

## Research Paper

# Health and wellbeing (dis)benefits of accessing inland blue spaces over the course of the COVID-19 pandemic

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## HIGHLIGHTS

- Inland blue space provided therapeutic outcomes for individuals during the pandemic.
- Local blue spaces were vital in helping people establish a daily lockdown routine.
- ‘Shielding’ individuals often experienced heightened anxiety at blue spaces.
- Future pandemic response strategies should prioritise access to inland blue spaces.

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## ABSTRACT

The COVID-19 pandemic led to widespread repercussions, affecting all aspects of society, from global economics to everyday social interactions. Due to the significant uncertainty caused by the pandemic, many individuals sought solace from nature. Freshwater environments, or inland blue spaces, are one type of natural environment that may have acted as a vital public health resource for communities during the pandemic. This research used semi-structured interviews combined with narrative analysis to capture detailed insight into the impact of, and nuanced benefits and challenges associated with, accessing inland blue spaces over the course of the COVID-19 pandemic. Participants from a range of backgrounds across Scotland were involved to determine the influence of their health and ‘shielding’ status on inland blue space experiences. In the initial stages of the pandemic, those who were taking shielding precautions described experiencing a heightened awareness of, and anxiety towards, other users of inland blue spaces. However, across the sample, individuals emphasised the overall beneficial impact of accessing freshwater areas for maintaining mental and physical wellbeing levels during the pandemic. Positive health outcomes were achieved through participating in a wide range of leisure and recreational opportunities at inland blue spaces. The research further justifies the value of accessing inland blue spaces and demonstrates the benefits of integrating access and exposure to natural environments into future pandemic response strategies. The qualitative insight also highlights the need for context-specific landscape management strategies to promote blue space access across user groups and address existing environmental inequalities.

## 1. Introduction

Since the onset of the COVID-19 pandemic in December 2019 (Wang et al., 2020), there has been an increased awareness of the importance of accessing natural environments for maintaining positive health and wellbeing outcomes (Pouso et al., 2021; Soga et al., 2021). The pandemic and associated public health responses have had a considerable impact on daily lives, at times curtailing an individual’s ability to travel to, and access, outdoor spaces (Tomasso et al., 2021; Suligowski

and Ciupa, 2023). As a result of this restricted access, society’s relationship with nature and the outdoors has altered (Garrido-Cumbrera et al., 2021; Soga et al., 2021). Furthermore, an increased appreciation of nature was recorded at the individual and societal level with governments supporting the call for a “green-recovery” from COVID-19 through the protection and enhancement of natural environments and resources (Beery et al., 2021; Brahmabhatt, 2021; Hanna et al., 2023).

Inland blue spaces, such as lakes, rivers, canals, and streams, are increasingly associated with health-promoting properties (Britton et al.,

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2020; White et al., 2020). A wide range of health benefits can be attributed to inland blue space exposure, including increased levels of physical exercise, relaxation outcomes, and a reduced likelihood of depression (de Bell et al., 2017; Afentou et al., 2022; Poulsen et al., 2022). Similar health benefits have been attributed to accessing green spaces such as parks and woodlands (Nguyen et al., 2021). However, in comparison to green space, the blue space evidence base is limited and key uncertainties remain regarding the potential for inland blue spaces to benefit populations over time. For example, the health outcomes associated with inland blue spaces may be dependent on a range of temporally variable factors, including land use, environmental quality and public perception (Dick et al., 2016; Tew, Simmons and Sutherland, 2019; Fisher et al., 2021).

Investigation of the relationship between health outcomes and blue space access and exposure in the pandemic era provided an opportunity to understand the role of water environments during periods of widespread national concern. Early research has identified that visiting freshwater and coastal blue spaces helped to mitigate stress levels for individuals (Jellard and Bell, 2021; Pouso et al., 2021; Jo et al., 2022). To date, most blue space research has focused on the early stages of the pandemic, including the initial 'lockdown' period, when governments encouraged individuals to stay at home unless strictly necessary (Astell-Burt and Feng, 2021; Earl et al., 2022; Mcintosh et al., 2022). Further research is needed to develop a greater understanding of how relationships with inland blue space have evolved since the onset of the pandemic. Public health responses varied significantly across countries, as did attitudes towards COVID-19, and so continued research will provide insight into the importance of inland blue space exposure for different populations (Summers et al., 2020). Developing a more comprehensive understanding of how inland blue space exposure impacted individual and community responses to the pandemic is crucial to better inform future public health policies and response strategies (Suligowski and Ciupa, 2023).

One group that were disproportionately affected by the pandemic were those who were 'shielding' (Halliday et al., 2022; Lasseter et al., 2022). In the United Kingdom, individuals who were at high risk of developing serious health complications from COVID-19, were advised to 'shield' by reducing all non-essential contact with others (National Audit Office, 2021). Shielding individuals were at greater risk of experiencing social isolation and reported lower health and wellbeing outcomes during the pandemic (Bachtiger et al., 2021; Di Gessa and Price, 2021; Fettes et al., 2021). However, shielding was not a simple classification, as many individuals who did not fit the government criteria voluntarily took precautions; whilst others for whom shielding was recommended, disagreed with the classification they had been assigned (Sauchelli et al., 2021; Sloan et al., 2021; Hearn et al., 2022).

It is likely that individuals who were on the shielding list, or who felt they should be on the list, experienced everyday interactions with natural environments differently to others due to the significant uncertainty and anxiety associated with COVID-19 (Roche et al., 2022). One key source of variation could derive from risk perception, as those with chronic health conditions may develop adaptive strategies to navigate everyday situations (Rettie and Daniels, 2021). Individuals must feel comfortable within an environment to obtain beneficial exposure outcomes (Milligan, Gatrell and Bingley, 2004; Sidenius, et al., 2017). Therefore, risk perception alongside shielding status may have contributed to the widening of environmental inequalities during the pandemic.

