

Participatory Interventions: Digital Crowd Mapping Perceptions of Safety in Public Space

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Abstract

Current estimates indicate the world will not achieve the United Nations SDG #5 of gender equality by 2030, with a more accurate prediction post-2300. Escalating global crises have brought existing gender disparities into sharper focus, exacerbating issues of unequal access and opportunity. These conditions make the prioritisation of gender equality imperative to the sustainable development of cities, regions, and rural communities. This article presents a case study of the YourGround project, which utilises an interactive, geolocative digital crowd-mapping platform as a participatory method to gather insights into perceptions of safety among women and gender-diverse people in public spaces in Australia’s two most populous states, Victoria and New South Wales. The data and insights from YourGround provide city planners, urban designers, and community members, with a gender-sensitive lens developed by the expertise of people from the community. This method of data collection and feminist co-design democratises the research process, amplifies marginalised voices, and avoids the hazards of technocentrism and top-down approaches. The findings underscore the nuanced and context-specific nature of gender inequality in public spaces, highlighting the pervasive impact of social and environmental factors on safety perceptions and access in both urban contexts and rural areas.

Keywords

digital crowd mapping; gender equity; public participation; public space; sustainability

1. Introduction

In 2023 the United Nations report on progress towards the 2030 SDGs recorded weak achievements on many of the targets, including those for SDG #5, on gender equality (United Nations, 2023, pp. 22, 62). SDG #5 states that “gender equality is not only a fundamental human right but a necessary foundation for a peaceful, prosperous and sustainable world” (United Nations, 2015a). Gender equality includes the right and ability to access public space, which is key for participation in many aspects of daily life, from education, work, health, social, and other essential services to leisure and social activities and opportunities (Whitzman et al., 2013). In order to feel free to access public spaces, people need to feel safe, included, and welcome. However, women and gender-diverse people tend to experience public spaces very differently from men and may feel neither safe, included nor welcome (Kalms, 2023; Sheffield, 2020, p. 192; Valentine, 1989). Consequently, many restrict their movements in public spaces and, in particular, exclude themselves from certain areas at certain times (Koskela & Pain, 2000; Vera-Gray, 2018).

Addressing gender equality in public spaces requires innovative methods including listening to those whose voices are not always heard in urban design. The soliciting of the everyday lived experiences of women and gender-diverse people reveals spatial inequities in cities and facilitates understanding of diverse needs (Beebeejaun, 2017). In this article, we draw on two iterations of an Australian social research project, YourGround, a crowd-mapping social survey designed to unpack some of the reasons for feelings of safety and inclusion in particular kinds of locales by women and gender-diverse people, and what they think can be done about it.

1.1. SDGs: Gender Equality

One of the targets for the gender equality goal (SDG #5) is “the elimination of all forms of violence against all women and girls in public and private spheres” (United Nations, 2015a). In 1987, sociologist Liz Kelly identified a continuum of men’s violence against women from sexual harassment to rape and detailed how all forms are interconnected (Kelly, 1987). Kelly also described the accumulating effect of violence, which means that violence experienced in private will impact the sense of safety in the public sphere (see also Koskela, 1997). In particular, sexual harassment is especially effective in rendering public spaces uncomfortable and frightening for women as it reminds women of their vulnerability to violence (Bowman, 1993; Vera-Gray, 2018). Harassment is a common experience for women and gender-diverse people in public spaces across the world (Sheffield, 2020). Women’s fear of men’s violence in public spaces is sometimes dismissed as irrational, but it is a rational response to a lifetime of exposure to potential and actual violence (Bowman, 1993; Vera-Gray, 2018; Whitzman, 2007).

A second target of SDG #5 is ensuring “women’s full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life” (United Nations, 2015a). This includes the ability to have a say in the design of public spaces and for those spaces to accommodate their needs. Public spaces have historically been designed for and planned by men, supporting and prioritising men and their activities (Criado-Perez, 2019; Kalms, 2023; Kern, 2019). This situation reinforces gender norms and inequality. An example is travel infrastructure—such as road networks and public transport—which tends to support the movement of men commuting to and from employment (Loukaitou-Sideris, 2016; Matthewson & Kalms, 2021). Women, however, are more likely to have complex travel patterns and make frequent and

shorter trips for a range of activities related not just to employment, but also to meet family and household needs (Sánchez de Madariaga, 2013). In addition, they use public transport and walk more than men (Goel et al., 2023). Public toilets are another example of the gendered nature of the built environment, with the queues for women's toilets a commonplace frustration in the developed world (Anthony & Dufresne, 2007).

