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Perceptions of People with Disabilities on the Accessibility of New Zealand's Built Environment

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Abstract

Accessing the built environment poses many challenges for people with disabilities, severely affecting their independence and quality of life. A panel of experts with a lived experience of disabilities co-designed a survey capturing the challenges in New Zealand's public places. There were 319 survey respondents with impairments related to mobility (66.5%), vision (18.8%), hearing (5.0%), sensory processing and cognition (8.8%). They perceived sports stadiums as the least accessible venue, followed by bars, boutique shops and public toilets. The most accessible venues were supermarkets, libraries and shopping malls. The type of disability affected the main accessibility challenges. Significant outdoor barriers included uneven and cluttered paths, inadequate provision of curb cuts, seating and accessible parking spaces, and obscure wayfinding. Entrance barriers included heavy doors, complex access control, remote ramps and narrow, obscure entrances. Interior problems included cluttered paths and poor signage. The top priorities for improvement were simplifying layouts, keeping paths clear, and providing clear, inclusive signage, communication and assistance for people with varying impairments. Providing lower counters, better colour contrast, hearing loop facilities and better control of lighting and acoustics also improve accessibility. This research contributes novel experiential data from people with disabilities that is critical to achieving an inclusive built environment.

Keywords: accessibility; built environment; disability

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1. Introduction

The World Health Organization estimates that 16% of the world's population identify as people with disabilities [1]. In New Zealand 17% of the population are people with disabilities, with 35% of this cohort aged 65 and older [2]. New Zealand is a signatory to the United Nations Convention on the Rights of People with Disability [3] and, as such has a commitment to meeting the United Nations sustainable development goals (SDGs). Sustainable cities and communities (SDG 11) require the built environment to be inclusive and accessible to everyone [4]. However, this requirement is not met, either in New Zealand or globally; accessibility of public buildings and spaces remains challenging for people with disabilities and application and enforcement of the principles of Universal Design is limited [5,6]. The consequences of poor accessibility are profound; people with disabilities experience social exclusion, isolation, depression and poorer health, all of which equate to a diminished quality of life. The number of people with disabilities and the correlation

between ageing and developing a disability means that it will impact most people (either directly or indirectly), so the problem of poor accessibility needs to be addressed.

Providing inclusive accessibility in the built environment is complex for two main reasons. Firstly, the many different types of disabilities place different, and sometimes conflicting, requirements on the optimal design [7]. For example, a person with vision impairment prefers an environment with bright lighting and clear colour contrast which may be very challenging for a person with sensory impairment. Secondly, researchers tend to focus on one area of the problem and fail to view the problem holistically. Three such areas (discussed in [8]) are studies on the main barriers to inclusive accessibility for single types of disability, studies reporting accessibility of specific building types measured by audit tools or customised checklists [9–11], and studies looking at accessibility legislation. In New Zealand, the legislation governing the built environment consists of the Building Act 2004, the New Zealand Building Code and the New Zealand Standard NZS 4121:2001 Design for access and mobility—buildings and associated facilities [12]. Compliance is mandatory for all buildings, but ambiguous specifications and recommendations coupled with lack of enforcement mean that many accessibility problems exist [13]. A synthesis of the literature in these areas is provided in Table 1.

Table 1. Synthesis of literature on accessibility in the built environment for people with disabilities.

Area	Key Research Themes and Source
Access barriers for different types of disability	Most studies consider challenges associated with physical impairments such as mobility [14–16]
	Access barriers associated with vision and hearing impairment [17–19]
	Access barriers associated with cognitive and neurodiverse impairments [20–22]
	Impairments may vary in number (one or more), severity and duration and are more common in older people [23–25]
	Social barriers, e.g., negative treatment and ableist attitudes of other people [26,27]
Access for different types of buildings	Public toilets [28], Marae [1] [29], gyms [30], hotels [31–33], public transport facilities [34,35], religious places [36], museums [37], medical centres [38], shopping malls [39], libraries [40], university facilities [41].
Accessibility legislation	Disability strategies, anti-discrimination legislation, building codes and standards aimed at inclusive access [23,42,43]
	Comprehensive policy and strict enforcement in the USA [44,45]
	Application and limitations of New Zealand accessibility policy [46,47]
	Community driven change and fair funding allocation [48,49]

[1]: A Māori religious and community place specific to New Zealand.

Aside from focusing on one area, researchers frequently fail to use input from people living with disabilities and produce solutions that theoretically improve access (for example, by complying with legislation) but that in practice fail the end-users [5]. The lack of studies

that capture the lived experience of people with disabilities in accessing the overall built environment, including both public buildings and their surrounds, is the research gap addressed in this study.

The aim of this work was to use an online survey of a representative sample of New Zealand residents with different disabilities and the guidance of a panel of experts (people with a lived experience of many different disabilities) to capture their difficulties accessing New Zealand's public built environment. The research objectives were:

1. To rank different types of public spaces (buildings and their surrounds) by perceived ease of access for people with widely varying disabilities;
2. To determine the effect of different types of disabilities on the perceived main barriers (a) outside buildings, (b) at the entrance to buildings and, (c) inside buildings;
3. To identify the top priorities for improving inclusive access to the built environment.

The limitation of the research is that the survey was restricted to only adults (people aged 18 or older) with disabilities, excluding the opinions of children and carers. This restriction was imposed by the human ethics committee reviewing the research because of concerns that the opinions of carers might not accurately reflect the experience of people with first-hand experience of disabilities. A further limitation is that the survey responses were primarily from people with physical impairments, so few inferences can be made for people with sensory, cognitive and neurodiverse impairments.

The findings identify and prioritise the main barriers for accessing New Zealand's public spaces, as perceived by people with many different disabilities and widely varying demographics (such as age, income, health status, etc.). This end-user view, based on a broad sample, is useful for construction practitioners, city planners and government stakeholders in achieving real improvements in inclusive accessibility in the built environment for all people with disabilities.