Understanding how COVID-19 impacted population access to the environment is important to help prevent the widening of health disparities and ensure that communities can continue to benefit equally from inland blue spaces. Research using questionnaires and social media data analysis has helped to establish the overall impact of COVID-19 on access to natural environments (Rousseau and Deschacht, 2020; Park et al., 2022); however, to gain rich insight, the application of a broader range of research methods is required. Qualitative research

methodologies offer the opportunity to gain a greater understanding of human-environment interactions (Fossey et al., 2002; Pitt, 2018; Cronin-de-Chavez, Islam and McEachan, 2019). Given the benefits afforded by qualitative research, this study used semi-structured interviews to evaluate the extent that the COVID-19 pandemic and associated public health mitigation policies have impacted the use of freshwater environments for adults living in Scotland. The three key research objectives were to: 1) investigate how the COVID-19 pandemic impacted access to freshwater environments in Scotland; 2) assess how risk perception of blue spaces has evolved because of the COVID-19 pandemic; 3) determine if health status affected inland blue space experiences and environmental access.

## 2. Materials and methods

The research design and methods were approved by the General University Ethics Panel at the University of Stirling. Before taking part in the research, informed consent was obtained from all participants.

### 2.1. Study area

Scotland has an abundance of freshwater in the form of streams; rivers; canals; lochs; and reservoirs. A significant proportion of Scotland's inland blue space is in rural areas, with 98 % of Scotland's land mass considered to be rural (Scottish Government, 2021). Inland blue spaces are commonly regarded as natural assets in Scotland, with the Scottish Environment Protection Agency regularly monitoring these environments to record their overall quality.

Fig. 1 outlines the public health response to the COVID-19 pandemic in Scotland.

### 2.2. Recruitment and sample

In-depth semi-structured interviews were conducted with adults from regions across Scotland. The recruitment process took place between February and April 2023 and was carefully managed to involve a broad range of participants. A variety of recruitment strategies were used including placing posters in shops and community spaces, advertising on social media platforms, contacting charitable organisations (including environmental trusts and health charities) and emailing community groups. Over twenty community groups and organisations were contacted across rural and urban districts in Scotland and, in addition, posters were advertised in community spaces across four council regions in central and Southern Scotland. Recruitment targeted a range of organisations: from student societies to welfare groups for older individuals. Community health groups (such as diabetes and chronic fatigue support groups) were also contacted to involve individuals who were classified as vulnerable to COVID-19, or who had voluntarily taken precautionary shielding measures. An example of the interview advertisement is included in the [supplementary information](#).

In total, twenty interviews were conducted from February to May 2023, with each lasting between 30 and 60 min on average (Table 1). Six interviews took place in person at the University of Stirling and 14 interviews were conducted using Zoom.

A sample size of twenty was established to create a rich dataset involving a range of adults from across Scotland, whilst still allowing for each interview transcript to be analysed in detail. The sample was not intended to be representative of the Scottish population, instead the primary aim was to include individuals with a wide range of different views and interests. In recognition of the issues associated with achieving data saturation in qualitative research, this study sought to provide an interpretation of blue space pandemic experiences without attempting to generalise unique perspectives or achieve a finite end point for the data collection process (Braun and Clarke, 2021).

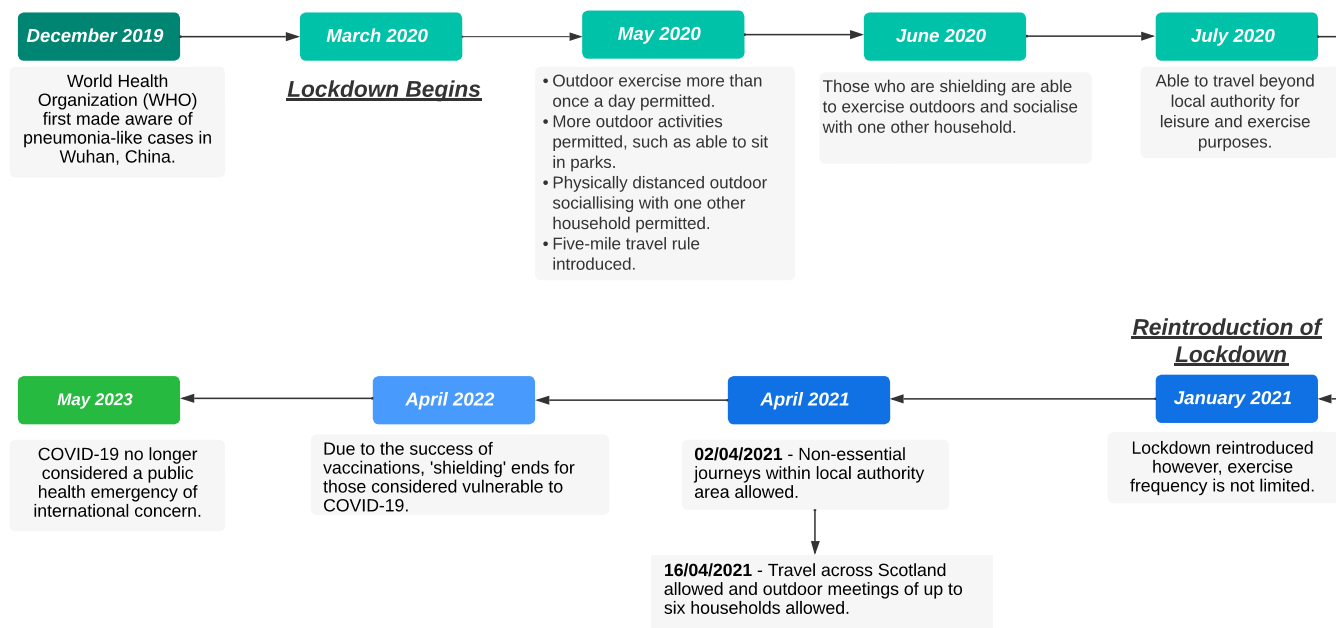


Fig. 1. Timeline of the events of the pandemic and key changes in Scottish COVID-19 legislation over the course of the pandemic (The Scottish Parliament Information Centre, 2023).