At least two more of the United Nations SDGs are involved in or impacted by perceptions of safety and accommodation for women in public spaces: SDG #3 on good health and well-being and #11 on sustainable cities and communities. First, just being in a public space can be stressful for many women and girls to the extent that it can outweigh the benefits of being there. This self-exclusion impacts the broader health and well-being of women in terms of accessing education, employment, and health services, but it also affects their ability to exercise or partake in active transport easily. Second, SDG #11 reinforces the importance of exercise and leisure with a stated target of providing “universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities” (United Nations, 2015b). In addition, feelings of unsafety in public spaces prevent women and gender-diverse people from developing stronger social and community connections that provide everyone with a sense of social belonging and inclusion, which is vital to sustainable communities (Dempsey et al., 2011).

2. Method

The case studies in this article are part of the YourGround project in Australia developed by the XYX Lab at Monash University and digital consultancy CrowdSpot since 2020. YourGround was a crowd-sourced social research project that used geo-locative crowd mapping to understand the equity of access to and use of public spaces. YourGround Victoria (YG-V) focused on surveying women undertaking exercise and recreation activities (XYX Lab & CrowdSpot, 2021). YourGround New South Wales (YG-NSW) broadened its scope to include all engagement by women and gender-diverse people undertaking any activity in all kinds of public spaces: from streets and parks to public facilities and transport hubs (Matthewson et al., 2024).

Datta and Ahmed (2020) discuss traditional maps as too often excluding the experiences and ambitions of women. When such maps inform policies, they automatically exclude and marginalise women constituting a severe limitation on their ease of access. Crowdsourcing is an increasingly used means of gathering information using citizens. In particular, over the last 10–15 years, fast-evolving digital technologies have offered highly innovative ways of obtaining information from the public about a wide range of matters including those to do with urban design (Finucci & Masanotti, 2023). Previous research suggests that such alternative and innovative data-gathering initiatives can draw on the voices of the marginalised, and this can help challenge barriers to participation in public spaces (Kalms, 2023, pp. 22, 84).

YourGround was web-based, accessible by digital/smart devices, and designed to reduce the barriers to engagement by using interactivity, visuals, and an intuitive interface. Easy access to the survey was critical for harvesting the stories and concerns of as wide a range of women as possible. Like other crowd-mapping surveys, YourGround offered anonymity—also important for lowering barriers to participation (Kalms, 2017). However, crowd mapping is dependent on citizens' access to the technologies. Australia does not have the limitations to accessing crowd-mapping technology that some other countries experience (Datta & Ahmed, 2020). Mobile phone usage is extensive. There are some internet coverage gaps but these are mainly in the more regional and rural areas of the country.

Participants to YourGround were able to place a pin on a precise geographic location in a public space to detail where they felt either uneasy, scared, and unwelcome, or happy, safe, and included. Once a pin was placed, the survey form appeared. Visitors to the site could peruse all the pins placed but only some of the supplied survey answers to preserve anonymity. Visitors could then contribute to the overall survey by commenting on existing pins or showing agreement by clicking the “thumbs up” button. YG-V gathered 5,533 responses comprising 3,182 pins, 683 comments, and 1,668 thumbs-up supports; YG-NSW drew on a smaller cohort total of 1,614 responses, with 1,031 pins, 191 comments, and 392 supports.

Underpinning the YourGround project is a gender approach to urban planning that is critical to making public spaces safer and more inclusive for women. Crowd mapping has been used very successfully to record specific incidents and locations of sexual violence and harassment through projects such as HarassMap, SafetiPin, and Free to Be (Chiao et al., 2021; Kalms, 2023; Plan International & XYX Lab, 2018; Viswanath & Basu, 2015). All confirm the high incidence of these events in the lives of women and gender-diverse people. However, YourGround was not designed to be this kind of reporting tool nor to be a tool for directly identifying hot spots (good and bad). Press interest in previous crowd maps run by CrowdSpot had highlighted supposed hotspots, but this approach risks obscuring the subtleties and potentials of the survey. It also risks reproducing particular urban spaces as sites of fear (Fileborn, 2021).

YourGround went beyond the sexual violence mapping projects listed above by inviting participants to describe experiences that made them feel safe and included or otherwise. In particular, it asked for details on the physical aspects of the location that contributed to the experience drawing out matters of particular concern to planners, designers, and policy makers. This acknowledges that safety is complex and extends further than the fear of sexual assault or intimidation, as important as that is, towards elements of exclusion. YourGround also allowed participants to suggest what might help improve the situation.