2. Materials and Methods

The research reported here is part of a larger research project reported in [50]. It was approved by Massey University's Human Ethics Committee Ohu Matatika 1 (ID OM1 24/20).

An Accessibility Partnership Panel (APP) was convened, having seven members with expertise in impairments related to cognition, sensory, neural, mobility, vision and hearing. Panel members were chosen through purposive sampling; organisations supporting people with disabilities and individuals living with disabilities and being active advocates were invited to participate both in nominating panel members and in advertising the survey on their social media platforms. Final selection of APP members aimed to capture people with the widest range of disability expertise. The panel and researchers co-designed survey questions in an iterative process beginning with APP members giving their perspectives on the different types of public places that should be included (independent of whether or not the APP members visited them) and the common access-related problems they encountered. The building types were chosen to represent common public places in the built environment that everyone should be able to access. The researchers used this information and their review of the literature to draft initial survey questions on the experience of people with disabilities in accessing public places. Feedback from the APP members was then used to modify the questions. The survey was administered using Qualtrics XM software(September 2024) for the online version, together with hard copy and phone survey options. Prior to activating the survey, the online and hard copy versions were checked by the APP members for functionality, and for compatibility with screen reader software (JAWS 2023 for Windows; SuperNova 2022; and VoiceOver for Apple devices) to accommodate individuals with vision impairment. New Zealand organisations associated

with people with disabilities were asked to announce the survey on their social media platforms. They were given an information sheet describing the research purpose and the options available for completing the survey, namely online, in hard copy or by phone, the latter to assist people with cognitive and/or sensory disabilities in understanding questions, providing responses, and navigating the survey. The inclusion criteria to complete the survey were:

- The respondent lived anywhere in New Zealand;
- The respondent lived with a disability of any type or types, including but not limited to their mobility, vision, hearing, age, cognition, and sensory abilities;
- The respondent visited any public buildings or spaces regularly, for example, monthly—this criterion excluded people who mostly remained in residences and medical facilities;
- The respondent was eighteen years or older—people under the age of eighteen and carers were excluded from the survey as a condition imposed by the university's ethics committee.

Every respondent gave their consent for the use of survey data in research publications. Survey responses were collected from September to November 2024.

The number of people with disabilities in New Zealand is 17% or 851,000 people [2]. For a confidence level of 95% that the real value is within +/−5% of the measured/surveyed value, statistical power analysis estimated the target number of responses to be 217 [51]. This target was exceeded; 319 valid survey responses were collected. Power analysis by disability type was not attempted because the country's population for each disability type is not known and because twenty-eight participants experienced two or more different disabilities.

Figure 1 shows the types of impairment of the survey respondents. Where a respondent had more than one type of impairment, their perceived main impairment type was used.

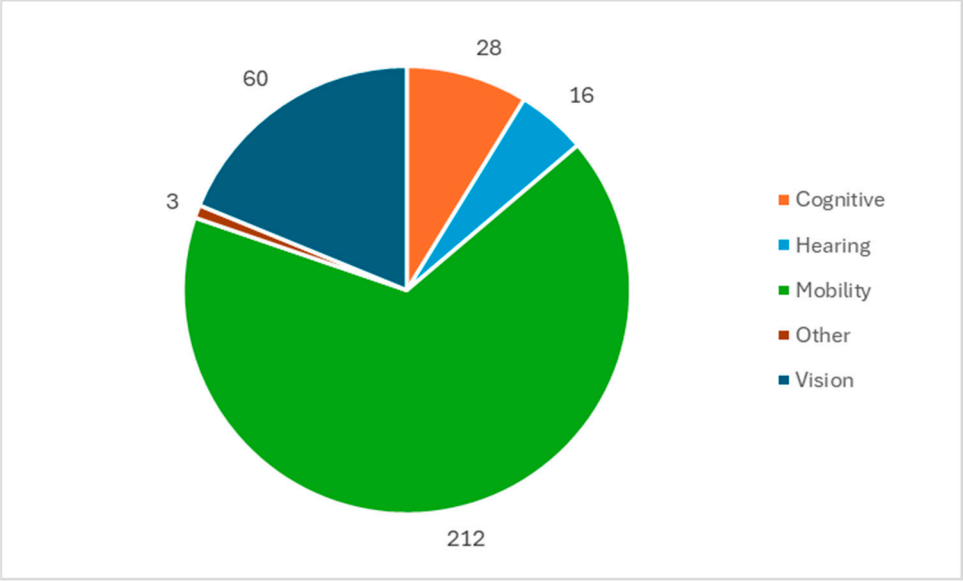

Figure 1. Type of impairment of respondents (N = 319).

The most common types of impairment are mobility (66.5% of respondents) and vision (18.8% of respondents). A total of 16 (5.0%) of the respondents reported hearing impairment and the remaining 28 (8.8%) experienced a variety of impairments such as sensory processing disorder (SPD), auditory processing disorder (APD), autism, dyslexia, schizophrenia,

depression, anxiety, and trauma which were loosely categorised as "cognitive/sensory" impairment. Three respondents (0.9%) did not identify their type of disability and were categorised as "Other".

Figure 2 shows the range of assistive devices used by the 212 respondents with mobility impairment.

