a total nightmare ... What you find is that the actual toilet roll dispenser is outward rolling, not towards you. (Participant 4)*

*So the height of [toilet roll dispensers] is [critical]. You can tell that the maintenance man has put them on ... they've got no idea where to put them. Sometimes they're above the grab rail, and sometimes they're below, and sometimes they're a bit further back ... this is just people not knowing the standards right. (Participant 9).*

### 3. Catheters in bathrooms

There are many different types of catheters and catheter usage. Hygienic conditions in public bathrooms are critical for people who use intermittent catheters due to the risk of infection when inserting them (Goldstine *et al.*, 2019). For people who transfer onto the toilet and use the toilet seat as a support:

*... you have to be so obsessed with hygiene when you're going to the bathroom. Especially if you're catheterising. So it would be, I guess, nice if there was hand sanitiser over here or hand sanitiser on the wall within reach [of the toilet]. (Participant 10)*

*[A lot of people who catheterise] will open a catheter, for example, and stick it on the wall. They need somewhere to stick it. If it isn't clean, they'll stick it on the rim of their wheel, and it'll hang down. (Participant 4)*

*I have to sit on the toilet, insert and then remove it, and throw it away ... But yeah, no, that's why it's really important for me to be able to get into the right position because I have partial feeling, and if it goes in ... wrong .. it hurts...So it's really important that I do that so I can avoid UTIs [Urinary Tract Infections] and things like that. (Participant 8)*

Participants spoke about a lack of understanding of the bathroom requirements of people who self-catheterise. For people who dispose of their catheter after use, there is a need for the safe disposal of catheter equipment:

*where am I supposed of dispose of the [catheter]? ... I am not carrying it with me ... [a bin] needs to be in reach [of the toilet]. (Participant 10)*

*You need a bin to be able to dispose [of a catheter]. Some people might take their old ones with them. So, they might take the old one out, put the new one in, put the old one in the packaging, and dispose of it that way. (Participant 4)*

*I hate throwing my catheters in the bin for pads because usually that's supposed to be eco-friendly and it's supposed to be able to be recyclable. But these are plastic, so you can't really recycle them. It breaks my heart that I do that, but it's sometimes my only option. I also don't want to throw it in the bin with all the hand towels because that's gross; it's got my pee on it. (Participant 8)*

The back rest is located behind an accessible toilet and is intended to provide back support and stability during use, but can, in fact, make self-catheterisation riskier and more difficult:

*I don't like [the back rests] ... I don't know what they support...it makes me too far forward...it pushes you off the toilet ... you need to have space behind and in front of you because depending on the angle of catheterising at the time...you might need to be going back and forth a lot or whatever it is. I hate that back thing. (Participant 10)*

*I bloody hate [the backrests] ... I self-catheterise, so if I do sit on a toilet and I do –, and I'm sitting on it the normal way and then the backrest is there, there's no way that I can self-catheterise because it pushes me so far forward onto the actual toilet that I can't actually get my hand down into the toilet bowl to actually catheterise. (Participant 12)*

Another bathroom detail important for catheterisation is a clean shelf to put equipment on. Participants expressed that the shelf in an accessible bathroom is never anywhere near the toilet where they are needed during catheterisation:

*There's no shelf [near the toilet]. It'd be great if there was even a dropdown shelf or something ... I line up [my equipment] on my wheelchair seat ... I have to get toilet paper ahead of time ... Ideally, what I would like is I don't need to use my seat as a second table. I could just fold [a shelf] down, and then it would just be all there. (Participant 10)*

*Some people have funding where they can afford to have a different catheter every day. Some people don't have enough funding, so they actually reuse the same one for a month or something like that, so they do need to wash it. They need an area that's sanitary and they need something near the toilet to rest all their items on and stuff. Otherwise, it's like, where do I put it? If there's no room on the basin and it's just a circle basin, then there's still nowhere to put it. (Participant 11)*

Suprapubic and indwelling catheters only require changing after 4-6 weeks but do require emptying of the collection bag. People with suprapubic catheters will still use a bathroom to empty the bag. However, they may not have to actually transfer onto the toilet:

*I've got a suprapubic indwelling catheter, and all [I] do is we just change the leg bag ... I lean down to the left foot and undo the strap which holds the foot on the footplate. Either swing the footplate out or take it off. This is where the baby table comes in or the sink. Sit the footplate on either one, as long as it's not on the floor. It's hard for me to pick it up off the floor. Then I put the heel up on the toilet basin and empty the bag because the bag is between the knee and the ankle. Then, put it back together. (Participant 5)*

#### 4. Toilet Backrests

Accessible toilet design includes a rigid backrest behind the toilet seat (and in front of the cistern) to provide support to a person who may not have the core strength to support themselves seated on the pan for an extended length of time. Participants explained why the backrest was important for some wheelchair users:

*One of the purposes of that backrest is so you don't fall back and slide off ... the other thing is positioning as well. So, it does keep your back upright and forces you to [sit upright] so you're not slouching. So, it forces you in that upright position so gravity can do its thing. (Participant 4)*

However, these backrests were pointed out as a design feature that actually made it more difficult to use the toilet safely for 8 out of 12 participants:

*... it pushes you forward ... for me [the backrest] creates more problems ... your centre of gravity is not in the right spot. (Participant 1)*

*I don't like [the back rests] ... it's pushing you [forward] off the toilet. (Participant 10)*

*It is annoying if the seat doesn't stay open when [the backrest] is there ... you can't leave the seat up to empty the leg bag. (Participant 11)*

*[The back rest] pushes me so far forward onto the actual toilet that I can't actually get my hand down into the toilet bowl to actually catheterise. (Participant 12)*

*I've noticed that the backrest, because of my height, pushes me too far forward. (Participant 2)*

#### 5. Bathroom Entrance/Doors

The ability to autonomously enter and lock the bathroom/cubicle was understandably important to all participants. Some participants spoke of public bathrooms having heavy manual doors they could not open. Others spoke about being locked inside accessible public bathrooms due to poorly maintained mechanical locks. The automated bathroom doors typical in Australian accessible bathrooms were considered easy to use but still required physically pressing the provided button:

*I think automatic door designs are good. I think to make them better, they should be more of a waving your hand over it to open or to close, as opposed to having to push buttons, because again, that's not necessarily something that someone's going to be able to do easily. Also, in these times, people don't necessarily want to be touching things as much. (Participant 12)*

*I have an attachment on the front of my wheelchair that means if there is not an automatic door I cannot get out of the locked toilet on my own. (Participant 11)*

In some cases, the automated door system caused some participants anxiety and stress either because sensors were too sensitive (and could open while they were on the toilet pan) or because they could become stuck inside the bathroom during a power outage:

*... [The toilet is in view of] the door opening. I don't personally like that. If the door opens by mistake ... they're sitting on the toilet in full view. (Participant 3)*

*No. I like to know the door is locked properly ... so I am not going to be disturbed ... that's really important. (Participant 4)*

*If you get a power outage, my guess is if you're in a toilet with an electric door, you're stuck in there. (Participant 5)*

Participants spoke about the importance of designing door handles that allow for easy pull and push motions. One participant spoke about how the engaged signal was expected to be used as a door pull. In the absence of automated entries, the weight of fire-rated doors is also an issue for many wheelchair users and people with physical disability.

*... if you haven't got the right handle, and as we were saying, if the door is heavy, sometimes I need two hands to fling the door open. (Participant 9).*

Whilst privacy and being able to securely lock the bathroom during use was important to many participants, it was also acknowledged that it is important to be able to get out of the locked bathroom in the case of an emergency, such as a power outage or fire.

*I mean, you might get embarrassed [by being able to open the door from outside], but at least you'll get out if there's a fire. (Participant 2)*

*What you don't find either is an emergency override for the door. I don't know why there isn't an emergency override ... if you're on that toilet and you have a problem, you can press the duress ... But you can't get out yourself ... you've got to wait for somebody. I always think if, in worse case, there was an emergency button, people are going past in shopping centres. You can shout for help, and at least you know you can get out. I mean, I've been in toilets before where the door has not opened properly, it hasn't worked. I'm in there banging on the door to get out ... It's a nightmare. (Participant 4)*

*The [need for] an emergency override [button] ... has come up a few times. Like people don't want to get locked in as much as they don't want to have it opened unexpectedly. (Participant 5)*