### 2.3. Interview design and protocol

Throughout the data-collection and analysis phase an interpretive qualitative approach was adopted. This enabled the research to capture the overarching impact of cultural context on inland blue space experiences and to identify different perspectives across the sample.

A semi-structured interview schedule (see [supplementary information](#)) was developed to compare participant's experiences of visiting blue spaces over the course of the pandemic. To frame the interview, participants were first asked to recall a key memory of visiting freshwater environments during the COVID-19 pandemic. The overall discussion was then guided by the inland blue space experiences described. Interview questions focused on how individuals perceived their use of and attitudes towards inland blue spaces to have evolved over time, with example questions including; "Do you think the way in which you use freshwater environments changed over the course of the pandemic?" and "Do you think the way other people use and behave in blue spaces has altered since the start of the pandemic?". This enabled the research to capture temporal blue space trends. The interview schedule was adopted in a flexible manner to allow the researcher to probe other blue space topics and provide participants the opportunity to discuss in greater detail aspects of freshwater experiences that they felt were of relevance.

If participants lived within reasonable proximity to the lead researcher, then where possible, interviews were carried out in person. In instances where participants lived further afield, interviews took place online using the video-conferencing platform Zoom to minimise travel time and participant burden. The interview schedule and style remained consistent regardless of whether the interview was conducted in-person or online. After the interview, all participants were reimbursed with a £15 online shopping voucher in recognition of the time taken to attend the interview and the knowledge shared.

### 2.4. Data analysis

Interviews were audio recorded and transcribed to Microsoft Word. It was recognised that whilst participants were recounting their own

experiences of the COVID-19 pandemic, the narratives that emerged during interviews were co-created from the specific interactions between the interviewer and interviewee (Riessman, 1993).

Two levels of narrative analysis as outlined by (Polkinghorne, 1995) were utilised; analysis of individual narratives and analysis of shared narratives across the sample (paradigmatic analysis). The combination of two approaches created a rich dataset, allowing the study to capture the varied and uniquely personal nature of blue space experiences during the COVID-19 pandemic whilst still presenting broader trends observed across the sample.

For the narrative analysis at the individual level, the interview transcripts were read as a whole and key inland blue space experiences occurring over the course of the pandemic were highlighted. The researcher focused on the temporal nature of participant's narrative accounts and sought to identify whether opinions relating to, and usage of inland blue spaces, altered across time. The overarching experiences of participants were summarised by the researcher, with care taken to ensure that each summary provided sufficient context to capture the individual experience of each participant. Four participant summaries are included in the results to highlight the significant variation in inland blue space usage and interactions during the pandemic. The selected summaries demonstrate differences in opinions from individuals who took 'shielding' precautions, compared to those who did not have to follow any stringent public health measures. To provide insight into the adaptability of inland blue spaces, the four participants included in the narrative analysis are from distinctly different life-stages and used freshwater environments for different purposes. The summaries are not designed to be representative of all participants involved in the research, or of the broader 'shielding' and 'non-shielding' groups, instead they provide rich insight into the personal meaning of inland blue spaces for select individuals during the pandemic.

To analyse thematic narratives at the sample level, interview transcripts were again read in detail before inductive coding was carried out. An iterative approach to coding was adopted by the lead researcher, with the aim to identify and code inland blue space experiences and perceptions. After coding had taken place, coded sections were compared to identify commonalities and generate broad categories of

**Table 1**  
Key demographic information for interview participants.

Demographic	Variable	Frequency
Age	18–24	1
	25–34	8
	35–44	1
	45–54	3
	55–64	1
	65–74	0
	75–84	4
	85+	0
Gender	Male	5
	Female	15
	Other	/
Region in Scotland	Angus	
	Argyll and Bute	1
	City of Edinburgh	3
	Dumfries and Galloway	5
	Galloway	3
	East Lothian	1
	Stirlingshire	6
	West Lothian	1
Urban/Rural	Urban	8
	Suburban	1
	Rural	11
Blue space activities carried out by participants (n)	Walking	20
	Wild Swimming	4
	Watersports	3
	Conservation Work	3
	Cycling	3
	Sedentary Activities (eg. Sunbathing)	4
	Previously contracted COVID-19	Yes
Classified as vulnerable to COVID-19	No	10
	Yes	5
Shared a household with someone classified as extremely vulnerable to COVID-19.	No	15
	Yes	3
Voluntarily taken precautionary public health (shielding) measures to protect themselves and or others.	No	17
	Yes	8
	No	12

inland blue space experiences during the pandemic. These categories were further revised to develop narrative themes. Whilst defining the themes, the original coding scheme and interview transcripts were referred to in detail to ensure the final thematic narratives were representative of the sample. Throughout the analysis process, a significant focus was placed on comparing the experiences of those taking shielding precautions with the experiences of those who did not have to take shielding measures.

A reflexive thematic diary was kept by the lead researcher to record key aspects of the research, from first impressions of the interviews to the development of final narratives and themes. The diary enabled the researcher to track how representations of COVID-19 experiences developed in the initial interviews and evolved during the analysis stages.

### 2.5. Positionality

When the pandemic first began in late 2019, the lead researcher MG was studying for a Masters in Public Health. Whilst MG was not required to take shielding precautions, they closely followed the public health responses to COVID-19. Throughout the pandemic, the researcher lived in both rural and urban areas of Scotland but was always able to maintain access to inland blue spaces for exercise and restorative

purposes. During interviews, MG remained aware of, and sought to minimize, the potential for their own positive bias towards blue spaces to influence interviewees.

