

FeedFinder: A Location-Mapping Mobile Application for Breastfeeding Women

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ABSTRACT

Breastfeeding is positively encouraged across many countries as a public health endeavour. The World Health Organisation recommends breastfeeding exclusively for the first six months of an infant's life. However, women can struggle to breastfeed, and to persist with breastfeeding, for a number of reasons from technique to social acceptance. This paper reports on four phases of a design and research project, from sensitizing user-engagement and user-centred design, to the development and in-the-wild deployment of a mobile phone application called FeedFinder. FeedFinder has been developed with breastfeeding women to support them in finding, reviewing and sharing public breastfeeding places with other breastfeeding women. We discuss how mobile technologies can be designed to support public health endeavours, and suggest that public health technologies are better aimed at communities and societies rather than individual.

Author Keywords

breastfeeding; mobile; user-centred design; public health; preventative health

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Breastfeeding is viewed as a positive health behaviour that has lasting health benefits for the breastfeeding mother and her child. In the UK women are recommended to breastfeed for the first six months exclusively and to supplement additional food for at least a year [19]. Research has suggested that infants who are not breastfed are more likely to contract short-term infections (including respiratory and ear) and in particular infections that require a period of

hospitalization. Longer-term implications can include a greater likelihood to become obese in later life, to develop type 2 diabetes, as well as slightly higher levels of blood pressure and blood cholesterol. For breastfeeding women, evidence suggests that benefits include a reduction in the risk of breast and ovarian cancer [24].

According to the 2010 Infant Feeding Study [19] 81% of women in the UK initiate breastfeeding within the first 48 hours, with 69% of women continuing to breastfeed their infant at 1 week. By the six to eight week medical check-up 55% of women are continuing to breastfeed their infant. By six months just over a third of women (34%) are continuing to breastfeed their infant, well below the target of exclusive breastfeeding up to six months. Those women that are most likely to breastfeed are older, with 87% of women aged over 30 choosing to breastfeed their infant, compared to 58% of women aged under 20 choosing to breastfeed. In addition, women who undertook managerial and professional occupations were more likely to breastfeed (90%), than women who have never worked (71%).

There is much perceived pressure among women to breastfeed [25], from midwifery care through to public health messaging, where the choice to breastfeed is framed in moralistic terms. Choosing to breastfeed therefore becomes strongly linked with being a "good mother", while choosing not to breastfeed is viewed as morally and socially deviant [22]. And, while breastfeeding is often described as the natural and trouble-free feeding method [42], many women experience practical difficulties and concerns in breastfeeding during the first few weeks of a baby's life. Breastfeeding requires learning on behalf of both the mother and baby, which requires support from local health services, practice, perseverance and persistence [8]. Less than optimal techniques can result in an extremely painful breastfeeding experience. And as the quantity of breast milk a baby consumes through breastfeeding not known, women can have concerns about insufficient milk supply and milk consumption, which undermine confidence in their ability to breastfeed and their bodies ability to ensure their baby thrives [6]. Finally, social, cultural and public values, familial history, class and regional influences all play a part in a woman's choice to breastfeed or not [33].

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The Public Construction of Breastfeeding

Women's feeding choices are influenced not only by their own opinions, but by the socio-cultural context in which those decisions take place. A woman's family, partner and the community in which she lives and works all play a part in the decision she makes as to whether she will breastfeed and continue to breastfeed up to and past six months [32, 33]. Previous research has identified that support for breastfeeding outside of the home is limited within the UK [33]. The act of breastfeeding is considered intimate and personal and therefore not appropriate for public consumption [9]. This lack of perceived public, practical and moral support for breastfeeding can be extremely problematic for breastfeeding women, as this sense of disapproval is viewed as a negative judgment of them as a person [32]. In response women arrange their day such that they remain close to home or to designated lactation rooms, in order that they never have to feed in public [39]. The work of keeping breastfeeding invisible clearly increases the labour associated with breastfeeding [41]. This paucity of day-to-day contact with breastfeeding is also evident in media production and consumption. For example, content analysis of British TV showed that bottlefeeding was shown often in televised programmes, but breastfeeding only appeared once [21]. Photos of women breastfeeding have, until very recently, been banned from social networking sites [31]. In addition, news stories in print media regularly report on instances where women have been asked not to breastfeed in a public place. This contrives to achieve a context where it is rare to see a woman breastfeeding an infant in public [9], and, where public breastfeeding is a necessity, there is a social expectation it will be discreet [36]. As less women are seen breastfeeding in public, breastfeeding is seen as a less available infant feeding option, especially for those from socio-economic groups where breastfeeding is less common [28, 39].