## 6. Hand washing and drying

Given the importance of hygiene, the sink and handwashing equipment sparked detailed discussions of design preferences. For some wheelchair users, the standard heights for sinks remain too high, and their structural stability is critical because many people have to lean on sinks to use the taps:

*... they're too high for me, but they might not be high for other people who are in higher wheelchairs. Sometimes I do have to lean heavily on the sink and ... I always think about what happens if the day where I'm like this and then the whole sink comes down off the wall. (Participant 10)*

*So, you can lean on [the sink] while you wash your hands or do whatever... (Participant 4)*

The size of the basin is also important:

*... you need to have a hand basin that's not small. So, sometimes you'll see a hand basin like this big [indicating size]. It's impossible to get your hands in there. (Participant 2)*

Additionally, the assembly of the taps in the basin came up as participants described being splashed in the face by poorly angled taps:

*When the tap is at a certain angle, if you get that spray set up that some of them use and because some – they design the sinks where the sink is – it's kind of, I don't know, at an angle, because you're lower, so you're not standing, and the sink is down here, so you're pretty much – like where the water is coming out of is like at eye line or just below. That spray that's coming out, then you get [it] ... straight in your face. (Participant 1)*

There was great variability in preferences for hand washing and drying design elements. The reach and dexterity of individuals varied significantly. Hence, the importance of the proximity of soap dispensers to the sink was commented on several times during interviews.

*[Soap dispensers] are usually too high, or they're too far away from the sink. (Participant 9)*

There was also variation in preferences for types of soap dispensers. For example, Participant 10 only liked automated dispensers or lever dispensers. Dispensers with a press button were not accessible for them:

*... the button one requires two hands ... I don't have the best core strength. That's why it's a lot of heavy leaning as well. (Participant 10)*

Not all participants liked the newer electric sensor soap dispensers.

*I've waved my hand a gazillion times under that thing and nothing will come out. I'm like, is it empty or is it just the sensors not working? (Participant 1)*

Most participants agreed that the lever taps were the best option for them. Automated taps were described as *frustrating* because they required multiple presses and didn't stay on long enough.

For hand drying, preferences were divided. Whilst automated air driers were considered the most accessible option for most people, the design of the air driers was important. Newer driers were considered much better:

*I find the [new models of air drier] better, rather than the old-fashioned kind of ones, because of the height that it's at. The air will blow into your face, the old-fashioned ones, so it's not necessarily comfortable, so I guess it's different if you're standing and using it. You're not getting that kind of movement. But the Dyson one, it doesn't go into your face. (Participant 12).*

However, some participants did express preferences for paper towels for hand drying:

*I prefer paper towels. I think probably everybody does. It is actually difficult to get your hands on those driers where you've got to put your hands inside [Dyson dryers] like that ... (Participant 2)*

And even the new model air driers didn't work for everyone:

*The problem with them – and I've never found a good one yet, is that they're too high. I can't get to it. Can't reach it [to put it in]. I'm out of breath even trying to do it. You can't turn it on and off. We quads don't have this tricep ability to move the hands in that direction. Not everybody does. (Participant 4)*

*[I don't like the air driers because] sometimes they're too tall, and I have to do this, or they just don't dry my hands correctly because they're at weird angles. Because they're at the angle of someone who would be standing. (Participant 8)*

*I ... prefer the hand towels because ... the hand dryers don't quite dry your hands. You've got to sit there five minutes, and then you're pushing your chair. So if you're pushing your chair with wet hands ... I'm pushing out of the bathroom with wet hands so getting everything wet. (Participant 9)*

## Coding spread

Table 1 below provides details of the coding spread for each participant when discussing perceptions of accessible public bathrooms and individual bathroom elements (layout, toilet, handwashing, grab rails). The table shows the participant number on the left with the wheelchair type used and a mapping of coding structure across the columns with an 'X' showing which codes were included in which interviews. This provides a way of showing thematic spread and indicates the relative similarity across the participant group, both powered and manual wheelchairs.

**Table 1: Type of wheelchair used by each participant and coding spread of participant interviews.** Source: Table created by authors.