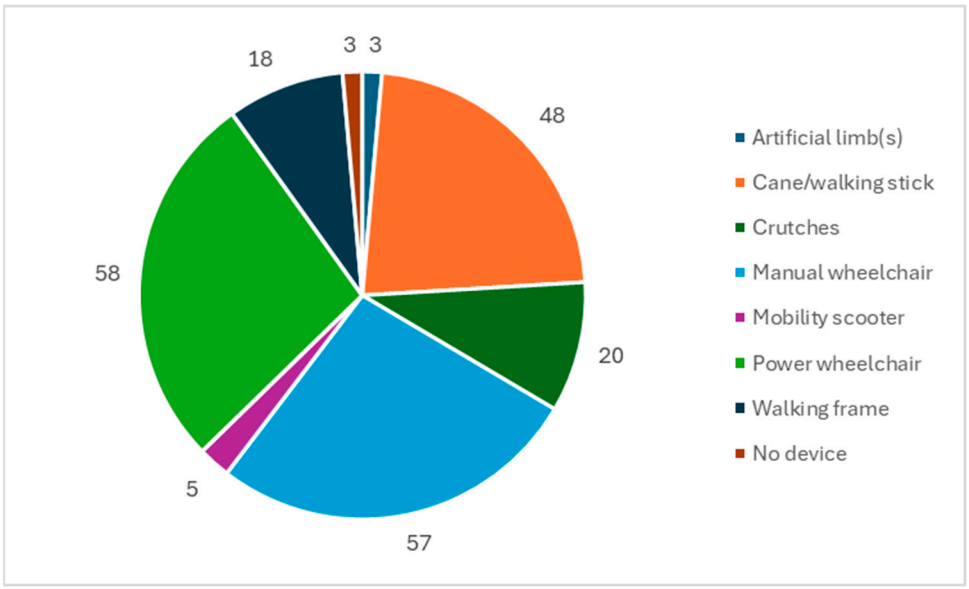

Figure 2. Type of assistive device for respondents with mobility impairment (N = 212).

Respondents with mobility impairment were predominantly wheelchair users (54%), with approximately equal numbers using mobility scooters and manual wheelchairs. The next most common assistive device was a cane/walking stick.

The survey collected data on the following:

1. Ease of access of 29 different types of public buildings or spaces (Table 2) using a 5-point Likert scale where 5 is Very Hard; 4 is Hard; 3 is Ok; 2 is Easy; and 1 is Very Easy. Respondents could choose an additional option: "I do not go there".
2. Open-ended responses to the most challenging aspect outside or around buildings.
3. Open-ended responses to the most challenging aspect of the building entrance.
4. Open-ended responses to the most challenging aspect inside the building.
5. Open-ended responses on the top priority for improving access to the built environment.

Table 2. Types of public buildings or spaces considered in the survey.

Type	Type	Type	Type	Type
Supermarket	Bar	Government office	Airport	Museum/gallery
Shopping mall	Doctor's office	Community centre	Bus stop	Boutique shop
Hospital	Dentist	Hotel/motel	Train station	Pharmacy
Marae [1]	Petrol station	Church	Cinema/theatre	Dairy [2]
Hairdresser	Bank	Sports stadium	Gym	Public toilet
Restaurant	Post office	Park/garden	Library	

[1]: A Māori religious and community place; [2]: New Zealand name for a small grocery shop.

The open-ended response data were manually examined to remove nonvalid responses and arranged within common themes, with a simple count of comments in each theme. The survey results are presented in the following section.

3. Results

This section reports the respondent demographics, survey responses relating to difficulty accessing different types of public buildings and spaces, significant barriers outside, at the entrance and inside buildings and the priorities for improving the access experience.

3.1. Demographics of the Respondents

Aside from the disability type discussed in Section 2, the survey collected demographic information on age, gender, ethnicity, gross income, work status, living situation and health status. Overall, 55% of respondents were female, 32% were male and the remainder did not identify their gender. Respondents were primarily European (74%), Māori (9%) and other ethnicities (such as African, Pacific Islander, and Asian). Of the 280 respondents who reported their living situation, 65% lived with family or friends, 32% lived alone and 3% lived in residential care facilities. Table 3 summarises the remaining demographics, namely, age, gross income, work status and health status.

Table 3. Demographics of the survey respondents with number of respondents (N).

Demographic	N	Category and Percentage			
Age (years)	291	18–24 4.5%	25–44 45.0%	45–64 33.0%	65–86 17.5%
Gross Income (1000 NZD)	252	<30 23.8%	30–59 22.6%	60–99 26.6%	>100 27.0%
Work status	270	Full time 34.5%	Part time 24.8%	Unemployed 20.7%	Retired 20.0%
Health status [1]	285	Mostly well 29.1%	1–2 p.a. 22.5%	4–12 p.a. 35.1%	In-home care 13.3%

NZD: New Zealand dollars; [1]: Categories are "Mostly well" meaning rarely visiting a doctor, "1–2 p.a."—meaning visiting a doctor 1–2 times per annum; "4–12 p.a."—meaning visiting a doctor every 1–3 months; and "In-home care"—meaning health professional/caregiver visits regularly.

Of the respondents, 78% were 25 to 64 years old. There was a fairly even distribution of income, work status and health status across all respondents. However, as mentioned in Section 2, most (66.5%) respondents reported mobility impairment, followed by vision impairment (18.8%) and hearing impairment (5.0%). People with impairments related to sensory and cognitive conditions may find surveys too challenging unless additional efforts are made to increase their participation [52].

3.2. Ranking Different Types of Public Buildings by Difficulty of Access (Research Objective One)

Figure 3 shows the perceived difficulty in accessing different types of public buildings ranked by all respondents from most difficult (sports stadium) to least difficult (supermarket), expressed on the 5-point Likert scale.

The ten least accessible building types are, in order of difficulty: sports stadiums, bars, boutique shops, public toilets, maraes (Māori community places), gyms, motels/hotels, dairies/small corner shops, bus stops, and theatres/cinemas. The most accessible places are supermarkets, followed by libraries, shopping malls, doctor's offices and pharmacies.

The number of respondents varied for each building type because the survey offered an additional response of "I do not go there". Figure 4 shows the percentage of respondents who did access each type of building. The survey did not investigate the frequency of access to the different types of spaces. People visit certain places, such as supermarkets, more frequently than others, for example, airports and sports stadiums. Frequent access to particular types of spaces might make the person more familiar with that environment and lead to them having a perception of a more accessible space.