Lactivism and Community Support

It has been suggested that the transition to motherhood can be a motivational force for women to engage in political activism [38]. And, since breastfeeding in public is not a neutral activity [33], but rather a political performance where the caring practice associated with, in particular, very young babies is made visible to the public [9, 40], there has been an increasing amount of activism in relation to breastfeeding in public in recent years. Nurse-ins are perhaps the pinnacle of this kind of 'lactivism', where breastfeeding women congregate to breastfeed en-mass, typically in restaurants, cafes and shops where a woman has previously been told that they can't breastfeed. Breastfeeding picnics similarly focus on bringing women together en-mass to breastfeed, but usually take place in family friendly places such as parks. Boyer et al [9] make the distinction between these two forms of lactivism, stating that nurse-ins focus on breastfeeding mothers rights as consumers (to breastfeed in cafes, airplanes, etc.), whereas breastfeeding picnics focus on breastfeeding

mothers rights as citizens (to breastfeed in parks, on benches). However, she also highlights how these forms of lactivism can further alienate some women who simply see themselves as trying their best to cater to their infant's needs when breastfeeding publically.

HCI, the New Mother, Gendered Spaces and Feminism

HCI has turned to new mother- and parent-hood as a transitional time in life which digital technologies may be well placed to support [3]. There exists a diverse range of design studies and devices from pregnancy suits to enable the non-pregnant partner to better empathise with the experiences of the pregnant women [23] through to devices to support pregnant women manage and share their healthcare records [17]. Research has investigated how new mothers use social networking technologies to find confidence in their new role, as well as maintain their identity beyond that of 'mother' [18]. Recently a small body of work has responded to needs around breastfeeding specifically, with for example the development of a relational agent that is able to engage in an empathetic dialogue with a mother to deliver information about breastfeeding antenatally [16]. Other projects have explored how a mobile application can aid people in correctly pasteurising breastmilk donated to human milk banks in developing countries [10]. Contributing to this work, this paper provides a case study of a user-centred design process undertaken with new mothers in the design, development and evaluation of a mobile application which enables women to find, review and share public places for breastfeeding. We report on methods used for engaging new mothers in a design process.

Recent discourse within HCI has identified that sites and spaces of gender and domesticity are actively produced by individuals and communities [4, 5], and that (ubiquitous) technologies may both play a role reinforcing gender stereotypes within spaces, or alternatively transform the beliefs, rituals and power dynamics associated with a space. Here, we reflect on the role that mobile technologies can play in delivering public health by focusing on change in the community, rather than change in the individual, arguably offering a concrete example of how a ubiquitous technology can transform perceptions of public space.

BREASTFEEDING IN THE NORTH EAST UK

The North East UK has low rates of breastfeeding initiation and continuation when compared with the national average. Around 54.5% of new mothers initiate breastfeeding within the first 48 hours, below the national average of 72.5%. While breastfeeding initiation in the area has improved slightly since 2006, continuation of breastfeeding beyond the first six to eight weeks is the lowest in the country, with only 31.9% of infants receiving some breast milk at six to eight weeks. Recent research notes that despite good maternity units and innovative interventions to support breastfeeding, breastfeeding is rarely seen in public [33],

with participants stating that adequate and comfortable places were rarely provided.

DESIGNING FEEDFINDER

We followed an iterative user-centred design cycle in the design of FeedFinder, initially seeking to develop a sensitising account of women's experiences of breastfeeding locally. Generative design ideation around these accounts led to the concept of a breastfeeding mapping application to allow women to find, review and share places for breastfeeding. Further inquiry took the form of a series of design workshops that explored what values contribute to good and bad breastfeeding experiences. Finally, a medium fidelity prototype was evaluated using cooperative evaluation to identify any usability issues.

Sensitising Interviews with Breastfeeding Mothers

At the outset of the project we conducted four one-to-one 30-minute interviews with new mothers in a local café, 12 to 16 weeks after the birth of their first baby. Each mother had reported prior to giving birth that it was their intention to breastfeed their baby. At the point of interview three women were breastfeeding their babies exclusively and one woman was formula feeding her baby exclusively. These interviews focused primarily on initial experiences of breastfeeding, but also touched on wider experiences of early motherhood. Each interview was audio recorded, transcribed and analysed using an inductive thematic analysis. We report on two reoccurring themes related to breastfeeding pressures and the act of public breastfeeding.

Pressures on Unfamiliar Ground

For each of the women the choice to breastfeed had initially been entangled with social, professional and familial identities and relationships. Two women had chosen to breastfeed as a result of their professions (a nutritionist and a support worker at a charity supporting early years education and health). "*I felt pretty pressured [to breastfeed] in the first place cause I work for Sure Start, so there we encourage Mums to breastfeed and it's best thing obviously, I know it is anyway*" (Sandra). Cara on the other hand stated that she had never really questioned whether she would breastfeed. As a nutritionist she considered it to be the best start for her child and "*... was determined to try and try and try even if it doesn't work.*" Sarah similarly reported the sense that breastfeeding was the best thing for her baby and although she "*... wasn't overly enthusiastic about it*" she felt that breastfeeding was a familiar option since her mother had breastfed her and her siblings.