CODES								
PARTICIPANT NO.	Wheelchair Type	Maintenance	Hygiene	Catheters	Avoidance	Back Rests	Doors	Shelving + hooks
P.1	Manual	x				x	x	
P.2	Manual	x	x	x		x		x
P.3	Powered		x		x	x		
P.4	Powered	x	x	x	x	x	x	x
P.5	Powered		x	x	x		x	x
P.6	Powered	x	x	x	x		x	x
P.7	Manual		x			x		
P.8	Manual	x		x	x	x	x	x
P.9	Manual	x	x			x	x	
P.10	Manual		x	x	x	x	x	x
P.11	Manual	x	x	x	x	x	x	x
P.12	Manual		x	x		x	x	

## Discussion

The interview results underscore not only the challenges faced by wheelchair users in accessible public toilets but the diversity of approach, use, and preference of all elements within an accessible toilet – from the toilet itself, to toilet paper, hand washing equipment, and door designs. These observations support the social relation model of disability discussed earlier in the paper, highlighted throughout the findings, and now form part of the discussion within the context of the overarching themes to be presented. In this discussion section, the results are synthesised into overarching themes of hygiene, safety, planning and avoidance, privacy and dignity, and maintenance.

### A. Hygiene

In many of the interviews, participants discussed hygiene and the problems associated with poor cleaning or dirty public toilets. Wheelchair users described how closely they must interact with toilets in order to use them. Firstly, wheelchair users who transfer onto the toilet often have to grab the toilet seat and use it as a weight-bearing hand support during transfer onto, and use of the toilet. Secondly, wheelchair users must approach the toilet pan face-on at seated height, meaning their face is centimetres from the open pan. Thirdly,



people who self-catheterise must reach down into the toilet pan (whilst they balance on the toilet) to have access to the catheter – sometimes touching or brushing the inside of the toilet pan. The points to a need to have hand sanitisers adjacent to the toilet pan and a shelf for catheterisation equipment for safer self-catheterisation. Given our recent history with the COVID-19 pandemic, the introduction of hand sanitisation should be standard within all public toilet facilities.

Hand hygiene is a fundamental aspect of public health, and for wheelchair users, the design and accessibility of sinks and handwashing equipment are paramount. The results reveal that for some, standard sink heights are too high, necessitating them to lean heavily on the sink. This not only poses a risk if the sink is not structurally stable but also emphasises the importance of hygiene, as wheelchair users have to touch these surfaces more frequently. Additionally, the proximity and type of soap dispensers were important to participants. While some participants preferred automated dispensers for their ease of use, others found them unreliable. This reflects the need for regular maintenance and refilling, in addition to the importance of getting the initial design and position in an accessible location. Finally, having dry hands is paramount for people using manual wheelchairs – leaving with wet hands makes propelling the wheelchair slippery and difficult.

*If you're pushing a wheelchair you're prone to getting dirty hands, and so that could be the primary purpose you're going to the bathroom, is to wash your hands.  
(Participant 2)*

*It is not just the proximity of soap – rather, everything needs to be at hand – including shelf storage at both the toilet and the sink, hand washing and drying. (Participant 4)*

## B. Safety

The hard surfaces, the presence of water, the need to balance on the toilet whilst reaching toilet paper, a catheter, or preventing a manual wheelchair from rolling away – all make the experience of using a bathroom a risky activity for many wheelchair users – particularly when coupled with a poorly maintained, unhygienic, and dirty public bathroom.

*The risk of injuries in bathrooms for us [wheelchair users] is the biggest thing.  
(Participant 4)*

*Fall risk is so dangerous [for wheelchair users] in a bathroom situation. (Participant 6)*

All participants spoke openly about the risks they face simply going to the toilet in a public place. Those risks include getting an infection following self-catheterisation, falling to the ground whilst transferring to or from the toilet pan, or being locked in the bathroom and, therefore, unable to get out in the case of an emergency.

*I have had a lot of incidents [laughs] in the past. [in accessible public bathrooms]  
(Participant 6)*

*... not everyone likes to sit too upright. For me, it's an issue for me when I'm transferring because [the backrests are] not all set at the same distance either. So*

*sometimes, if I'm transferring too far, I'll just fall forward. I'll hit the back support and I'll fall forward. (Participant 9)*

*...when you actually are transferring from one point to another, when you're kind of in no man's land is when you're in the middle of a transfer and anything that's a variable, like just say my brake gave way, or whatever it was, then that's a problem. That's where you could end up on the floor. (Participant 1)*

*... If you have a toilet seat that is rickety and it's not secured properly, it's actually super dangerous. (Participant 10)*

It is the feeling of not being safe that leads to participants avoiding public toilets in general, especially ones that are known as not being well designed.