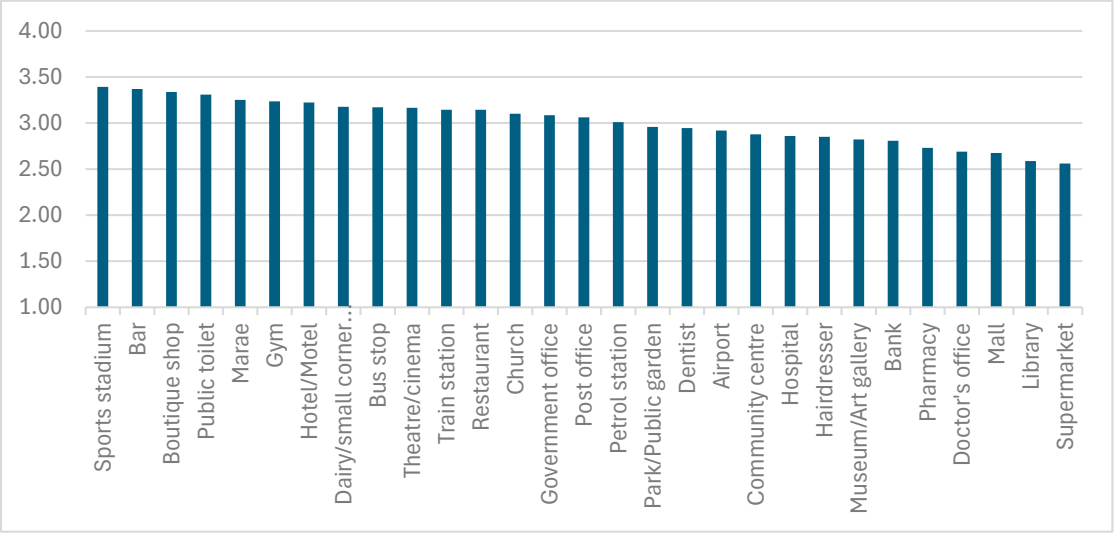

Figure 3. Ranking of perceived accessibility of different building types from hardest to easiest.

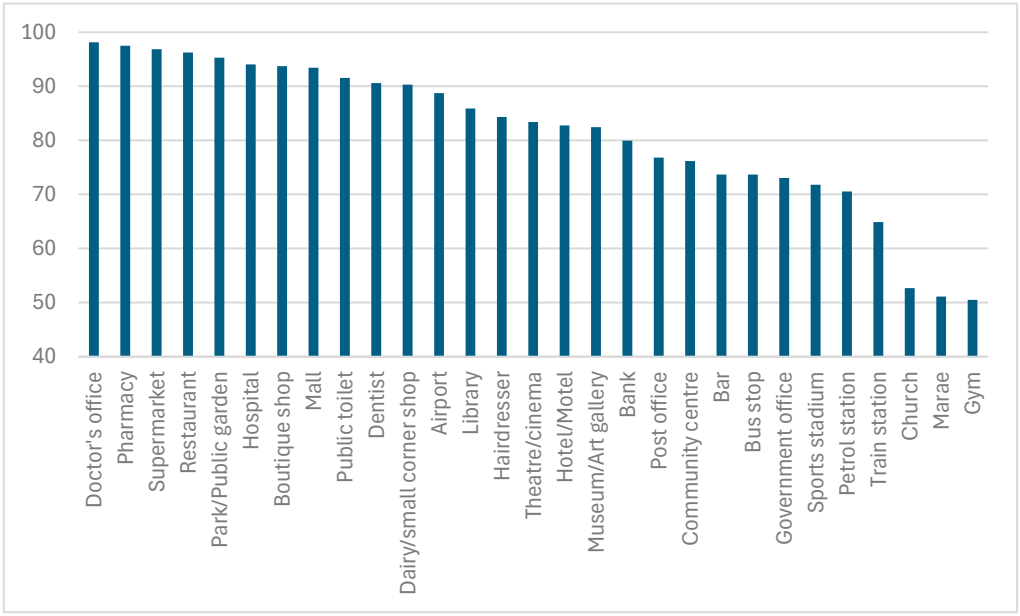

Figure 4. Percentage of respondents accessing the different types of building.

Only about half of the respondents visited gyms, churches and maraes but this could either be from personal choice or from perceived access difficulty.

An important distinction needs to be made between the results reported here and published studies on accessibility for a single building type (such as those listed in Table 1). The latter research considers factors such as the location, age and condition of the building since these affect accessibility. For example, new buildings and buildings that have been recently renovated are generally more accessible. In the research reported here, these factors are not considered since the aim is to capture the perception of average accessibility of different types of public spaces over all locations, ages and conditions. The survey participants (people with different disabilities) live anywhere in New Zealand and are not usually aware of the age or renovation status of the public spaces.

3.3. Accessibility Challenges for People with Mobility Impairments

The cohort of people with mobility impairment numbered 212 and wheelchairs were the most commonly used assistive device, followed by walking sticks (Figure 2). Their per-

ceived main barriers in accessing public buildings are discussed in Sections 3.3.1 and 3.3.2 presents the respondents' priorities for improving their access.

3.3.1. Main Barriers Outside, at the Entrance and Inside Buildings (For People with Mobility Impairment)

Respondents reported their main barriers outside, at the entrance and inside the buildings (Tables 4–6, respectively). They could report multiple barriers, so the number of comments varies. The number of responses (N), the number of comments (C) and the percentage of comments related to each type of barrier are stated. Barriers that were mentioned in fewer than 10% of the comments are categorised as "Other".

Table 4. Ranking by people with mobility impairment of barriers outside buildings (N = 190; C = 362).

Rank	Barrier	%	Comments
1	Paths	22.2	Cracked, potholes, rough (gravel), poorly maintained.
2	Accessible parking	13.1	Missing/too few, inadequate van/lift clearance (particularly overhead in covered parking), too far away, on a slope.
3	Obstacles on paths	12.1	Bollards, trolleys, scooters, cars over footpath, recycling bins, gutters, planters, people.
4	Travel distance	12.1	Too long, too far from accessible parking to the ramp or from the ramp to the entrance, more seating needed.
5	Curb cuts	11.1	Missing, too high, poorly maintained.
6	Wayfinding	11.1	Too complex, inadequately sign posted or marked, no pedestrian crossing/unsafe (exposure to cars), no path from accessible parking to footpath.
7	Other	18.3	Steps: No handrail (especially necessary when wet), no markings. Ramps: Too steep, missing, placed at rear of building or not obvious, access to ramp blocked. Traffic: No protected path, wheelchairs are low and not visible to traffic. Exposure to weather makes everything harder.