While each woman might have made the decision to at least try breastfeeding for their own reasons, their choices were made antenatally. And for each of the women the experience is something quite different from their original perception. Cara explained: "*I knew it would be tiring – but I didn't realize how tiring it was going to be. I've got a*

couple of friends who have already given up because they found it too tiring. Some days you have more time between feeds, but most of the time it's sort of every hour, hour and a half." And, while Cara was able to overcome some of the uncertainty associated with breastfeeding a baby (for example, knowing when to feed and knowing whether the baby has had enough), Sandra found herself unable to: "*I'm not breastfeeding anymore. I started mix feeding. It's just too, too hard, too tiring. She was too greedy, but she's in a lot better routine now, I wish I hadn't given up, but... I didn't realise how difficult it was going to be ... I had no idea when she was going to need feeding.*"

The choice to continue or not with breastfeeding has to be both the best choice for the baby and the mother. So while Sandra might wish she hadn't given up breastfeeding, she is now better able to sleep as she can share the care of her baby with her partner more fully, and feels "*much happier now I have stopped.*" However, having made this choice Sandra had to fight to legitimise it. She considers that she continued to breastfeed "*more for other people than for me, like the midwives and things. They ask you if you are still breastfeeding and if you have any concerns they push you to do a couple more days... I was terrified about telling my midwife I didn't want to breastfeed anymore so I avoided her.*"

Exposing a New Self

In the early weeks of motherhood the women we interviewed attempted to confine breastfeeding to the home. Cara would "*try and time feeds so I could feed him at home, get out and then be back at home for the next one or somewhere where I could hide away*". But the attempt to provide this care for their babies in private hindered the extent to which they could continue managing other aspects of their lives. Sandra tells us how "*I couldn't even nip to the shops*", "*I didn't come into town in case she did wanted to be fed*". Yet, for most breastfeeding women there comes a time when one must breastfeed in public. In doing so, they are confronted with the public perception of breastfeeding. For instance, Sarah was aware "*from my antenatal classes that breastfeeding is really low in the north east*". As a result when the women made the decision to breastfeed in a public place they seemed to anticipate that it would be perceived by others as a controversial activity. Sarah told us with surprise "*I haven't had any problems – no one has said anything to me or anything like that.*", while Sandra armed herself with legal knowledge when breastfeeding outside of the home: "*because of the job I do I would know I was well within my rights to be doing it.*"

Having "*jumped in at the deep end*" and fed in public, Cara seemed to positively embrace a sense of freedom: "*I don't care where I do it. I fed him on the Quayside market sitting on a step the other day! I've turned into one of those mothers who will just get their boobs out everywhere. I just don't care anymore.*" While Sarah is also "*not that bothered about breastfeeding in public*", she took a much

more deliberated approach to breastfeeding in a public place: “...I’ve spoken to a few people at church just to like gage what other people’s opinion [of breastfeeding in public] is, like am I too confident, should I be more like reserved? But I don’t think I have been. Like, I only do it when I’m sitting out of the way or in a café I’d sort of sit in a corner, like I try and sit somewhere more discreet...” This concern with whether there is a proper way to feed in public is felt by Cara not through her own concerns, but through the concerns of others she is close to: “My friends who don’t have babies, they would be like, this woman just got her boob out in McDonalds, and I would tell them well I hope you know I’m going to be doing that don’t you. And they were like well you will have to be discreet won’t you and I was like well I’ll try.” And, while both Sarah and Cara use a feeding scarf in order to be discreet in public if and when necessary, Sarah attempts to be discreet also through planning and choosing where she can breastfeed when out and about: “I think it’s useful in bigger department stores knowing there’s somewhere you can go which I hadn’t known existed beforehand... but I’m quite happy to sit in a coffee shop if I need to.” Similarly although Cara will breastfeed anywhere she has at times sought to find places where breastfeeding is welcome, but has found online resources to be lacking: “...the resources are old, they aren’t kept up to date. Like it said there was a good one [breastfeeding room] in Boots and I went in and they don’t have one anymore. It didn’t matter in my case but that could panic people who don’t like to feed in public at all.”

While drawing attention to a range of issues related to early experiences of motherhood, the interview data highlights some challenges experienced by new mothers who choose to breastfeed. In line with [39], we see how breastfeeding a young baby can be unpredictable, such that women do not feel confident to leave the house in case they have to breastfeed outside of their home. Similarly to [32], we find that breastfeeding outside of the home is considered a challenge not only because of the fact that intimate parts of one’s body may be exposed, bodily fluids might be leaked, but also because women are unsure how their breastfeeding might be perceived by the public, and how they might cope with public hostility.

Design Workshops

Following analysis and ideation our design response took the form of a mobile phone application that allows women to find, review and share places for public breastfeeding. The application could serve the very practical benefit of allowing women to know where other women have had positive experiences of breastfeeding in public places, while also potentially highlighting the variety and breadth of places where women do have positive experiences of breastfeeding in public. To explore the design as well as understand the specificities of how such an application we conducted a series of design workshops.