The YourGround surveys included open-ended questions (which allowed participants to describe in their own words their experiences and opinions), multiple-choice answer questions about safety-related experiences in public spaces, and general demographic questions. Because the survey captured respondent’s experiences in both free text and set answers, it was able to be analysed both qualitatively and quantitatively creating a rich dataset. Free-text responses were thematically analysed or coded to identify prevalent trends and provided details that the set answers could not capture. Crowd mapping can be random in who might contribute to the map and consequently, they are not necessarily representative. However, when the many stories gathered are analysed, a collective consensus is possible.

One of YourGround’s strengths was its ability to investigate multiple axes of information. A key set of the multi-choice answers listed reasons why a place might feel safe or not—these reasons were drawn from a range of research and workshopped with the partners to the projects. Participants could choose as many or as few as they liked. These “reasons for safety” could then be investigated by location types, time of day, and activities—as well as by age, demographic categories, geographic location, and other factors—generating the relative importance of the reasons for safety in different circumstances. While the concept of the two iterations of YourGround was the same, some questions and set answers differed. Some changes were in response to feedback from participants and partners, and others were a result of elements that came through strongly in the coding analysis of YG-V. YG-V provided 8–9 safety factors each for safe and unsafe pins while YG-NSW provided 13 each (Table 1).

3. Findings: How the Findings Feed Into SDG, Participatory Design, and Urban Design

What becomes clear from the findings of the YourGround project is both the complexity of planning for safety and inclusion, but also the level of universality of experiences for women and gender-diverse people in public spaces. In general, women learn to “read” public spaces for clues relating to their risk of being there (Vera-Gray & Kelly, 2020). They read both the physical and social aspects of a location for these clues. The former include the lighting, space conditions, and amenities or facilities and the latter relate to the other people present in the space—who they are, what they are doing, how many there are, and so on. Readings of public spaces are also inflected by the personal history of each woman (Yavuz & Welch, 2010, p. 2495).

3.1. Reasons for Safety and Inclusion

Participants could select from a series of provided reasons for feeling unsafe and excluded. Table 1 lists the reasons in order of frequency of selection for all participants in each iteration of YourGround. The patterns of selection shifted with demographics, situation, activity, and between the two iterations. However, some aspects remained constant.

Table 1. Reasons provided by survey.

YG-NSW		YG-V	
Safe	Unsafe	Safe	Unsafe
There are other people around	Lighting is bad	Space seems well-maintained	Poor lighting
It's easy to see what's around me	Bad vibes	Can see ahead	The behaviour of people here makes me uncomfortable
Good vibes	Feels isolated	Pathway is safe	No people around
Path condition is good (e.g., wide, even)	Hard to see what and who is around	Easy to find my way around	Hard to see what and who is ahead
Lighting is good	There are no people around	Clear exits/entrances	It feels uncared for
I know this place well	It's not well-maintained	Lighting is good	I feel trapped here
It's well-maintained	Bad stories	Buzzing/Good vibe	Bad stories here
It's easy to find my way around	Feel trapped here	Not too crowded	Overcrowded
Mobile phone coverage is good	Hard to find my way around		It's hard to find my way around
It's accessible	Inaccessible/Not fit for my needs		
There are good amenities here	Feels overcrowded		
Not too crowded	Visible security		
Visible security (e.g., CCTV, security personnel)	Mobile phone coverage is poor		

Source: Matthewson et al. (2024) and XYX Lab & CrowdSpot (2021).

First, participants selected far more of the reasons for a place feeling safe and inclusive than they did for a place feeling unsafe. Moreover, while “there are other people around” was the most commonly selected reason for feeling safe (78%) in YG-NSW, less than 1% of participants chose this reason on its own. Just 4% selected only one reason and 83% selected four or more from the list. This pattern generated an average of 5.9 reasons. In marked contrast, on the unsafe pins a much higher 20% of the participants selected only one of the provided reasons for lack of safety, with a much lower 39% choosing four or more. This created an overall average of 2.9 reasons. YG-V presented the same discrepancy: a high average of 3.85 for safe reasons compared with a 1.85 average for unsafe (7% of safe pins selected a single reason and 28% a single reason for unsafe pins).