The most reported barrier outside buildings (Table 4) is the condition of the path; rough surfaces, cracks and potholes are problematic. This is followed by difficulties with accessible parking (not available, inadequate clearance, too far away), navigating around obstacles, lengthy travel distance, inadequate curb cuts and suboptimal wayfinding (poorly marked, unsafe).

The main problems with the entrance to buildings (Table 5) is the door itself; both in terms of type of door (too heavy, too narrow, poorly marked, closing too quickly) and the access control. Obstacles such as steps, thresholds, mats and plants make the entrance harder to use.

Barriers inside buildings (Table 6) are most commonly narrow paths and obstacles (primarily merchandise stands). Poor signage makes navigation difficult, and more rest areas are needed. People in wheelchairs struggle to reach counters and shelves. There is inadequate provision of accessible bathrooms with easy-use doors, adult changing facilities, good clearance space and proper maintenance. A noteworthy finding is that many of the stated barriers related to other types of disabilities indicating that while many people (66% of all survey respondents) have a mobility impairment, they also have other impairments

(related to vision, hearing and sensory conditions). This reinforces the importance of addressing accessibility issues for all types of disability.

Table 5. Ranking by people with mobility impairment of barriers at entrance to buildings (N = 188; C = 346).

Rank	Barrier	%	Comments
1	Door type	27.2	Too heavy (especially fire doors), transparent/poor contrast doors are hard to see, double doors where one is locked and it is not obvious which door to use, revolving doors are a health/safety risk—wheelchairs can get jammed in there, automatic doors close too quickly.
2	Obstacles	20.7	Steps or objects in front of entrance, high threshold/lip, uneven surface, mats, plants obscuring handrails.
3	Access control	18.5	Manual door is difficult/hard to push, hard to locate/grip the handle (e.g., when using a walking stick), complex controls, opening in/out is hard to determine.
4	Width	17.4	Too narrow, not enough clearance
5	Other	16.2	Finding entrance: Poor/no sign to show where it is, incorrectly labelled as wheelchair accessible. Ramp: Missing or not in an obvious place near the entrance.

Table 6. Ranking by people with mobility impairment of barriers inside buildings (N = 190; C = 362).

Rank	Barrier	%	Comments
1	Narrow aisles	21.8	Insufficient space to move/turn.
2	Obstacles in paths	18.8	Merchandise display stands, people, furniture.
3	Wayfinding	14.9	Complex layouts, lack of or poor signage/instructions, accessible bathrooms hidden.
4	Lifts/stairs	9.9	No lifts, buttons/card reader hard to reach, too narrow to turn, stairs without handrails.
5	Other	34.6	Shelves/counters/card readers: unreachable (too high, especially sliding doors on top of refrigerator cabinets), inadequate clearance. Related to other disabilities: Vision (lighting, small font on notices), stroke (one-sided queues), hearing (unable to follow verbal instructions), sensory (lighting, noise). Rest areas: no/few seats in waiting areas and on long paths, inadequate space for wheelchairs. Accessible bathrooms: Not available, inadequate clearance, not maintained, no adult changing facilities, problematic doors. Path surface: Slippery, highly polished, thick carpet, too steep. Emergency escape route: difficult to find and use, heavy fireproof doors. Rude people, poorly designed furniture (no clearance for wheelchair).

3.3.2. Priorities for Improved Accessibility (For People with Mobility Impairment)

Respondents were asked: "What is the one thing (related to building access) that you would fix that would make things easier for you?"—179 people with mobility impairment responded to this question; 158 making one or more specific comments (Table 7), while the remaining 21 made general comments such as:

- All design should be Safe, Obvious and Step-free (SOS);
- Adopt Universal Design in all buildings, not as an afterthought;
- Consult with the community;
- Make access a law for all public buildings—give building owners two years to comply;
- Provide online accessibility information for venues to help with planning.

Table 7. Ranking by people with mobility impairment of priorities for improved building accessibility (N = 158; C = 220).

Rank	Priority	%	Comments
1	Doors	32.8	Should open automatically with adequate open time, wider doors, clear indicators for direction of opening, level path in/out of doorway, button operated fire doors, doorbell or intercom assistance, Braille instructions.
2	Diverse impairments	15.6	Many people with mobility impairment also have other impairments (e.g., sensory, neurodivergent, deaf, vision, age-related, etc.).
3	Aisles/paths	12.5	Wide enough, clear of objects, level, smooth non-slip surface, no thick pile carpet.
4	Ramps	10.9	Available at all entrances where there are stairs, with handrails, not too steep.
5	Other	28.2	Wayfinding: clear signage with large text, multi-mode instructions (pictorial, Braille, audible, screen display), large entrance/exit signs visible from a distance, safe from cars. Stairs/lifts: handrails on stairs, clear instructions on how to operate lifts, accessible lift controls, adequate lift space. Rest areas: more seating, especially in waiting areas and on long travel distances. Accessible bathrooms: with adult changing station, adequate space, easy-open doors, well-maintained. Provide physical access that does not rely on a keycard or provide quick assistance.

Doors that are easy to open (particularly automatic ones) are the top priority, followed by wide, clear paths with level, smooth, non-slip surfaces and the provision of ramps at or near all entrances. The respondents require ramps to be not too steep and fitted with handrails. Other areas for improving accessibility are clearer signage, better lifts and stairs, more seating and more accessible bathrooms with adequate space, adult changing facilities, and proper maintenance. A significant finding is that many of the priorities were related to multi-dimensional disabilities.

3.4. Accessibility Challenges for People with Vision Impairments

The 60 survey responses from people with vision impairment on their accessibility challenges outside buildings, at the entrance to buildings, and inside buildings are given in Section 3.4.1 (Tables 8–10, respectively). Section 3.4.2 describes the respondent's priorities for improving access to buildings.