Within the UK context local community breastfeeding support groups are available to offer informal places for women (often with new babies) to gather and breastfeed. On the whole, these groups offer a much needed space for women to meet other women who have recently become mums, as well as a place where women can come to solicit support and advice on breastfeeding. We were invited to run our design sessions within four of these community support groups around the city and its suburbs, and through this engaged with a further 21 mothers. Our design sessions were structured around two lightweight and flexible activities, the first focused on mapping women’s experiences of breastfeeding locally (*mapping past experiences*) and the second focused on drawing out the experiential qualities that make a place good for breastfeeding (*prioritizing location qualities*). Each activity was designed to be relatively quick to complete, require minimum hands-on activity from the women (since they could be breastfeeding) and could be conducted either with individual women, or with groups of women. Each workshop was audio recorded, transcribed and analysed using an deductive thematic analysis.

Mapping Past Experiences

Using an annotated map of the area surrounding each breastfeeding community group we asked the women to map places where they had breastfeed publically and to describe some of their (positive and negative) experiences of breastfeeding locally.

The data further suggested that women experience anxiety in relation to breastfeeding in public. And while this anxiety and feeling of embarrassment fades over time and with experience (“I don’t find it embarrassing because I think you get over that really quickly, within the first of weeks...”) it was considered to exacerbate stress relating to early breastfeeding experiences (“What am I going to do, where am I going to go and that’s another anxiety you’ve got to get over and not only have you got to make sure they latch on properly and you’re doing all the other things, you’re trying to go through a mental checklist and the problem of finding somewhere and then thinking are they going to let me, is it going to be alright?”)

In discussing public breastfeeding with our participants we heard a handful of negative stories. Nancy told us of her experience breastfeeding in a high-end pizza chain: “... They were absolutely awful in there... When they saw me getting [my baby] ready to feed they were like ‘oh don’t come and sit over here. Oh no no, go and sit over here in this corner...’ I’m like no what’s wrong with me sitting here because I was quite near the window and they were like ‘oh no, we’d rather you go and sit there’ and then I had people walking out of there because I was feeding...”

However, overall the women’s experiences were positive when they did breastfeed in public, with one participant reporting that a stranger in cafe had congratulated her for

breastfeeding. In our group discussions women often shared with one another good places to breastfeed around the city, as well as discussing certain problems that had to be overcome when looking for somewhere to breastfeed. The pragmatics of navigating a busy café with a buggy (“...there’s nothing worse than banging into every table and chair going...”), to knowing that a member of staff would carry a hot drink to the table (“because you can’t manage a buggy, a baby, a toddler if you’ve got one and whatever drink”), or that free drinking water was available. Common strategies for juggling these practical concerns was to only visit places which had baby changing facilities as the women considered that this indicated some level of baby friendliness.

Prioritizing Place Qualities

The second activity aimed to understand what qualities of a place were important to a positive public breastfeeding experience. We explored this through a card sorting activity. 14 cards were designed, each representing a feature or quality used to describe a place: clean, open, bustling, stylish, convenient, baby facilities, friendly, comfy, familiar, privacy, spacious, affordable, entertaining, calm. To complete the activity an individual or group of women were asked to provide a description of the quality in question and then place it on a target; the nearer the centre the more important, the nearer the perimeter the less important (see Figure 1). Blank cards were also available for women to include additional qualities of places that they considered important to a positive breastfeeding experience.

Through this activity we discovered that the qualities central to a positive experience of public breastfeeding were in part changeable dependent upon the age of the women’s baby and thereby their experience in breastfeeding. For example, for those new to breastfeeding, women tended to prefer to feed their babies somewhere private so as to concentrate on getting the baby to latch on properly. Alternatively, women with older babies tended to prefer somewhere quiet so as to reduce possible distractions (“Especially now as he’s got older I need somewhere quiet rather than somewhere that there’s loads going on because literally he’ll be on and off and on and off to see what’s going on.”) Similarly, while women got used to breastfeeding and in particular different ways of holding and supporting their baby while feeding, they tended to seek out places to breastfeed with supportive soft seating. However, as women became more experienced and in tandem their baby developed better head control and strength, women found they could feed on hard seats, or the ground if necessary.

Cooperative Evaluation

The final element of our user-centred design cycle saw the cooperative evaluation [30] of a wireframe, medium-fidelity prototype of FeedFinder. We brought the wireframe, which illustrated interactions required to find a

review, add a review and add a place, to one of the breastfeeding community groups who had participated in the original design workshops. We asked six women to walkthrough the wireframe, completing three activities: finding and viewing the reviews for a place, adding a review for a place, and adding a new breastfeeding place to the map. As the women completed each task, we asked the women to ‘think-aloud’ their actions and discuss with any problems that they were encountering. Notes were made throughout each evaluation and any usability issues and potential remedies were discussed with the user.

WHAT IS FEEDFINDER?

FeedFinder is a mobile application, available for free on both iOS and Android that enables women (and other interested parties, such as breastfeeding community workers, midwives, partners, business owners) to explore and contribute to a map which describes how supportive the local community and services are toward women who breastfeed. Women can use FeedFinder to search for and view places on the map where other women have previously breastfed, along with those women’s reviews and ratings along five categories: Comfy(ness), Clean(liness), Privacy, Baby Facilities and Average Spend. Women can also add new places to the map where they have breastfed and leave reviews for that place.