While this result might suggest that unsafe spaces could be remediated simply by responding to that single element, it was clear that the situation was more complex than this. So, although both surveys recorded bad or poor lighting as the top reason for a place being unsafe, less than one-quarter of participants chose it on its own. This is important to unpack because “improve the lighting” is often a reflexive response to safety concerns; indeed 59% of those who offered recommendations in both iterations of the survey requested better lighting. But in their answers to the range of questions in the surveys, participants to YourGround also suggested that while lighting conditions are a strong contributing factor to their sense of safety, it is by no means the only one. The implication for urban designers and policymakers is that to design safe and inclusive public spaces they need to consider a wide range of design elements and strategies, and not rely on lighting alone to “fix” problematic spaces. Instead, no one element alone can provide a feeling of safety and inclusion—the design of public spaces for safety and inclusion will always require attention to a mix of elements.

Second, collating all the reasons selected for feeling safe and unsafe generated rankings. Table 1 lists the overall rankings but they were dynamic, shifting depending on different analytical categories. For example, poor lighting spiked for those over the age of 50 in YG-NSW but dropped to second place for those under 30 behind bad vibes. Bad vibes were also more important than lighting for street and public transport locations, for waiting and shopping activities, and for those with a migrant or refugee background. Note that with the “vibes” set answer, participants could describe any strong feeling about a location where the direct cause of that feeling might be hard to pinpoint. Isolation equalled lighting in car park areas and spiked for Metropolitan fringe locations.

In the main, these differences in rankings were a matter of degree rather than concerning discrepancies, but they do emphasise the nuanced nature of safety concerns in public spaces. Even though some of the reasons for safety or lack of safety might rank low overall, they still held significance for particular groups, locations, or activities included in the surveys. For example, YG-V found that lighting was much more critical for participants who were runners and dog walkers than it was for those doing other activities (the Victoria study restricted participants to selecting one activity). The stories from participants told us that this was often due to these activities typically being undertaken on a regular schedule before or after standard work hours—dawn and dusk times in winter—meaning that such activity was compromised during these months. The perception that darkness is an unsafe time to be in public spaces meant they felt unsafe exercising or simply did not exercise. It also means that lighting is more critical at this time of day and year. Notably, patterns of occupancy and activity in public spaces change over time—of day, week, and season. This means that perceptions of safety also change and this needs to be factored into any lighting design for public spaces.

These differing patterns of ranking for different groups, times, and the like to some extent reinforce the difficulty in planning for safety and inclusion for all women and gender-diverse people. However, they also strongly suggest that all the nominated YourGround reasons for safety and lack of safety have importance and priority for some groups at some time. They are context-dependent, varying based on individual experiences, activities, and environmental conditions. This means that urban designers need a comprehensive understanding of all the elements listed in Table 1 and the impact they have on safety and inclusion concerns.

Third, a number of the reasons able to be selected for unsafe pins strongly connect to the fear of violence from unknown men. In particular those concerned with poor visibility, limited sightlines, and wariness of isolated spaces and entrapping ones (some of the reasons for feeling safe were the opposite of these; see Table 1). In both surveys “hard to see what and who is around/ahead” ranked fourth overall. However, concerns about visibility also featured in 29% of the stories associated with unsafe pins in YG-NSW and 32% for Victoria (excluding concerns about lighting). Visibility includes awareness of places where predators could potentially hide, places where it might be possible for an opportunistic man to hide and possibly attack (feeling trapped set answers were selected on 17–20% of unsafe pins in the surveys). Visibility is critical to a sense of safety as it allows women and gender-diverse people to assess the risk of gender-based violence (Kalms, 2023, p. 199). In addition, visibility issues were recorded at higher than average levels by LGBTIQ+ participants, a reflection of the vulnerability of this group.

The calls for better lighting noted above are also because at night visibility is reduced, as well as the media often conveying the idea that “bad things happen at night” (Hubbard, 2005, p. 120). For that reason, 27% of YG-NSW specifically never went to certain locations at night (a set answer), while 15% of Victorian participants stated the same in their stories (we presume that were this a set answer this figure would have been higher).

3.2. Women Limit Their Engagement With Public Spaces

Safe and unsafe locations in YG-NSW showed distinct patterns in the types of activities participants did there (the Victoria survey only allowed the selection of one activity). Participants consistently used safe locations for multiple activities, indicating both a sense of comfort in, and versatility of, such spaces and suggesting that public spaces that encourage longer stays and diverse activities receive positive reviews. In contrast, unsafe places were predominantly used for a single activity (67%), suggesting that these locations were far less welcoming. Moreover, that single activity was overwhelmingly “passing through” (travelling to and from a destination) and was selected at a rate more than four times the frequency of the next most selected activity. Clearly, if a place felt unsafe, the participants were reluctant to do anything there but pass through—some noting that they did so as fast as possible if they were unable to avoid the location.