## 3. Results

Participants recalled a wide-range of freshwater memories from the pandemic, from discovering the calming benefits of wild-swimming for the first time, to the feeling of freedom gained from cycling alongside a river after COVID-19 restrictions were reduced. Within the interviews, participants typically discussed their experiences chronologically and reflected on how their perceptions and actions evolved over time as public knowledge relating to the COVID-19 virus increased.

A timeline of the events of the pandemic in Scotland, alongside participants experiences is presented in Fig. 2. In recognition of the complexities associated with the shielding list, participants were categorised as those who shielded, those who voluntarily shielded and those who did not shield.

### 3.1. Narrative analysis at the individual level

Narrative summaries of inland blue space experiences for four participants are presented below. The narratives are organised around the COVID-19 pandemic timeline, with a particular focus placed on how individual's perceptions relating to COVID-19 anxiety and blue space use changed across time. Each summary provides unique insight into the personal meaning ascribed to inland blue spaces during the pandemic.

#### 3.1.1. Participant 1

In the initial phases of the pandemic, participant 1 (Female, 26–30, Voluntarily Shielding) recalled a high-risk perception of inland blue spaces and other outdoor environments. One of the principal concerns of participant 1 was to protect their partner from catching the disease. Throughout the interview, participant 1 repeatedly demonstrated how seriously they took this responsibility through discussing the preventative measures they adopted and highlighting the emotional impact of COVID-19. During the first two years of the pandemic, the participant described feeling trapped, and having a sense of unease about accessing outdoor environments.

*“I don't want to re-live it. I felt bad going into uni. I felt bad for meeting up with people outside and going for a run which was so ridiculous, but like, if we stopped for coffee afterwards. There wasn't a moment where I didn't feel anxious about it at all throughout, like the whole year and a half, two years, definitely. And I guess I still do today. Yeah, but it's one of those things you just learn to live with it, yeah.” Participant 1.*

The interview was held approximately three years since the beginning of the pandemic, at that time, the participant highlighted that they were now able to enjoy visiting freshwater environments.

*“When I walk my pup along the lake like it makes me so happy seeing the sunrise over the lake [...] And I know that even if I've had a stressful day, if I just go along the lake like I'll feel happy.” Participant 1.*

After their experience of the pandemic, participant 1 feels they have a greater appreciation of the importance of access to inland blue space and countryside environments. This appreciation has manifested in the participant actively choosing to visit scenic environments for walks and runs wherever possible. Whilst their anxiety levels have reduced over the course of the pandemic, participant 1 continues to take precautions in the form of washing their hands after touching gates during runs and prefers to socialise with others in outdoor environments where possible.

#### 3.1.2. Participant 2

When the lockdown restrictions were first announced, participant 2 (Female, 26–30, Voluntarily Shielding), lived in the centre of a city and was placed on furlough. The participant was able to access the city's