We added a brief survey to FeedFinder to collect an overview of women’s experiences of using the application. The short survey asks users to rate how happy they are with the application, whether they would recommend the application to a friend and whether the application has helped them to find a place to breastfeed in the last week. The survey has an open text box for any additional comments. The survey is made available to women four weeks after the application was first downloaded.

Imagining FeedFinder in Use

Sally had her first baby four weeks ago. She hasn’t left the house for weeks and she hasn’t wanted to. It’s been enough to try and get on top of nappy changes, feed her new baby as well as try to make sure she looks presentable for all the many visitors to her home since Ian was born. Today, Sally has decided to head into town to meet a friend for coffee. She’s excited to show Ian off, but worried about where she’s going to breastfeed Ian and whether people will stare at her if Ian cries or if she can’t get him latched on quickly. A friend recommended FeedFinder to her which she’s downloaded to her smart phone. She looked at the FeedFinder map before organising a place to meet her friend to find somewhere that would be breastfeeding friendly. She was surprised to see there were lots of places positively reviewed by women, and feels comforted that she’s not the only person trying to breastfeed a baby in Newcastle. She’s looked at a few of the reviews for places she used to visit before having a baby and found one of her favourite cafes is well rated by breastfeeding women, but

those women have noted that there aren't baby change facilities or much chance of privacy. Sally doesn't want other people to get an eyeful while she's feeding Ian, so she decided on a different café where she understands there's a sofa at the back of the café which is quite quiet and private, and which other women have said is clean with good changing facilities.

After her trip into the city Sally is feeling very pleased with herself. She's managed to change Ian's nappy in a café, dealt with a possetting incident and breastfeed Ian in public for the first time. As Ian sleeps in his buggy on the metro ride home, Sally opens FeedFinder, finds the café she visited earlier and adds her own review of the facilities and experience for other breastfeeding women to use. Sally keeps using FeedFinder throughout the first four months of Ian's life. As she gains confidence and Ian becomes more competent at feeding she doesn't need to use FeedFinder as often to find places to breastfeed, instead deciding to give back to the community by adding more places and reviews to the map in order to support other women.

RELEASING FEEDFINDER

The release of FeedFinder was planned to coincide with the birth of Prince George (July 2013) in order to maximise on possible interest within both regional and national press. The project was featured in television, radio and print media, including Sky News, BBC News as well as local press venues such as 'the Journal', the Metro radio and LBC radio.

We wanted the women who downloaded the application when it was first released to feel there was content there for them to interact with before hopefully moving onto adding reviews and new places to breastfeed based on their own experiences. As such, we invited a number of local breastfeeding women (recruited primarily through the university and informal networks) to use an early version of the application to add reviews for places where they had experience of breastfeeding. In addition, we added reviews to the map within the local area based on data collected in our design workshops, and particularly in relation to the 'Mapping Past Experiences'.

EVALUATING FEEDFINDER

FeedFinder has now been running for over 12 months and has seen an uptake of just under 3,000 members. FeedFinder has been used primarily in the UK however a smaller, but growing, number of venues and reviews have been added in the USA, Western Europe and Australia. At present, FeedFinder has over 3000 women who have used or currently use FeedFinder, 1900 places added and a total of 1810 reviews.

Members on average used FeedFinder on 2.6 separate occasions over a period of 25 days. However those that interacted with the application on more than a single day, around 48% (1366 users), used the application almost twice

that, with an average of 4.16 sessions over an average period of 53 days. The average session use time was 164.14 seconds (~3 minutes), which is more than twice the average amount of time spent interacting with a mobile application (71.56 seconds) reported by Böhmer et al [7]. However, the FeedFinder average session time is similar to the average amount of time that users were found to interact with health focussed applications specifically (an average of 153.80 seconds) [7]. During each session members performed on average 7.37 actions, viewing 1.45 venues and performed 5.2 map searches, with members searching 1.17 miles from their starting location. In addition, we found that 16% (475) of FeedFinder members have added at least one venue. A similar figure 14% (399) of members have contributed at least one review. This level of participation is similar to that reported by Van Mierlo in [29], who found that between 17 – 24% of members of online health communities made at least one post during their membership.

Members used the application throughout the day, but there were peaks in use three points during the day: 9am, 4pm and then 9pm. The application usage in the morning may reflect women searching to find places to breastfeed for later in the day. The 4pm peak in map searching may correspond with members attempting to find places to breastfeed while out and about. At 9pm the majority of reviews are submitted and places added suggesting that members find it easier to contribute to FeedFinder when in the evening, perhaps once the baby is in bed.

As FeedFinder made use of the Foursquare API it was possible to categorise places added to FeedFinder. The four place types added most commonly were Coffee Shops (108), Cafés (95), Pubs (82) and Department Stores (74). The most reviewed venue categories were Department Stores (119), Coffee Shops (95), Cafés (87) and Pubs (60).