Street, public transport, and trail and walkway locations are clear places where passing through would be expected to be the dominant activity. However, it was also commonly selected for other kinds of public space where other activities are supported and encouraged. For example, it was selected for 58% of pins placed in open spaces including parks. Here there was a sharp distinction between those pins in open spaces deemed safe and those unsafe: passing through features on 41% of safe pins as an activity undertaken there but 71% on unsafe pins placed in open spaces. Relaxing and recreation were dominant (76%) in safe open spaces but dropped to 24% for unsafe open spaces.

Passing through is a critical activity for accessing multiple education, work, health, social service, leisure, entertainment, and other destinations, but it is also the activity that requires the least engagement with public space and the people in it. Moreover, three-quarters of the YourGround participants used safety tactics when negotiating their journeys: avoiding some places if they could (YG-V 15%; YG-NSW 34%) or at night (YG-V 15%; YG-NSW 27%), or would only go if they were with someone else (YG-V 39%; YG-NSW 15%; the different results between the two surveys were due to differing set answers.) This lack of engagement with public spaces or of self-exclusion from them by women and gender-diverse people is a key issue for urban designers and policymakers who want public spaces to be occupied and used by a range of people. The notion suggested by YourGround participants that women and gender-diverse people may not feel welcome or able to linger in public spaces has a major impact on the ability to develop strong social connections with their local community.

3.3. What Makes a Place Safe or Unsafe? The Physical Environment

YourGround was particularly interested in the impact of the physical conditions of public spaces. The nuances of lighting and visibility have already been noted. There was a strong alignment in YG-NSW between the selection of lighting for the safe and the unsafe pins: Lighting (good) was selected on 59% of the safe pins and bad lighting on 57% of the unsafe. YG-V showed more of a discrepancy (58% bad; 47% good) but still confirms the importance of lighting in the perception of safe and inclusive public spaces.

Certain locations ticked multiple boxes for feeling unsafe—notably tunnels and underpasses. The following quote from a participant in YG-NSW highlights the range of unsafe elements in this kind of locale:

I try to always walk through the train station as the pedestrian railway underpass is scary day or night. The tunnel has broken glass, graffiti, smells of sewage, there is no CCTV, the convex mirrors which once let you see who was in the tunnel have been removed, some of the roof panels have fallen or been taken off, exposing old peeling lead paint. (Comment on Strathfield Station Underpass Pin, YG-NSW.)

The quote highlights poor maintenance and poor visibility, including the lack of or loss of infrastructure that might aid visibility and safety. Being well maintained topped the reasons for safety in YG-V for safe pins (Table 1). Although it was ranked further down in New South Wales, it was considered especially important for public amenities where it ranked second. Poor maintenance, including the presence of rubbish and graffiti, was selected for 26% of the unsafe pins for both YG-NSW and YG-V as an element that made a place feel unwelcoming and unsafe. Levels of maintenance are a key clue that women and gender-diverse people read when assessing risk in any public space and are an element that has a long history in crime prevention literature (Lorenc et al., 2013).

The path condition being good was one of the top four reasons why a location felt safe for YG-NSW participants submitting safe pins and in the top three for YG-V. This was particularly so for older age groups. Conversely, the stories on the unsafe pins suggested that poor path conditions contributed to making a place feel unsafe for some participants.

Mobile phone coverage was introduced into the New South Wales iteration of YourGround based on a safety survey conducted the previous year which considered it a notable safety factor (Transport for NSW, 2023). While coverage was selected as important for 46% of the safe pins, it barely featured as a concern in unsafe

spaces at just 1%. This suggests that while good coverage was part of the package of elements that helped generate a positive sense of safety, its absence was less of an issue for lack of safety. It is possible that because the main activity in unsafe locations was passing through, then participants may not have noticed phone coverage, or they quickly selected the most obvious elements such as lighting and maintenance.