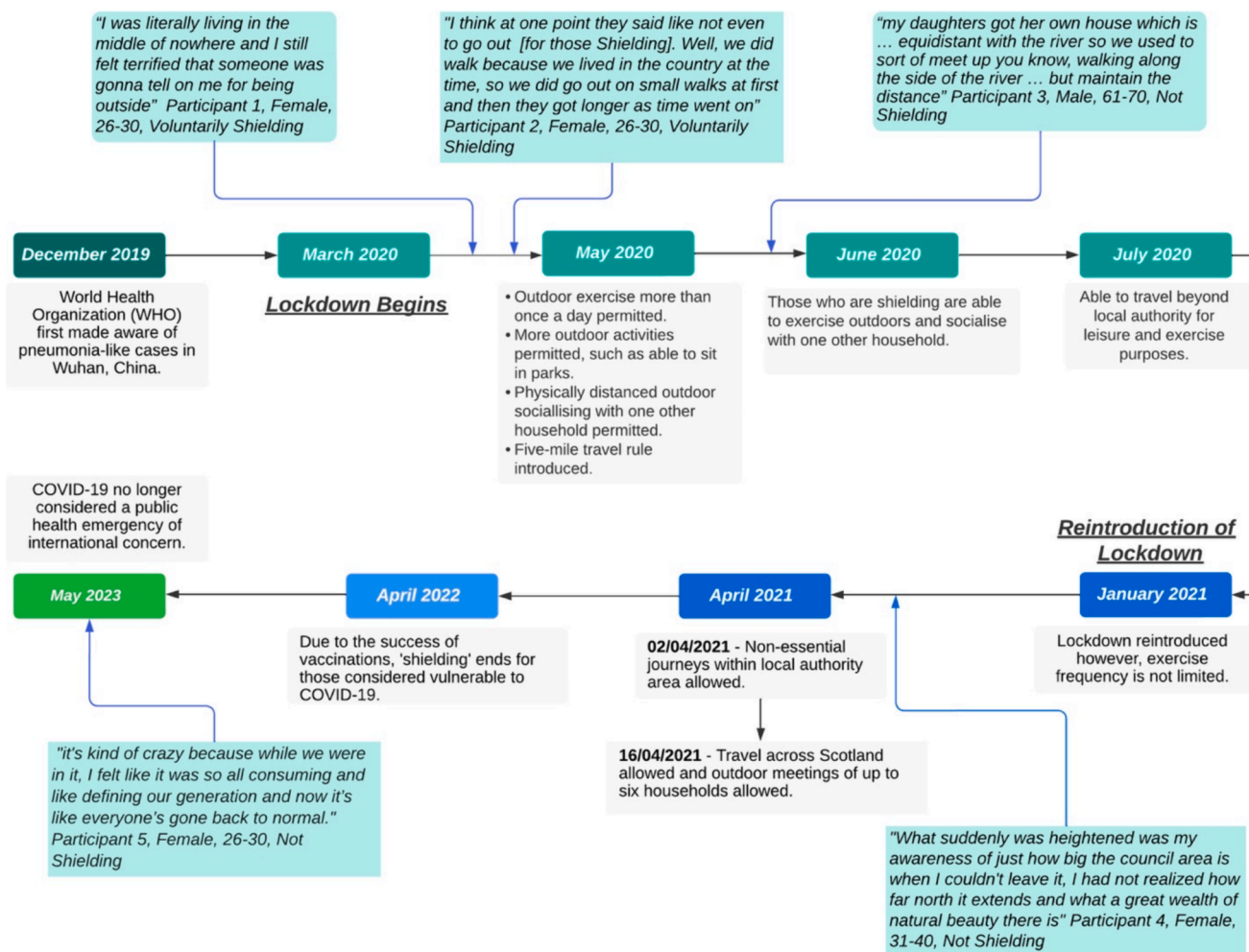


Fig. 2. Timeline of the events of the pandemic and key changes in Scottish COVID-19 legislation over the course of the pandemic (grey boxes). Quotes from participants are included at relevant time points to illustrate altering perceptions and blue space experiences (green boxes). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.) (The Scottish Parliament Information Centre, 2023)

riverfront but found they were unable to relax because of the number of other people using the environment as part of their lockdown routine. Whilst lockdown restrictions were still in place, participant 2 decided to relocate to a rural area to stay with their partner who was classified as Clinically Extremely Vulnerable to COVID-19. One of the key benefits they found from moving to a more rural location, was the ability to relax at quieter blue and green space environments.

The participant demonstrated a moderate risk perception of inland blue spaces during the initial stages of the pandemic: "If we saw people on a walk, we'd say hi but yeah, I guess we were a bit concerned that being close to anyone would be a risk" (Participant 2).

Alongside their partner, participant 2 followed government guidance in relation to shielding; however, at times they felt that the guidance was not clear. Often in relation to outdoor access the participant chose to follow their own instincts. Instead of exclusively staying at home, as instructed by the government, the participant and their partner went for a walk first thing every morning during the pandemic. During this time, they regularly visited a nearby river.

"I don't think I realised beforehand how much I needed to be outside to be feeling well and yeah, I took it pretty hard being stuck [inside]. So, once you were able to be out in the country and we ended up being out for hours every day, which obviously you can't do now because of work and other stuff." Participant 2.

With the return to work after lockdown restrictions ended, the

participant found that whilst their risk perception of freshwater environments had significantly decreased, they now have less time to access outdoor environments. Additionally, they have since moved house and no longer have access to local freshwater spaces.

### 3.1.3. Participant 3

In the initial phases of the pandemic, participant 3 (Male, 61–70, Not Shielding) perceived the risk of COVID-19 transmission at inland blue spaces to be relatively low. In-line with government guidance, the participant practiced social distancing during the lockdown restrictions; however, the enclosed nature of their local riverside walk meant that this was not always feasible. Additionally, the participant questioned the reasoning behind the prescribed social distance of two metres and wondered whether it was an arbitrary distance.

During the lockdown restrictions, participant 3 worked from home and described the importance of being able to walk along the riverside path at the end of the working day to maintain their mental wellbeing. The participant visited the river most days during the height of lockdown restrictions.

"so I was sat looking at spreadsheets and financial stuff for sort of 6–8 h and then just getting up and walking... it sort of clears the head and just allows you to sort of refocus on what's going on [...] a couple of times when I was working from home, basically you shut down your laptop and

then you were in the living room, [work] is still sort of rattling about your head, so you just need that sort of natural gap.” Participant 3.

At the time of the interview, the participant no longer had any anxiety related to catching the COVID-19 virus and highlighted that their life had transitioned back to relative ‘normality’. The participant was newly retired and in place of walking after work, the riverside path is instead used as a place to socialise with friends and family and take part in environmental volunteering.

“I mean I use it all year round, it’s because the water changes [...] You know I find it quite therapeutic just looking at the water and the way it moves. Have you heard the one that you know if you stand beside the river, close your eyes for 10 s open them again, you’re not looking... at the same river because that river has moved on? So, it’s a sort of a philosophy.” Participant 3.

Throughout the discussion, the participant consistently emphasised that the river maintains an intrinsic value in their life, providing therapeutic properties across the seasons.

### 3.1.4. Participant 4

Participant 4 (Female, 31–40, Not Shielding) lives in a remote area and has a young family. Once the initial lockdown restrictions lifted, the participant decided to start wild swimming at a nearby lake after encouragement from a friend.

“I went to Loch Ard, which is my possibly my favorite loch, around here anyway [...] and it was just so beautiful and so calm. I have two small kids, so COVID was quite intense in the house. It was loud, and everybody was on top of each other all the time, so it was really nice to get out and do quiet things by myself.” Participant 4.

The participant explained that the proximity to nature and the ability to observe the sun-setting through the hills during evening swims were key aspects that helped to contribute to the relaxing experience. Despite the popularity of Loch Ard during the summer months, the participant was confident that there was minimal risk of COVID-19 transmission. However, the participant was concerned about the environmental impact of a significant increase in visitors to the lakeside environment and the overall rural community.

With the easing of COVID-19 public health restrictions, the participant found they had less opportunities to take part in wild swimming due to other commitments. The participant is still keen to prioritise swimming and has decided to make sure they always have their swimming kit in their car to increase the opportunities they have to swim. Additionally, participant 4 is looking forward to introducing their children to wild swimming.

“Now my kids are a bit older and a bit better at swimming, so maybe we can actually do some, you know, family evenings, going swimming. It’s obviously very different, because then the meditative aspect of it is ruined, but it will foster their love of the outdoors and freshwater and Scotland.” Participant 4.