Survey Data, Feedback and Member Correspondence

So far, a total of 109 unique comments have been received in the "additional comments" section of the survey. These comments provided insight on the need for more places (49), specific faults (43), potential new features (15), motivations for use (33), and miscellaneous items (1).

Not Many Local Places Yet!

Most prominent was the identified need for more places, which was linked to the need for more users (15), for pre-populated data (6), and for more promotion and advertising (5). In some cases, despite its usefulness, members recognised the need for further content: "*Easy to use app and has helped me to locate breastfeeding friendly locations. Would benefit from further reviews and more locations however I understand this requires user feedback.*" Members were also keen to either be directly

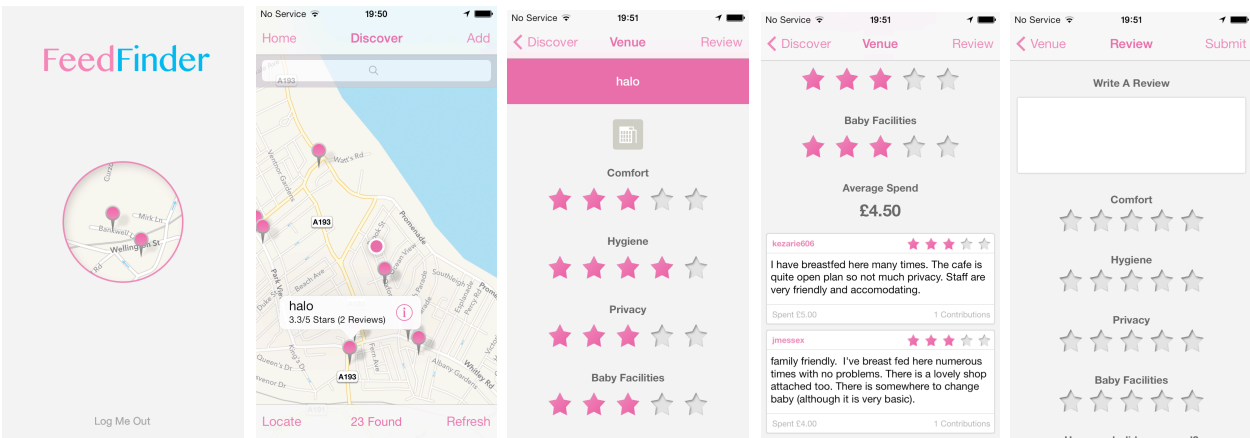


Figure 1: FeedFinder on iOS, the home screen, a mapped breastfeeding place, a review for a place, and the add a review screen

involved in this member feedback, or in recruiting or promoting feedback from others. One member wanted to integrate FeedFinder with Facebook to promote other member to provide reviews. "great concept. will improve with more recommendations. anyway of linking it to check ins with eg Facebook to remind people to add venues?"

Yet, feedback also pointed to a need to prepopulate the app with 'obvious' locations, and contradicts the above suggestions of member feedback. As one comment suggests: "I love the idea but there's no places listed! Would have been much better if you'd done some research and pre-populated it with a few of the obvious places in advance. Mothercares, mamas and papas, John Lewis etc. You shouldn't just rely on user submissions as people won't use an app with no content. Hopefully it'll have more content soon though." These comments point to a conflict in the expectations for authoritative data and the design of FeedFinder to promote community generated data.

Consumers and Citizens

Motivation for use appears to come from both its current usefulness (9) and expected usefulness for expecting mothers (7). Four commenters were active promoters of the application, while eight others identified their use as 'helping others', often despite their own comfort in public breastfeeding and reduced need for the app (4). Promoters of the app were particularly interested in demonstrating the ease of public breastfeeding to nervous mothers. This was both for professional support workers: "As a breastfeeding worker, I use this app to show new mums how easy it is to find a decent place to feed, especially if they are worried about public feeding. It's a great local app!" And for mothers: "I am happy to bf [breastfeed] my 22 month anywhere but will review places to aid new bf mothers or mothers that are more nervous to feed in public." The use FeedFinder as a tool to promote breastfeeding more formally was also confirmed in email correspondence with three NHS trusts and two local councils. In all five cases FeedFinder is being used as part of campaigns to support and increase breastfeeding.

There was also a change in how these members approached FeedFinder as they grew in confidence. "I used the app more when my baby was new born, now my baby is 4-5 month I am more confident and feed where ever I want! I think it's great for more nervous mothers so will still review places for them." One of these commenters disagreed with the notion of only certain places being breastfeeding friendly: "If someone was nervous about feeding in public and found confidence in others feeding at a location without issue then that's where this would be handy. For this reason only I've added some locations. But I hate the idea of acceptable places to feed, if your baby wants feeding then it's fine to feed them, wherever, whenever. Focus on baby and be proud of what you're doing." This perspective was also evident in e-mail correspondence received by the authors, where, following the UK's Equality Act, all locations across the country should be 'relatively breastfeeding friendly'. Although FeedFinder aims to expand on the 'relative' element to this, some users (and non-users) reject this for an absolute model of breastfeeding friendly places.