*The risk of injuries in bathrooms for us [wheelchair users] is the biggest thing. (Participant 4)*

The safety concerns highlighted in this research are presented in relation to a number of bathroom situations and contexts. From the stability of toilet seats, which some wheelchair users rely on as a pseudo grabrail, to the potential hazards of being locked inside a bathroom due to malfunctioning doors or power outages, these risks are significant. The mention of emergency override buttons and the fear of being trapped inside a bathroom in case of emergencies like fires underscores the gravity of these concerns. Furthermore, the weight and design of bathroom doors, especially heavy fire-rated doors, can pose challenges for wheelchair users wanting to exit in an emergency situation such as evacuation, making them feel unsafe while using the bathroom.

## C. Planning and Avoidance

The interviews revealed the many insights of wheelchair users into strategies and considerations before using public bathrooms. The interview results shed light on the importance of planning ahead for wheelchair users. Participants noted the importance of knowing where appropriate and suitable accessible toilets will be when considering social participation. For others, simple tasks, such as ensuring toilet paper is within safe reach before transferring, become critical in minimising the risk of a fall. The potential of being locked inside a bathroom or facing a malfunctioning door means that wheelchair users must always be prepared for unforeseen challenges. This constant need for foresight can be mentally taxing and underscores the importance of designing public bathrooms that minimise these challenges.

The interviewees heard stories of people having to assess whether the toilet paper is reachable and, if not, get the toilet paper ready before transferring onto the toilet. Similarly, if there is no storage for catheter equipment, a wheelchair user must assess alternative storage during toilet use, such as the seat of the wheelchair.

*The bathroom is the one area where not everyone - not any standard that you set will meet everybody's [needs]. That's the one area that I've always thought it's going to be so hard to get a bathroom right - a public bathroom right. (Participant 9)*

Participants spoke about not going to events or particular places in urban environments when they were aware that the public bathroom amenities were either inaccessible or in poor condition / poorly maintained. This highlights the importance of access to information systems that indicate the presence, availability, and level of maintenance of public accessible toilets for those wanting to plan social activities. In Australia, an Australian Government-funded project has Geo-mapped public toilets (National Continence Program, n.d.). The National Public Toilet Map provides details of toilet locations, opening times, accessibility, and amenities available. Some of the toilet listings do share photos of the toilets, but the level of maintenance, condition and cleanliness are not noted.

Given the lack of key information about accessible toilets, wheelchair users in this study noted the problems created by not having certainty about appropriate toilet facilities. With uncertainty comes a lower level of public participation depending upon the independence of those wheelchair users and the need for creativity or alternative solutions to using accessible public toilet facilities. This includes those using urinary leg bags so that they are able to dispose of urine in other ways. This practice is noted in other studies and includes access to toilets on aeroplanes for people with disability (Darcy, 2012) and for long-distance car travel for wheelchair users (Darcy and Ely, 2014; Darcy and Burke, 2018).

Wheelchair users have to make judgement calls about the level of risk associated with using a public bathroom based on its design, condition and how that might increase the risk of a fall during transfer, as well as its level of hygiene. This can mean finding workarounds in relation to their bodily functions that meant they could avoid public bathrooms altogether:

*I'm fortunate that I can control my number twos ... to in the evening shift when I've got a carer. (Participant 5)*

*I avoided them even prior to COVID-19 ... just because of hygiene and stuff....before I do anything in transferring out of my wheelchair, for my own benefit and for the carer's benefit, I have to feel safe in my head that, yes, I can do that. (Participant 3)*

*I have just sort of avoided trying to use public toilets as much as possible. (Participant 8)*

People not only plan when they are inside an accessible toilet, but some participants plan their day to avoid them entirely:

*Somebody with a high-level injury [like me] would only go to a public toilet in an emergency. So, they would have their routine in the morning, and they obviously prepare themselves before they go out. (Participant 4)*

Some participants described not being able to avoid using public bathrooms despite wanting to. And the experience of having to deal with a poorly maintained toilet:

*I can't avoid a public bathroom. If I need to go, I need to go because of the urgency, especially when you are drinking anything, it can be within seconds between you needing to go and then something happening. It's completely [undignified]. So, if it's absolutely disgusting or if ... it's not the best access bathroom, you just have to use it. There's no other option. (Participant 10)*

Wheelchair users live with an elevated risk of infection and contamination because of the need to touch more surfaces during transfers and have their bodies facing—and closer to—the toilet bowls. This risk is further exacerbated when hand washing/drying facilities are not in close proximity:

*You have to think of it like I'm going to need X, Y, Z before this even happens. I need to wash my hands first, but then I'm going to re-bacteria [contaminate] it going from the hand basin into the wheelchair. Well then, I'm bringing out hand sanitiser, I'm bringing out catheters, I'm bringing out whatever sanitary products, anything else. (Participant 10)*

The responses from participants highlight the links between dirty and poorly maintained toilets and health risks for wheelchair users, as well as the social consequences of avoiding places because of inadequate design or cleanliness of bathrooms.

#### D. Privacy and Dignity

One of the most discussed topics was the ability to securely lock the bathroom without the risk of it being opened by someone else. Preferences for mechanical locks over automated locks were also argued:

*What I like and what I commented about here is that I know that the door is locked. I can see that it's physically – I can manually lock it, and I know it's locked. A lot of us don't trust the automatic, even in shopping centres. (Participant 4)*

Participants spoke about the security of knowing a bathroom door is locked — and how some locks do not provide that security:

*Sometimes those push button locks... you think it's locked, it's not locked, and then you get a surprise. ... I have been in airports, and the electronic lock— you push the button, and it goes red, and then there's some glitch in the system, then, oh my god, the door is opening, and I'm still [on the toilet]. It just – I mean, .... I just like seeing that physical lock turning with the bolt coming across because then you know, even if someone's trying to get in ... (Participant 1)*

Automatic sensor locks can be set up to be too sensitive, leading to difficulties ensuring privacy is maintained:

*When you go into a shopping centre particularly, some of the sensors are so badly set up inside that you've got to go and hide in the corner and wait for the door to shut and lock, then go and actually lock it. Otherwise, if you move towards it, it'll open again. (Participant 5)*

*Things that need to be thought about though is how long [automated doors] stay open and also setting the sensitivity of them. So sometimes, if somebody walks past - the door is trying to close right, but just as the door is about to close someone will walk past - it will open again. (Participant 9)*

The lack of dignity and risk of the doors opening something that participants feel they live with:

*It is always a fear of mine ... because the toilet is always directly in front of the door ... I can't go [to the toilet] fast enough ... I think about [the door opening] all the time. (Participant 10)*

Other participants commented that the design of bathrooms should consider the dignity of wheelchair users by prioritising autonomy and independence:

*Everyone just expects us to go and just ask someone for help, and it's like I'm going to the toilet; I shouldn't need to ask somebody to hold a door open to go to the toilet. It's not – we shouldn't have to do that. (Participant 11)*

## E. Maintenance

The design of accessible bathrooms is highly regulated, and new bathrooms in public spaces must all comply with Australian standards in order to be approved for occupancy after construction (Fair Trading, n.d.). Whilst a public bathroom may be designed to comply with standards and be accessible, participants spoke about significant problems arising when bathrooms are not maintained.

*... who maintains them? They're never maintained because no one knows who - no one will take responsibility for maintaining them, whether it's council or whatever. So, you've got those sort of two things competing when you're looking at those sort of facilities. (Participant 9)*

This avoidance of inaccessible or poorly maintained toilets highlights the direct link between the provision and maintenance of accessible toilets and the participation of wheelchair users in the wider community. The relationship between participation in the community, quality of life and avoidance of inadequate public bathrooms is not limited to wheelchair users and has been explored for people with cognitive impairment (Bichard *et al.*, 2005), other bathroom-dependent communities (people experiencing conditions such as irritable bowel condition, urinary incontinence) (Corradi *et al.*, 2023) women (Reddy *et al.*, 2019; Wu *et al.*, 2019) and transgender communities (Lerner, 2021; Platt and Milam, 2018). Greed (2007) wrote about the inadequacy of current public bathroom distribution and design in the UK regarding design, location, safety, layout, and accessibility. Interestingly, there is substantial evidence discussing social isolation for wheelchair users and access to transport (Velho *et al.*, 2016; Velho, 2019; Cochran, 2020) – however, the authors found no research into similar social implications for bathroom access.