## 3.2. Narrative analysis at the sample level

Narrative analysis was conducted across the sample to document the shared commonalities in blue space usage and perceptions. Four key thematic narratives were identified from the interview transcripts. The blue space narratives are described in detail below.

### 3.2.1. During lockdown restrictions: avoiding the “slump” of the everyday

The immersive nature of blue spaces provided participants with a break from their current circumstances, allowing for a much-needed sense of variation during stringent lockdown restrictions. Blue space visits were regarded by participants as a multisensory experience. While spending longer periods of time at home in lockdown, some participants

were much more aware of indoor soundscapes and so for them, the natural sounds associated with inland blue spaces became particularly important. Observing nature during lockdown restrictions also helped to keep participants grounded, through tracking seasonal trends in wildlife and observing the continuous flow of rivers. Given the uncertainty of the pandemic, participants valued the sense of calm that visiting inland blue spaces provided.

“It’s not just freshwater, its kingfishers and otters and all sorts of other things as well. And the leaves watching the seasons and things, yeah.” Participant 6, Female, Voluntarily Shielding.

“It’s even just like, the sounds and then even like touching the water and like everything just brings like a bit of calm. And I don’t really know how to put into words, other than it’s just like adds a bit of serene that is outside of where we exist within four walls.” Participant 5, Female, Not Shielding.

The increased amount of leisure time reported during the pandemic resulted in blue space environments becoming more accessible to participants. In turn, this encouraged participants to engage with blue space recreational opportunities. Several tried out wild swimming and became regular swimmers due to the restorative health benefits they felt it provided. Younger participants who had exclusively visited inland blue spaces for exercise purposes in the past, also began to also visit these areas for relaxation, to spend time sitting and listening to music, or sunbathing. Across age-groups, participants sought to introduce variation into their lives through exploring new waterways within their local area and spending longer periods of time outside at inland blue spaces.

### 3.2.2. Risk perception: the impact of others

Participants typically perceived the risk of COVID-19 transmission to be higher in indoor areas than in outdoor environments such as blue spaces. However, individuals who were voluntarily shielding often reported greater anxiety levels at inland blue spaces during the initial stages of the pandemic. Whilst all participants were able to gain restorative exposure outcomes from blue space visits during the pandemic, non-shielding individuals often benefited more from access to these areas in the early lockdown period due to reduced anxiety levels.

“And I think what COVID did was it and I would say it’s not just about me, but certainly my friends, we all said we all we became more anxious about others and crowds and ... so that transferred to walking down somewhere like the riverside path, the anxiety about the numbers you sort of noticed you know, as I hadn’t done before.” Participant 6, Female, Voluntarily Shielding.

When larger groups of people were legally able to meet outside, participants explained that previously quiet blue spaces became noticeably busier. For younger non-shielding participants, this freedom to meet outside was viewed as a significant benefit as it enabled them to socialise with friends. However, for older participants (>30), the rapid increase in popularity was often regarded as a source of concern as they felt it exacerbated the degradation of inland blue spaces through an increase in litter and pollution levels. Some participants suggested that new visitors to blue spaces were not accustomed to spending time in nature and so were unaware of how to treat the environment, leading to the increase in environmental issues and degradation. Additionally, for individuals who were taking shielding precautions, the increase in visitor numbers was regarded as a greater risk for COVID-19 transmission. Due to a higher perceived risk of COVID-19 transmission, alongside frustration caused by observing environmental degradation, several participants chose to avoid visiting specific inland blue spaces.

“I definitely noticed, walking up the reservoirs during COVID, I would come home and instead of being relaxed, I would just be really angry about the way people were treating the space because you’d have people camping but with that kind of music festival kind of

mindset where they just leave their tent and all their other gear behind.” Participant 7, Male, Voluntarily Shielding.

Visitor numbers and associated environmental degradation were still regarded as an on-going issue by participants, with warmer weather in the summer months often exacerbating the issue. At the time of the interview, some participants still described taking precautionary measures to minimise the risk posed by other blue space users, including wearing masks while at outdoor environments.

### 3.2.3. Post lockdown restrictions: shifting priorities

A key central narrative captured during the interviews, was that of re-negotiating blue space usage after lockdown mitigations had ceased. For a range of reasons, including higher workloads, increased social commitments and caring for young families, most participants now found they had less time to visit inland blue spaces. Despite increased commitments, participants still incorporated blue spaces into their routines for the purpose of socialising. Some stated that during the pandemic they had developed a routine of meeting friends and family for riverside walks or swims and now continued with this habit. Participants who had been shielding or voluntarily shielding during the pandemic, also preferred socialising outdoors due to the reduced risk of COVID-19 transmission.

“Me and my husband meet up with their family and we enjoy being by the water [...] they’ve got their paddle board and their canoe, and I’ll swim near them. You know, we never used to do that.” Participant 8, Female, Voluntarily Shielding.

Those who had newly retired or reduced their workload since the onset of COVID-19 commented that they were now able to prioritise spending more time at blue spaces. For them, blue spaces now offered important opportunities to establish new daily routines through exercising, socialising and taking part in voluntary conservation work.

### 3.2.4. Nowadays: Reflections on environmental access

While narrating their COVID-19 experiences, participants were conscious to point out what they perceived as their own relative privilege during the pandemic. This awareness of privilege typically stemmed from having heard other’s experiences of COVID-19 through news stories and word of mouth. Living in quiet locations, having good health and having access to high quality natural environments were independently regarded by participants as reasons to be grateful during lockdown restrictions. Those who were older expressed an inherent sympathy for children and younger generations. Whereas younger participants were grateful for their health status and not having to worry about taking heightened COVID precautions.

“I was an older person who loved walking alone and I could do it whether it was a pandemic or not, so I felt I was very fortunate compared to your generation or younger.” Participant 9, Female, Voluntarily Shielding.