Beyond using the application to support other breastfeeding mothers in finding places to breastfeed, we know some women used FeedFinder to attempt to influence local service provision. In email correspondence with a FeedFinder member and local lactivist, Violet, discusses how she used FeedFinder to show the customer service manager of a large department store how reviews for his store compared with a local competitor, and where his store might improve its facilities to improve women's breastfeeding experience.

DISCUSSION

Feeling comfortable breastfeeding in public is, as suggested by much of our interview and design data, a time sensitive issue. For many, it is a case of doing it once or twice before feeling at ease with the act. FeedFinder appears to have been helpful in giving women the confidence to go out and breastfeed, with a large number of women (and breastfeeding supporters) downloading and using the

application over a short period of time. Some women then go onto to continue adding places and reviews to support a community of women after them who are entering into public breastfeeding. Other women simply leave the community, their needs hopefully fulfilled. Here we frame FeedFinder as a *supportive health technology*. We highlight how FeedFinder as an everyday mundane design and service that enables women to engage in matters of the everyday also has the potential to facilitate publics to form to *engage with matters of concern*.

Changing the Individual, Changing the Environment

Much work within the HCI community has focused on how digital technologies might persuade or motivate individuals to engage in positive health behaviour [1, 2, 13, 27]. Strategies used have ranged from those inspired by theories of individual behaviour change, and lived experiences of motivation [2, 14], through to ambient adaptations of public space that aim to make healthy choices more available [1, 37]. Within the domain of public and preventative health there is similarly an increasing interest on how web 2.0 technologies can and have changed the landscape of health communication [11]. In such discussion, there is an acceptance that the public at large is moving away from simply consuming information to being engaged in the production of information for themselves and others. And examples exist of public health web 2.0 interactions that enable individuals to share healthcare experiences [20] or supporting the personalization of healthcare messages to specific communities.

Key to public health messaging and many persuasive health interventions is the notion of a “right” health behaviour regardless of culture and context. Accordingly, the core tenant of criticism in relation to public health 2.0 approaches therefore is that these channels allow for patients to share their own healthcare advice and views, which will not necessarily agree with official, and rigorously evaluated (i.e. “right”) advice, and in fact may even be classified by experts as bad advice. When a critical lens from within the field of HCI is applied to technologies which seek to persuade or motivate healthy behaviour [12, 26, 34, 35], concerns are raised such that technologies have the potential to produce a context where healthy behaviour is forced and where negative comparisons with others are rife (in turn leading to neurosis).

The choice over whether to breastfeed or not is often constructed as a moral one, where breastfeeding is a value and cornerstone of “good” mothering [22, 25]. We cannot argue that FeedFinder is an example of a valueless technology, since its core focus is providing support to mothers who have chosen to breastfeed, and not those who haven’t. But, FeedFinder was not designed to persuade mothers to breastfeed. Instead, FeedFinder was designed from the position of offering a *supportive health technology* for women who have chosen to breastfeed, or for women who might chose to breastfeed should the socio-cultural

context prove accepting. As such, we consider that FeedFinder contributes to a vision for public health services where the focus is not on whether particular (healthy) choices are actually made in practice, but instead on whether individuals within a society have the opportunities to make a particular (healthy) choice where it suits them [22]. FeedFinder has the potential to help women find out for themselves (from the comfort of their own home) how their local community and services respond to breastfeeding women, provide feedback to their local services about how they might improve their services in relation to breastfeeding women, as well as, with time, increase the number of women seen breastfeeding in public. All of which can help to contribute to providing breastfeeding as an infant feeding option for those women who want to try. So, rather than attempting to change the individual [2, 14], or design a new environment [1, 37], FeedFinder attempts to provide women with the tools to understand and affect change in their own environment for themselves.

FeedFinder as a Public Thing

In [15] DiSalvo et al. introduces Latour’s notion of “DingPolitik” to HCI, discussing the role that design and HCI might play in facilitating contemporary democracy through objects which enable publics to form around and engage with matters of concern i.e. groups committed to addressing a specific issue. Through this lens, we can identify FeedFinder as a tool that facilitates the collection of data about the lived experience of breastfeeding in public locally, regionally and nationally. FeedFinder thus enables individuals, groups and communities to compare the lived experience of breastfeeding against the presumed rationality (that the public is not supportive of public breastfeeding). By facilitating the collection of this lived and affective experience, FeedFinder offers a platform through which the qualities that categorise political conditions can become better known, and acted upon by publics. We have evidence that a minority of women used FeedFinder to actively fight for the rights of women in their local community to receive good breastfeeding support, highlighting the capability for publics to form around FeedFinder. For example, Violet used FeedFinder to show a local business how it could better support breastfeeding women by making improvement to its parents’ room.