3.4.1. Main Barriers Outside, at the Entrance and Inside Buildings (For People with Vision Impairment)

Tables 8–10 show the results of thematic analysis of the responses of the 60 respondents with vision impairment on the main barriers outside, at the entrance and inside buildings, respectively. Some participants did not respond, so the number of respondents (N) varies. Responses in other languages (mostly Chinese) were translated into English using Google Translate. Some respondents cited more than one barrier, so the number of comments (C) varies. If a barrier was mentioned in fewer than 10% of the comments, it was categorised as "Other".

The greatest challenge outdoors (Table 8) is obstacles in the path, either from the condition of the path itself (having a rough surface and being poorly differentiated) or from people, cars, signs, display stands and other objects. Wayfinding and signage are other major challenges. Respondents report being unable to find the main entrance, correct door, steps, and ramps because signage is missing or inadequate (with small text) and because there is low colour contrast (for example, doors blend in with walls). The addition of better signage (including Braille and audio signs), bright lighting, tactile marking and good colour contrast would reduce this challenge. Safety is a priority, and the outdoor environment should be designed in a way that keeps people safe from traffic and other obstacles. Finally, people who have vision impairment report feeling self-conscious and isolated as they interact with other people.

Table 8. Ranking by people with vision impairment of barriers outside buildings (N = 56; C = 75).

Rank	Priority	%	Comments
1	Obstacles in path	34.7	People, traffic, uneven paths, potholes, unmarked steps, steps without a handrail, curbs, signs/displays, animals, tables, construction zones, bridges.
2	Wayfinding	32.0	Difficulty finding: the route, main entrance, correct door, a safe route (avoiding cars), the correct building itself, steps, ramp.
3	Signage	10.7	Absence of large signage indicating the entrance (both at the door and at the footpath showing the direction to the door), unclear/small signs (for directions, parking restrictions and safety warnings), signs with poor contrast, few/no Braille or audio cues.
4	Other	22.7	Doors: poor contrast with surrounds (particularly glass ones). Safety concerns: no footpaths or pedestrian crossings, walking amongst cars. Poor colour contrast, inadequate lighting, weather (such as rain or snow) obscures obstacles and makes surfaces slippery, poor screen readability, limited tactile markings, feeling judged by people, getting assistance, social isolation.

People with vision impairment prefer wide, automatic-open doors that do not require an access card or pin to operate (Table 9). The entrance itself should be clearly marked, particularly when it is identical in appearance to the façade of the building. Other challenges are perceived dim lighting (as eyes adjust from sunlight outside) directly inside the entrance, obstacles (such as threshold lips/steps, plants, people, canopies) in the entrance, narrow entrances, and lack of appropriate signage.

Table 9. Ranking by people with vision impairment of barriers at entrance to buildings (N = 55; C = 78).

Rank	Priority	%	Comments
1	Access control	29.5	Complex manual/automatic door control (e.g., fitted with a child lock, requiring security card, pin code or phone to access), knowing whether glass sliding door is open/which way it slides, locating door handles, unmarked opening direction, sudden and loud alarms on doors.
2	Finding entrance	21.8	Identifying entrances that match the façade, unmarked doors/doors without signs (particularly café/restaurant doors).
3	Door type	19.2	Heavy manual doors are hard to open (particularly when using a guide dog, wheelchair or walker), narrow doors, revolving doors are very difficult, unmarked glass doors, low-contrast doors.
4	Obstacles	16.7	Entrance steps (particularly unmarked and without handrail), entrance lip, people, objects (plants, benches, debris) near the door, and weather barriers (e.g., vestibules, awnings, or canopies) that obscure the doorway.
5	Other	12.8	Dim lighting (relative to outdoors) obscures obstacles and makes it hard to see signage, getting assistance, signs/directions near the entrance with small text, inadequate tactile marking and braille, slippery entrance surface.

Table 10. Ranking by people with vision impairment of barriers inside buildings (N = 56; C = 92).

Rank	Priority	%	Comments
1	Wayfinding	33.0	Few navigation cues or directions (to show position of reception desk, merchandise, counter, queue line, lift, stairs, accessible bathroom), complex layout, no receptionist/person to assist, only vision-based information.
2	Signage	14.3	Inadequate signs/screens (small text, poor contrast), black tape barriers at airports (yellow tape is more visible), lack of audible/tactile signage.
3	Obstacles	14.3	People, steps (particularly unmarked), escalators, furniture, doors, debris, construction materials.
4	Paths	11.0	No/unmarked walkways (especially in large open spaces), shiny/patterned floors, narrow paths (through people moving in different directions, or restaurant tables), uneven floors, moving walkways.
5	Other	27.4	Lifts: locating them, no braille/audible information, out of service. Lighting: too dim (especially in restrooms), too variable. Service: Lack of reception/staff to assist. Miscellaneous: few rest places, poor acoustics (loud background noise or echoes), sensory overload, poor air quality (from smoking or chemicals), guide dog-prohibited.

Inside the building, the main challenges (Table 10) relate to complex wayfinding, poor signage and obstacles in the paths. Paths should be clear, wide enough to accommodate a

guide dog, well-differentiated, plain matte surface, and have tactile marking (particularly in large open spaces). Signage should be both visual (with large text) and non-visual (braille or sound-based) and include directions to the lift, restroom and service area. Trained assistants, seating areas, good acoustics (low background noise and no echoes) and good lighting would improve the experience inside public buildings.

3.4.2. Priorities for Improved Accessibility (For People with Vision Impairment)

Only 37 of the 60 people with vision impairment responded to the question "What is the one thing (related to building access) that you would fix that would make things easier for you?", with some describing more than one priority. The specific priorities are summarised in Table 11. General comments were:

- Consider safety, predictability and reliability;
- Unfortunately, there isn't only one thing;
- While physical access has improved, little has been done for access for blind people; Better signage would help but one needs to know it's there and where it is; feeling around the walls is not "a good look" and is not helpful;
- Acceptance of and provision for guide dogs;
- Provision of affordable public transport;
- More accurate entrance location on Google Maps.