3.4. What Makes a Place Safe or Unsafe? The People

Who is in a location—and what they are doing there—affects how safe and inclusive, or not, it is or is perceived to be. The presence of other people tops the list of reasons for a safe and inclusive space in YG-NSW (78%) and was a strong result from the coding of responses in YG-V (52%). However, both surveys noted caveats about the kind of people around—with “friendly,” “diverse,” and “welcoming” being noted—and families, children, and dog walkers were clearly described. Within the stories, participants noted that such people provided a sense of positive surveillance, monitoring the behaviour of others which would prevent poor behaviour. Coupled with this was an expectation that if there was a problem, others were around to help. Other area users, passers-by, and nearby workers and residents together also create a busyness in a location, which participants also noted was a factor in a place feeling safe and inclusive—63% for YG-NSW and 43% YG-V, both set answers.

On the other hand, unsafe and excluding locations could be either crowded or empty of people, although the lack of people rated as a much higher concern than overcrowding in both surveys (3–5% for overcrowding and 36–39% for no people around). Isolation was a separately recorded issue, one which meant both “no people around” and that a location wasn’t surveilled by nearby buildings or activities at all (42% in NSW as a set answer and 21% in Victoria from the coding).

A further concern for unsafe locations was the kind of people there. If safe and inclusive places were populated by friendly people, unsafe and excluding ones featured unpredictable or difficult people (acknowledged in 46% of YG-V responses for unsafe pins set answer and 39% of YG-NSW coded responses). Spaces that were numerically dominated by men were explicitly noted in around 1% of the stories in both surveys. These were mainly sports venues and particularly skateboard parks. All situations were uncomfortable for women and gender-diverse people who participated in the YourGround surveys.

3.5. Suggestions From Participants

Around a quarter of participants in both surveys made suggestions for what might help—these were free-text answers that were coded. Better lighting formed 59–61% of the suggestions, a result that aligns with the top ranking of lighting as a reason for the lack of safety in both surveys. However, this “better” was qualified by the participants. Better lighting was not necessarily more lighting, although participants in both surveys were especially interested in improved lighting at dawn and dusk in the winter months to make their exercise and commuting feel safer. Better lighting also meant lighting that was properly maintained, and not overly bright as some felt exposed under such conditions. Others were keen to protect native fauna from strong lighting. In general, lighting in public spaces needs to be carefully designed (Yang et al., 2022).

There was a similar result from each survey desiring better maintenance—18% of all the suggestions, which included 8% requesting the trimming of vegetation to ensure better visibility. Alongside maintenance, as might be expected from the importance recorded in YourGround of the presence of people, amenities that

might attract 'good' people to a place were also strongly requested. This result suggests that multiple physical conditions are key for attracting people, which in turn are good for improving perceptions of safety and inclusion.

3.6. Findings Summary

Women's sense of safety in public spaces is strongly impacted by the real and perceived threat of violence from men. The YourGround surveys examined a range of both physical and social environmental factors that either imply an opportunity for perpetration of such violence or offer a sense of safety from it. Participants were highly sensitive to the general feeling or "vibe" of a location and were very much concerned with visibility. YourGround also uncovered a lack of engagement with public spaces by women: They tend to move quickly through spaces they consider unsafe and find too few reasons to linger or occupy.

Overall, the YourGround surveys support existing research that finds women and gender-diverse people often experience feelings of unsafety and exclusion in public spaces, both of which contravene the aims of SDG #5. For women to feel and be safe in public spaces, they need to have a strong sense of belonging through public spaces designed for their needs as well as the right to occupy such spaces free from the threat of violence from men.

The YourGround data highlighted the interconnectedness of diverse environmental and social factors in shaping perceptions of safety and inclusion. This means that addressing women's safety and inclusion is complex with no simple, single solution likely to resolve issues. The findings therefore suggest the importance of multiple and context-specific approaches to improving safety and inclusion in specific locations. Given this, by addressing both environmental and social factors and tailoring interventions to specific contexts and local demographics, policymakers and urban planners can work towards creating safer and more inclusive environments.

4. Conclusion

Addressing women's safety and inclusion concerns in public spaces is not straightforward and demands holistic, nuanced, and gender-sensitive strategies. YourGround participants emphasised the significance of feeling comfortable occupying urban spaces, and improving physical conditions in order to attract people to use and occupy a location is critical to inducing this feeling. At the same time, the surveys also showed the need to address systemic gender inequality issues, such as men's violence, gender-based discrimination, and unequal access to resources.

The YourGround surveys built user-generated spatial datasets that can inform a range of location-based insights to help improve access and inclusivity in public and urban spaces for women and gender-diverse people vital to achieving sustainability goals. These insights can be used by those involved in urban design spaces to improve women's safety and inclusion in public spaces. They provide information highlighting the needs of women and gender-diverse people in communities which can impact strategic planning and budget allocation and build awareness about gender issues within communities. The archive maps are also available online and anyone can zoom into a particular location to see what might have been said about it. This means that there is a longevity of some data for future research and information for local authorities.