Across age-groups, differences were observed in perceptions of rural and urban inland blue space. Participants who lived in rural areas typically felt grateful for the opportunity to easily access nature and blue space during the pandemic. As a result, they felt their lockdown experience would have been significantly different from individuals living in urban areas. However, city dwellers were keen to point out their ability to easily access nature within their local community and felt sorry for anyone who did not have the same ease of access.

“I think in Edinburgh we’re lucky [...] with sort of green spaces, with access to water. The Water of Leith walkway is quite good, you can pretty much walk the whole length of the Water of Leith walk now, it’s about 13 miles [...] I think other people are sort of picking up on it because you see a lot of people walking along with dogs, dogs and kids cycling... things like that.” Participant 3 Male, Not Shielding.

Participants who were shielding or voluntarily shielding, acknowledged the difficulties that taking precautionary public health measures entailed. However, access to natural environments during the pandemic was cited as a key factor that helped to maintain wellbeing levels during restrictions. These participants also expressed sympathy for those who they recognised as having a worse pandemic experience than they did.

One socio-demographic factor that did impact access to inland blue spaces was car ownership, this particularly affected younger participants, aged 18–30. Limited bus schedules were regarded as frustrating, and the length of time it would take to reach the train station often made visits to inland blue spaces unjustifiable. The cost of public transport was regarded as an additional barrier to accessing inland blue spaces.

“I feel like if I really have to plan for like an hour and a half of commuting on the bus then that kind of takes away quite a bit of the day and that does kind of put me off sometimes. I mean I go out less probably than I thought I would.” Participant 5, Female, Not Shielding.

While older participants typically owned a car, many also had access to a bus-pass and voluntarily made use of public transport to access freshwater areas. Often buses were used to allow individuals to complete longer riverside walks before taking the bus back. These participants acknowledged that they were less busy than younger participants and so it was easier for them to use public transport. Additionally, this age-group had often lived in their local area for a long period of time, and so had a greater awareness of bus routes and transport links to inland blue spaces.

## 4. Discussion

The qualitative insight gained from in-depth interviews demonstrates that in times of significant change, such as the onset of a pandemic, inland blue spaces can provide individuals with vital mental health and wellbeing benefits. Narrative analysis at the individual level highlighted the broad range of different circumstances faced by individuals during the pandemic, and the unique benefits that accessing freshwater provided. Further complementary thematic narrative analysis across the sample demonstrated shared commonalities in how participants recalled their use of inland blue spaces during lockdown restrictions, with participants often accessing these areas to provide variation to their everyday lives and recalling a shared concern of the potential risk posed by other visitors at inland blue spaces.

Natural environments have long been regarded as therapeutic landscapes, providing health promoting properties to user groups (Bell et al., 2015). This research further demonstrates the therapeutic potential of inland blue spaces. Whilst participants appreciated the physical health benefits associated with accessing and exercising at freshwater areas, interviewees were often more enthusiastic about the mental health benefits of inland blue space exposure. This coincides with a growing body of research documenting the positive effect of accessing blue spaces and other natural environments for maintaining mental health and wellbeing levels during the pandemic (Pouso et al., 2021; Puhakka, 2021; Jo et al., 2022; Kanelli et al., 2023; Oliver et al., 2023). Within therapeutic landscape research, there is an awareness that associated health benefits may change over time and that not all individuals may gain therapeutic benefits due to differing backgrounds and personal circumstances (Rose, 2012; Mossabir, Milligan and Froggatt, 2021). Yet, during interviews, participants emphasised the overall therapeutic nature of inland blue spaces, regardless of their health and shielding status. The use of interviews as a cross-sectional research method may have influenced this response; alternative longitudinal research methods deployed shortly after blue space visits may have identified greater variation in human-environment interactions. However, the positive and restorative reports narrated by participants, provide novel insight into the overarching impact of access to freshwater environments during the COVID-19 pandemic.

A key aspect of inland blue spaces that contributed to their perceived therapeutic properties for participants was the multisensory, immersive nature of these environments. The combination of green space, wildlife and the movement of water created a restorative environment with multiple sources of interest for individuals. As with marine-focused blue space research, participants in this study described embodied connections with inland blue spaces and emphasised the associated benefits they gained from this (Bell et al., 2015; Kronsted Lund, Gurholt and Dykes, 2022). For several participants, COVID-19 provided the time and opportunity to take part in sedentary activities whilst at inland blue spaces. Previous research has focused on the nature by which physical activities, including wild swimming, can create an immersive restorative experience for individuals (Foley, 2015; Gould et al., 2020; Bates and Moles, 2023). The current research helps to advance the blue space evidence base by highlighting the diverse range of activities that can create an embodied blue space experience.

The increase in leisure time associated with the height of COVID-19 public health restrictions significantly increased the accessibility of inland blue spaces for participants. However, the small sample size may have influenced this finding. The consequences of the pandemic were interlinked with socioeconomic status, therefore different subsections of the population may have different recollections of inland blue space experiences and accessibility during the pandemic. Highly skilled employees were typically able to work remotely, enabling increased flexibility for accessing nature compared to lower income workers who continued to work on-site (Honey-Rosés et al., 2021; Rios, Neilson and Menezes, 2021). As highlighted by some younger participants involved in the current research, access to private transport also impacted blue space accessibility over the course of the pandemic. These findings align with quantitative survey results demonstrating that attitudes towards transport changed significantly during the COVID-19 pandemic, with journeys by public transport often regarded as an inconvenience (Eisenmann, Nobis, Kolarova, Lenz, & Winkler, 2021; de Haas, Faber, & Hamersma, 2020). Investment in both the availability and quality of public transport is vital to maintain public confidence during times of significant uncertainty (Bauer & Bauer, 2022). Further larger-scale research would complement the current findings and help to consider the complex implications of COVID-19 and socioeconomic status on perceived blue space accessibility.