Table 11. Ranking by people with vision impairment of priorities for improved building accessibility (N = 37; C = 47).

Rank	Priority	%	Comments
1	Wayfinding	31.9	Use a standardised layout (e.g., prominent entrance, no steps near doors, identification signs on doors), simple navigation paths, audible or tactile navigation cues, non-shiny flooring (plain, matte finish is best), more detailed layout maps.
2	Signage	17.0	High contrast, large text instructions, tactile and braille signage.
3	Doors/ entrance	12.8	High visibility handle, good contrast with background, clearly labelled, blind-friendly markings on glass doors, automated doors, distinct ramp near main entrance.
4	Obstacles	10.6	Reduced exposure to hazards (e.g., traffic, sharp corners, hard surfaces, moving doors, display stands), clear paths, well-differentiated steps (with good colour contrast), standardised emergency protocols.
5	Assistance	10.6	Prominent service area, tactile ridge for paths through large spaces, audible/braille directions to key facilities (assistance, queue line, toilets), audio descriptions.
6	Other	17.1	Stairs/ramps/lifts: Stairs with uniform height and tread depth, adequate handrails (particularly at direction changes, extending to the end of the last step, at hand-level); more ramps; and verbal cues for lifts. Accessible restrooms: standardised layout (fixed position of rails and dispensers) and lock type, more available, restricted use (e.g., with a universal key).

Safety, predictability and reliability are important to people with visual impairments in accessing public buildings. Paths should follow simple layouts, keep people safe from cars and other obstacles and should have tactile marking. Uniform, well-differentiated steps with continuous handrails and lifts with braille or audible messages are essential. Key building features should be clearly marked, with good colour contrast. Instructions and directions should be given in large text, braille and audible format. Restroom layout should be standardised. Low background noise, good lighting (adequately bright but without glare), and plain, matte flooring will all help people with vision impairment to access buildings.

3.5. Accessibility Challenges for People with Hearing Impairments

Only 16 of the 319 survey respondents were people with hearing impairment and, of these, two reported other impairments related to brain injury and trauma. The limited data prohibited thematic analysis, but the main findings are discussed below. The cohort commonly reported feeling anxiety, depression and low self-esteem in describing their experiences accessing buildings. Several respondents reported barriers associated with other types of impairments, such as mobility- and vision-related.

3.5.1. Main Barriers Outside, at the Entrance and Inside Buildings (For People with Hearing Impairment)

Twelve people with hearing impairment provided a total of 14 comments on their perceived barriers outside buildings. These included safety concerns from being unable to hear traffic and traffic signals, difficulty getting assistance (being unable to hear the response) and inadequate support for people with hearing impairment at cultural/entertainment, education and sports places.

The main barrier at the entrance to buildings (N = 12, C = 14) arose from locked entrances with inaudible voice message instructions and no alternative communication such as screens or printed text. A call button usually summoned verbal assistance but again, this was not helpful.

Inside buildings (N = 14, C = 17), challenges arose from inaudible public announcements and assistants only being unable to communicate verbally. Background noise from music, machines and construction interfered with the respondent's ability to hear and electrical noise disrupted hearing aid function.

3.5.2. Priorities for Improved Accessibility (For People with Hearing Impairment)

The top priorities for people with hearing impairment (N = 11, C = 11) include use of visual/electronic displays of all messages, showing item prices (since they cannot ask and hear a person's response), and provision of vision-based assistance from building staff. They also wanted more accessible restrooms.

3.6. Accessibility Challenges for People with Sensory, Cognitive and Neuro-Diverse Impairments

Twenty-eight of the survey respondents reported a wide range of impairments not related to mobility, vision or hearing, such as pain, sensory processing disorders, autism, cognition, autoimmunity, speech, brain injury, anxiety, depression, fatigue and multi-dimensional age-related problems. The impairments included both acute/permanent and chronic/variable issues. For convenience, and without intending to marginalise any type of impairment, these respondents are referred to as people with sensory/cognition impairment. The results from thematic analysis of the comments by these respondents are summarised below.

3.6.1. Main Barriers Outside, at the Entrance and Inside Buildings (For People with Sensory/Cognition Impairment)

Twenty-two respondents provided 31 comments on their perceived barriers outside buildings. The main barriers were wayfinding and obstacles in the path. Other challenges related to lack of accessible parking nearby and anxiety (about parking/transport to places, danger, unfamiliar environments and noise).

The main barriers at the entrance to buildings (N = 21, C = 26) arose from locating the entrance and confusing signage/instructions. Additionally, people, noise and unfamiliarity were anxiety-triggering issues.

Inside buildings (N = 24, C = 39), challenges arose from wayfinding (understanding directions/instructions) and obstacles in the path that were mostly related to sensory issues, such as crowds, noise (electronic beeping and crowd noise), bright colours, lights (too bright, flashing, flickering or humming), smells, and close spaces (such as queues). People with sensory/cognition impairment also struggled with social anxiety, self-consciousness, insecurity and fatigue.

3.6.2. Priorities for Improved Accessibility (For People with Sensory/Cognition Impairment)

The top priority for improving the experience of people with sensory/cognition impairment (N = 25, C = 32) was improved wayfinding with better signage (simple, unobstructed, English/universal picture) for directions and for place markings. The second priority related to the sensory environment, with either a scheduled period with low/no background noise and dimmer lighting, or a separate "quiet room" with dim lighting, acoustic insulation and muted colours where they could recover and rest. People with sensory/cognition impairment also wanted safe paths (non-slip surfaces, no loose mats), more seating, more assistants trained in different types of non-physical impairments and online information about the environment so that they could prepare (for example, bringing ear protection for noisy spaces).