However, there are limits to YourGround. While overall it clearly shows addressing women's safety and inclusion is complex with no single bullet remedy, the result that safety is context-specific means that localised investigations of problematic areas identified are important. In doing so, YourGround strongly suggests it is vital to draw on the local knowledge of those who live and work in and nearby when proposing changes. Inclusivity is critical to feeling safe and it begins with including women in not just the evaluation of public spaces but also the design of them.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

Data may be available on request to the corresponding author. Otherwise, see Matthewson et al. (2024) and XYX Lab & CrowdSpot (2021).

References

- Anthony, K. H., & Dufresne, M. (2007). Potty parity in perspective: Gender and family issues in planning and designing public restrooms. *Journal of Planning Literature*, 21(3), 267–294. <https://doi.org/10.1177/0885412206295846>
- Beebeejaun, Y. (2017). Gender, urban space, and the right to everyday life. *Journal of Urban Affairs*, 39(3), 323–334. <https://doi.org/10.1080/07352166.2016.1255526>
- Bowman, C. G. (1993). Street harassment and the informal ghettoization of women. *Harvard Law Review*, 106(3), 517–580. <https://doi.org/10.2307/1341656>
- Chiao, R., Shash, F., Abdelmonem, A., & Flinkman, N. (2021). Mapping and stopping sexual harassment together. In S. P. de Souza, N. Rehman, & S. Sharma (Eds.), *Crowdsourcing, constructing and collaborating: Methods and social impacts of mapping the world today* (pp. 98–112). Bloomsbury.
- Criado-Perez, C. (2019). *Invisible women: Data bias in a world designed for men*. Abrams Press.
- Datta, A., & Ahmed, N. (2020). Mapping gendered infrastructures: Critical reflections on violence against women in India. *Architectural Design*, 90(4), 104–111. <https://doi.org/10.1002/ad.2597>
- Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable Development*, 19(5), 289–300. <https://doi.org/10.1002/sd.417>
- Fileborn, B. (2021). Digital mapping as feminist method: Critical reflections. *Qualitative Research*, 23(2), 343–361. <https://doi.org/10.1177/14687941211028797>
- Finucci, F., & Masanotti, A. G. (2023). Crowdmapping: Inclusive cities and evaluation. In O. Gervasi, B. Murgante, A. M. A. C. Rocha, C. Garau, F. Scorza, Y. Karaca, & C. M. Torre (Eds.), *Computational science and its applications—ICCSA 2023 workshops* (Vol. 14112, pp. 80–90). Springer Nature. https://doi.org/10.1007/978-3-031-37129-5_7
- Goel, R., Oyeboode, O., Foley, L., Tatah, L., Millett, C., & Woodcock, J. (2023). Gender differences in active travel in major cities across the world. *Transportation*, 50(2), 733–749. <https://doi.org/10.1007/s11116-021-10259-4>