Despite the overall sense that inland blue spaces contributed to restorative health outcomes during the pandemic, participants also highlighted the negative impacts of environmental degradation on blue space exposure outcomes and the perceived impact of other users. In line with the current findings, marine-based research during the pandemic identified that several sources of conflict arose between tourists and residents as lockdown restrictions ended (Jellard and Bell, 2021; Wheaton et al., 2021; Earl et al., 2022). Heightened land-use conflicts were observed globally, as individuals became more protective of their local area and concerned over the potential public health risks posed by the presence of visitors (McGinlay et al., 2020; Nguyễn-Phú and Phạm, 2022; Vich et al., 2022). Our study further documents issues related to navigating busy natural environments whilst also highlighting the intrinsic link between land-use conflict and environmental privilege. Environmental privilege refers to the societal constructs that allow for sub-sets of the population to have greater access and control over environments and environmental assets (Argüelles, 2021). Prior to the onset of COVID-19, several participants were used to having almost exclusive access to high quality inland blue spaces. This may have intensified the anxiety associated with an increased frequency of visitors to local blue spaces. The pandemic increased environmental inequalities in numerous ways, with those with greater resources often still able to access alternative high quality natural environments that were less affected by visitors (Rios, Neilson and Menezes, 2021). Less research has focused on access to nature for underprivileged groups during the pandemic; however, vulnerable groups, such as those living in urban deprivation, were often more significantly affected by social and

environmental injustices during the COVID-19 pandemic (Sharifi and Khavarian-Garmsir, 2020; da Schio et al., 2021).

The pandemic created novel risks that significantly affected human-environment interactions, this in turn may have altered the therapeutic properties of natural environments (Choi et al., 2022; Pan and Bardhan, 2022). The narrative analysis demonstrated that during the initial stages of the pandemic, higher levels of anxiety were associated with social interactions at inland blue spaces. This was particularly the case for individuals who were taking shielding precautions. Similar concerns were reported by individuals accessing a range of natural environments (Korpilo et al., 2021; Lopez et al., 2021; Burnett et al., 2022). For many participants, this initial anxiety had since subsided; however, individuals' awareness of others typically remained heightened. The shared response experienced by participants can inform land-management strategies to aid preparedness for future pandemic responses. Furthermore, the careful management of vegetation and built surroundings at inland blue spaces could allow for greater space and flexibility for the avoidance of close interactions with others, enabling individuals to gain positive exposure outcomes even in times of uncertainty. This style of land management could help to foster a sense of solitude in nature that can in turn lead to positive environmental exposure outcomes (Long et al., 2003; Lee and Scott, 2017). Different demographic groups may use natural environments in different ways, with men and older adults more likely to access remote areas of parks (Sang et al., 2020). Encouraging landscape variation within blue spaces can help to create more inclusive environments, facilitating greater spatial dispersal of visitors and allowing for positive blue space exposure outcomes during future pandemics or periods of instability.

Our findings provide rich insight into inland blue space perceptions and environmental usage during the pandemic, enabling an in-depth comparison of the influence of shielding status on environmental experiences. However, the research was subject to limitations. Whilst the qualitative interviews enabled the reasoning behind blue space usage to be assessed, the methodology is inherently subjective and so the generalisability of findings to the wider Scottish population is limited. Further research with different communities in Scotland would help to bolster evidence-based policy making. Despite an extensive recruitment strategy, females were overrepresented in the sample. Gender has been shown to influence COVID-19 risk perception, therefore the overrepresentation of females may have impacted the research findings (Stephen et al., 2023). It would be beneficial to further investigate gender influences on risk perception in the context of access to blue space environments.

Individuals with a range of health conditions involved in the research; however, all participants had good mobility levels. Likewise, there has been a tendency for research to focus on human-environment interactions of 'able-bodied' individuals (Foley and Kistemann, 2015; Bell et al., 2019; Job, Heales and Obst, 2023). With 'long COVID' expected to have affected nearly 36 million individuals in Europe alone since 2020, it is vital that blue space research is more inclusive, through continuing to involve people with a range of health conditions and actively involving disabled people (World Health Organisation, 2023). People with physical disabilities may face greater barriers to accessing natural environments; however, equitable access should be facilitated across populations. Additionally, as highlighted by current participants, the immersive opportunities of sedentary blue space activities should not be overlooked. The BlueABILITY model offers one solution to ensure the interlink between blue space, accessibility and health and wellbeing outcomes are sustainably considered within research and policy settings (Job, Heales and Obst, 2023).

## 5. Conclusion

Through the application of semi-structured interviews, the significance of accessing inland blue spaces during the pandemic for maintaining positive health and wellbeing outcomes at the individual level



has been evidenced. Participants recalled the restorative nature of freshwater areas during the pandemic, with both individuals who had been voluntarily shielding from COVID-19 and those who had not been required to shield reflecting on the solace they found from accessing these environments. Inland blue spaces offered individuals the opportunity to establish a routine in times of significant uncertainty during the pandemic. The research findings further justify the growing recognition that regular access to natural environments is vital for maintaining health and wellbeing outcomes. Access to freshwater areas may be particularly beneficial during times of uncertainty and so there is the potential to utilise inland blue spaces to help individuals navigate future crises. However, to ensure future public health benefits, the quality of these environments must be preserved, and public health and environmental policies should work towards creating more inclusive environments that encourage a broad cross-section of the population to visit and benefit from these areas.

### CRedit authorship contribution statement

**Megan J. Grace:** Writing – original draft, Writing – review & editing, Conceptualization, Methodology. **Jen Dickie:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Phil J. Bartie:** Writing – review & editing, Supervision, Methodology, Conceptualization. **David M. Oliver:** Writing – review & editing, Supervision, Methodology, Conceptualization.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request.

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### Appendix A. Supplementary data

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