4. Discussion

The survey respondents ranked their perceived difficulty accessing different types of public buildings (research objective one). The ten least accessible building types are, in order of difficulty: sports stadiums, bars, boutique shops, public toilets, maraes (Māori community places), gyms, motels/hotels, dairies/small corner shops, bus stops, and theatres/cinemas. The most accessible places are supermarkets, followed by libraries, shopping malls, doctor's offices and pharmacies. Not all respondents visited all types of buildings; only about half of the respondents went to gyms, churches and maraes, but this could either be from personal choice or from perceived difficulty of access.

Respondents (with all types of disabilities) reported their main barriers outside buildings, at the entrance to buildings and inside buildings (research objective two). The priorities for improving accessibility (research objective three) include the following:

- Outside buildings: Keep paths short (or provided with seating), smooth, wide, properly differentiated, clear of objects, well-maintained (no cracks and potholes), safe from cars, and with adequate curb cuts. Provide enough accessible parking spaces with adequate clearance (including overhead). Use direction and information signs for all important features, such as parking, main entrance, and ramps. Signage should be inclusive, i.e., in large text, braille, universal images, and audio messages.
- Building entrances: Use automatic- or easy-open doors, that are prominent, remain open long enough, and are clear of obstacles such as steps, lips, canopies, notice boards, mats and plants. Avoid card/pin access control systems and call button assistance

that is non-inclusive (for example, requiring the person to have quick responses, good vision or good hearing). Provide stairs and ramps (not too steep) with handrails close to the entrance. Increase light level in the entrance to accommodate eyes adjusting from sunlight outside.

- Inside buildings: Use simple layouts with clear and inclusive navigation and information signage (easy to understand, visual, braille and audible) for all key features (such as the reception/assistance area, lifts, and accessible bathrooms) and for public announcements. Keep paths level, smooth, non-slip, plain matte finish, well-differentiated (e.g., with tactile marking), clear of obstacles (particularly display stands) and adequately wide. Use clear markings and continuous handrails on stairs and ensure that lifts have adequate space and inclusive operation/information. Provide accessible bathrooms with easy-open doors, standard layout, adult changing facilities, good clearance space and regular maintenance. Control lighting and acoustics to minimise glare, flashing/strobing lights, beeping and loud noises and provide seating/rest areas, particularly where people need to walk far or stand for long periods.

Some requirements vary depending on the type of impairment. People using wheelchairs should be able to reach counters and shelves. Good colour contrast and accommodation for guide dogs helps people with vision impairment. Installation of hearing loop systems that transmit audio directly to hearing aids in entertainment, education and sports facilities improves the experience of people with hearing impairment. Controlling the sensory environment either through scheduled times, during which lights are dimmed and background noise is lowered, or provision of a separate quiet space helps people suffering from sensory overload. Finally, educating assistants on how to interact with people with a range of disabilities will make the built environment more inclusive for everyone.

Previous studies have similar findings. Common accessibility barriers are poor/non inclusive direction and information signage [21,53]. Entrances should have automated doors and nearby ramps [14,54]. Adequate, well-maintained accessible bathrooms are essential [55–57]. Finally, research shows that inclusivity is greatly enhanced when assistants are properly trained to help people with different disabilities [58].

There are some limitations in this research. Firstly, two-thirds of the survey respondents reported mobility impairment, heavily skewing the findings to this demographic. Few (7%) of the respondents reported sensory/cognitive/neurological impairments, and they demonstrated a wide variation in their conditions. These types of disabilities are seldom addressed in access-related research [19,59], but there are some cases where their needs are considered [23,24]. Future research should actively target solutions for non-physical types of impairment.

5. Conclusions

A panel of experts (people with a lived experience of many different disabilities) co-designed a survey on the experiences of people with disabilities accessing a wide range of public places in the New Zealand context. Over 80% of the 319 survey respondents had mobility- and/or vision-related impairments, while the remainder reported hearing impairment and a wide range of sensory/neurological/cognitive impairments. Access was most difficult in places such as sports stadiums, bars, boutique shops, public toilets, maraes and gyms, which indicates where improvements in inclusivity are most needed. Only about half of the respondents ever visited gyms, churches and maraes either because of personal preference or perceived access difficulty. Supermarkets, libraries, shopping malls, doctor's offices and pharmacies were easiest to access.

The main challenges in accessing New Zealand's built environment were identified for different types of disabilities. Top priorities for improving outdoor accessibility related to paths, curb cuts, seating, accessible parking spaces and inclusive direction and information signs (in large text, braille, universal images, and audio messages). Entrances to buildings should have easy-open/automatic doors, that are clear of obstacles and avoid non-inclusive access control systems. Stairs and ramps (not too steep) with handrails should be close to the entrance. Building interiors need simple layouts with clear, inclusive navigation and information signage for all key features (such as the reception, lifts, accessible bathrooms) and for public announcements. Other priorities related to user-friendly paths, well-marked stairs continuous handrails, spacious lifts with inclusive operation/information, more and better-equipped accessible bathrooms, rest areas and control of the lighting and acoustics. Certain priorities are specific to the type of impairment. Counters, shelves and refrigerators need to be usable by people in wheelchairs. Good colour contrast helps people with vision impairment and hearing loops at entertainment and education venues facilitates use by people with hearing impairment. Quiet, low-lit environments are easiest for people with sensory difficulties and can be provided either on a regular schedule, or via a separate room.

Unlike other studies that focus on a single impairment and accessibility issues in one type of building, this research presents a holistic view of access to New Zealand's public built environment from the perspective of people with widely varying disabilities. Disability is very common, particularly amongst older people, and it can affect everyone whether it be temporary or permanent and directly or indirectly through family and friends. Provision of an inclusive built environment helps reduce the negative impact of disability on quality of life. This research outlines ways to improve accessibility, making cities and communities more inclusive and enjoyable for everyone.

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Abbreviations

The following abbreviations are used in this manuscript:

APD	Auditory Processing Disorder
APP	Accessibility Partnership Panel
SDG	Sustainable Development Goals
SPD	Sensory Processing Disorder
UN	United Nations
UNCRPD	United Nations Convention on the Rights of People with Disability
WHO	World Health Organization

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