- Hubbard, P. (2005). The geographies of going out: Emotion and embodiment in the evening economy. In J. Davidson, L. Bondi, & M. Smith (Eds.), *Emotional geographies* (pp. 117–134). Ashgate Publishing.
- Kalms, N. (2017). Digital technology and the safety of women and girls in urban space: Personal safety apps or crowd-sourced activism tools? In H. Frichot, C. Gabriellsson, & H. Runting (Eds.), *Architecture and feminisms: Ecologies, economies, technologies* (1st ed., pp. 112–121). Taylor & Francis Group. <https://doi.org/10.4324/9780203729717-13>
- Kalms, N. (2023). *She city: Designing out women's inequity in cities*. Bloomsbury Publishing. <http://ebookcentral.proquest.com/lib/monash/detail.action?docID=30949421>
- Kelly, L. (1987). The continuum of sexual violence. In J. Hanmer & M. Maynard (Eds.), *Women, violence and social control* (pp. 46–61). Palgrave Macmillan.
- Kern, L. (2019). *Feminist city: Claiming space in a man-made world*. Between the Lines.
- Koskela, H. (1997). 'Bold walk and breakings': Women's spatial confidence versus fear of violence. *Gender, Place & Culture*, 4(3), 301–320. <https://doi.org/10.1080/09663699725369>
- Koskela, H., & Pain, R. (2000). Revisiting fear and place: Women's fear of attack and the built environment. *Geoforum*, 31(2), 269–280. [https://doi.org/10.1016/S0016-7185\(99\)00033-0](https://doi.org/10.1016/S0016-7185(99)00033-0)
- Lorenc, T., Petticrew, M., Whitehead, M., Neary, D., Clayton, S., Wright, K., Thomson, H., Cummins, S., Sowden, A., & Renton, A. (2013). Environmental interventions to reduce fear of crime: Systematic review of effectiveness. *Systematic Reviews*, 2(1), Article 30. <https://doi.org/10.1186/2046-4053-2-30>
- Loukaitou-Sideris, A. (2016). A gendered view of mobility and transport: Next steps and future directions. *Town Planning Review*, 87(5), 547–565. <https://doi.org/10.3828/tpr.2016.38>
- Matthewson, G., & Kalms, N. (2021). Unwanted sexual behaviour and public transport: The imperative for gender-sensitive co-design. In S. Coxon & R. Napper (Eds.), *Advancing a design approach to enriching public mobility* (Vol. 198, pp. 53–67). Springer. <https://doi.org/10.1007/978-3-030-64722-3>
- Matthewson, G., Larin, T., & Kalms, N. (2024). *YourGround New South Wales—Baseline Insights report*. Monash University XYX Lab; NSW State Government. <https://doi.org/10.26180/25769685>
- Plan International, & XYX Lab. (2018). *Unsafe in the city: The everyday experiences of girls and young women*. Plan International. <https://www.plan.org.au/publications/unsafe-in-the-city-the-everyday-experiences-of-girls-and-young-women>
- Sánchez de Madariaga, I. (2013). From women in transport to gender in transport: Challenging conceptual frameworks for improved policymaking. *Journal of International Affairs*, 66(1), 43–65.
- Sheffield, C. J. (2020). Sexual terrorism in the twenty-first century. In L. L. O'Toole, J. R. Schiffman, & R. Sullivan (Eds.), *Gender violence: Interdisciplinary perspectives* (3rd ed., pp. 190–211). New York University Press. <https://doi.org/10.18574/nyu/9781479801794.003.0026>
- Transport for NSW. (2023). *Safer Cities survey report*. <https://www.transport.nsw.gov.au/node/17733>
- United Nations. (2015a). *SDG 5: Gender equality*. <https://www.un.org/sustainabledevelopment/gender-equality>
- United Nations. (2015b). *SDG 11: Cities*. <https://www.un.org/sustainabledevelopment/cities>
- United Nations. (2023). *The Sustainable Development Goals report 2023: Special edition*. United Nations Department of Economic and Social Affairs. <https://doi.org/10.18356/9789210024914>
- Valentine, G. (1989). The geography of women's fear. *Area*, 1(4), 385–390.
- Vera-Gray, F. (2018). *The right amount of panic: How women trade freedom for safety*. Policy Press.
- Vera-Gray, F., & Kelly, L. (2020). Contested gendered space: Public sexual harassment and women's safety work. *International Journal of Comparative and Applied Criminal Justice*, 44(4), 265–275. <https://doi.org/10.1080/01924036.2020.1732435>

- Viswanath, K., & Basu, A. (2015). SafetiPin: An innovative mobile app to collect data on women's safety in Indian cities. *Gender & Development*, 23(1), 45–60. <https://doi.org/10.1080/13552074.2015.1013669>
- Whitzman, C. (2007). Stuck at the front door: Gender, fear of crime and the challenge of creating safer space. *Environment and Planning A*, 39, 2715–2732. <https://doi.org/10.1068/a38449>
- Whitzman, C., Legacy, C., Andrew, C., Klodawsky, F., Shaw, M., & Viswanath, K. (Eds.). (2013). *Building inclusive cities: Women's safety and the right to the city*. Routledge.
- XYX Lab, & CrowdSpot. (2021). *YourGround Victoria report*. XYX Lab.
- Yang, H., Berry, J., & Kalms, N. (2022). Perceptions of safety in cities after dark. In S. Sumartojo (Ed.), *Lighting design in shared public spaces* (1st ed., pp. 83–103). Routledge. <https://doi.org/10.4324/9781003182610-5>
- Yavuz, N., & Welch, E. W. (2010). Addressing fear of crime in public space: Gender differences in reaction to safety measures in train transit. *Urban Studies*, 47(12), 2491–2515. <https://doi.org/10.1177/0042098009359033>

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