## Implications and Recommendations

This research highlights several policy and design implications for creating more accessible public bathrooms and encouraging greater community participation by wheelchair-using communities and amongst people who use catheters. The research contributes evidence towards the following:

- That wheelchair users, often assumed to be a single homogenous ‘user group’ of accessible bathrooms, are, in fact, diverse in their preferences and use of public bathroom spaces.
- That diverse usage translates to diverse design preferences. There are a number of design tensions that arise in bathrooms, such as the existence of backrests, toilet heights, and the location of grab rails. This makes the standardisation of bathroom design difficult and highlights the value of greater numbers of wheelchair-accessible public bathrooms with varied designs.
- That accessible public bathrooms are critical for the safety, well-being, and participation of wheelchair users throughout communities and in public spaces.
- The importance of regular toilet maintenance in addition to good design. Dirty, wet public bathrooms directly result in a greater risk of injury or illness due to contamination in unclean bathrooms or slipping or falling from toilet pans during transfer. The increased stress brought about by the awareness of this increased risk was also evident in our interviews. It doesn’t matter how well-designed an accessible bathroom is - if it is not maintained well, it presents significant hygiene and safety issues for wheelchair users.
- Evidence of wheelchair users having to plan ahead for any journey outside the home and that places are avoided altogether if it is known that the public toilet amenities are inaccessible or poorly maintained/cleaned. This underscores the increased stress and health implications of delaying or avoiding toilet use if there is no information about local public toilets to plan ahead with.
- The need for greater recognition and acknowledgement of the experiences of catheter users in public bathrooms. This aligns with two earlier studies, which, whilst not focused on wheelchair users, examine people’s perceptions of public bathrooms and catheter use. Bolinger and Engberg (2013) reported that the most significant barriers to practising intermittent catheterisation are access to public bathrooms and inadequate shelves or countertops for placing catheter supplies in preparation for intermittent catheterisation. This is confirmed by Wilde *et al.* (2011), who described public bathrooms as being inaccessible and poorly designed and cleaned.

## Conclusion

Bathrooms are spaces where design deeply influences experiences of participation, dignity, stress, and comfort. This study details the experiences of Australian wheelchair users navigating accessible public bathrooms. By analysing the design elements in the current Australian accessible bathroom standards, this research aims to bridge the gap between standardised design and the diverse lived experiences of both manual and powered wheelchair users. While the initial design and construction of a bathroom are vital, the ongoing maintenance and upgrading throughout its lifespan are equally crucial.

Accessible public bathrooms, often highly regulated in design and construction codes and standards, are spaces where the intricacies of design decisions profoundly impact users, especially wheelchair users. A diverse range of wheelchair users were interviewed in order to understand the diversity of use of public bathroom spaces, including transfer methods onto the toilet pan (or not), stabilisation techniques, and preferences around toilet paper,

catheterising, and handwashing and drying. Although this research is exploratory with a small sample size, three key findings emerged:

1. There is a need to recognise that wheelchair users are a diverse community themselves based on underlying impairment, disability type, level of support needs, and the assistive technology that they use. This challenges the notion that wheelchair users and users of accessible public toilets form a single homogenous subgroup within the disability community. It also challenges the notion of one single standardised bathroom design for all users.
2. Public Bathrooms need to be both accessible and clean to ensure safe use, emphasising the importance of both initial design and consistent maintenance and upgrades.
3. The absence of clean and accessible toilets directly influences the community participation of wheelchair users. Wheelchair users will avoid public places with inadequate toilet amenities, leading to broader implications of both social inclusion and social isolation.

### Future research directions

This project is exploratory, with a small sample size and limited to wheelchair users. The field will benefit from a larger study with a bigger sample size to build empirical evidence about the diversity of use of public bathrooms by wheelchair users. There is also the opportunity for further research to explore experiences of public bathrooms by other communities of people with disability as well as older people and children. Further research into the links between public bathrooms and social isolation is warranted.

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