Departing from [15] we argue that there are gains to be made through both designing to engage and capture something of the lived experience of a social condition, while in conjunction providing solutions to a perceived problem. FeedFinder can be and is viewed by many as a convenient service and solution to the problem of not knowing where to breastfeed in public. This characterisation of FeedFinder is demonstrated through its large and growing user population, and the fact that most users used FeedFinder to search for and find places to breastfeed. But, FeedFinder as a service (as well as a design that engages with a matter of concern) only works if those

using it decide not only to use FeedFinder to consume information, but also to contribute information. Based on our analysis of community participation, as well as existing quantitative analysis of social networks [29], we know that relatively few users will actually contribute elements of their lived experiences to online communities. However, we also know that the focus of FeedFinder as a service that provides support to breastfeeding women acted to motivate some women to contribute content about their lived experiences of breastfeeding in public. They did this often not as a political act of being engaged with a matter of concern, but as an act of supporting other women engaged in the everyday act of caring for their baby in a manner that suits them. As such, we consider that the success of design seeking to make known the qualities of contemporary social conditions through active user participation may very well be contingent upon an ecosystem of different types of members and users, with a large pool of (happy) consumers central to the emergence of publics.

Designing with Mothers with Babies

The involvement of breastfeeding women within our iterative user centred-design process was essential in identifying and confirming the design space, as well as understanding how breastfeeding experiences might be rated and reviewed. When working with women with young children we quickly learned that design tasks needed to be incredibly flexible, quick and undemanding. Young babies crave to be held, even when they're not being fed, which means that individuals participating in a design tasks will likely only ever have one hand free, ruling out many creative tasks. In addition, because the needs of a young baby can be particularly demanding and unpredictable it is important to develop design methods that can be easily paused and re-started, as well as not requiring a large amount of time to complete (we found ten minutes to be about right). Finally, since a participant's attention will be split consider developing methods that are easy to respond to. We found tasks which were already part completed, or required ordering were sufficient for supporting useful design dialogue while being respectful of the amount and time and energy a woman would have for participating in the project.

CONCLUSION

Breastfeeding in public causes many women anxiety and can make the early weeks of motherhood a lonely and isolating time. In response we have designed, developed and deployed a mobile application which supports women in finding, reviewing and sharing places for public breastfeeding. Through so doing, we have identified one vision for the design of technologies to support public health, which moves the focus away from the individual and instead holds a lens to communities and societies and asks whether these contexts provide opportunities within which healthy choices can be made.

REFERENCES

1. Arroyo, E., Bonanni, L. And Valkanova, N. 2012. Embedded Interaction In A Water Fountain For Motivating Behavior Change In Public Space. *In Proc. CHI 2012* Pp. 685–688.
2. Balaam, M., Rennick Egglestone, S., Fitzpatrick, G., Rodden, T., Hughes, A.M., Wilkinson, A., Nind, T., Axelrod, L., Harris, E., Ricketts, I. And Others 2011. Motivating Mobility: Designing For Lived Motivation In Stroke Rehabilitation. *In Proc. CHI 2011*, Pp. 3073–3082.
3. Balaam, M., Robertson, J., Fitzpatrick, G., Say, R., Hayes, G., Mazmanian, M. And Parmar, B. 2013. Motherhood And HCI. *In Proc CHI EA '13*, Pp. 3215 – 3218.
4. Bardzell, S. 2010. Feminist HCI: Taking Stock And Outlining An Agenda For Design. (2010), *In Proc. CHI 2010*, Pp. 1301–1310.
5. Bell, G. And Dourish, P. 2006. Back To The Shed: Gendered Visions Of Technology And Domesticity. *Personal And Ubiquitous Computing*. 11, 5 (Oct. 2006), 373–381.
6. Berridge, K., Mcfadden, K., Abayomi, J. And Topping, J. 2005. Views Of Breastfeeding Difficulties Among Drop-In-Clinic Attendees. *Maternal & Child Nutrition*. 1, 4, 250–62.
7. Bohmer, M., B, H., Schoning, J., Kruger, A. And Bauer 2011. Falling Asleep With Angry Birds , Facebook And Kindle – A Large Scale Study On Mobile Application Usage. *In Proc. Mobilehci* (2011), 47 – 56.
8. Bottorff, J.L. 1990. Persistence In Breastfeeding: A Phenomenological Investigation. *Journal Of Advanced Nursing*. 15, 2, 201–9.
9. Boyer, K. 2011. “The Way To Break The Taboo Is To Do The Taboo Thing” Breastfeeding In Public And Citizen-Activism In The UK. *Health & Place*. 17, 2, 430–7.
10. Chaudhri, R., Vlachos, D., Borriello, G., Israel-Ballard, K., Coutsoydis, A., Reimers, P. And Perin, N. 2013. Decentralized Human Milk Banking With ODK Sensors. *In Proc. Computing For Development* (New York, NY, USA, 2013).
11. Chou, W.S., Prestin, A., Lyons, C. And Wen, K. 2013. Web 2.0 For Health Promotion: Reviewing The Current Evidence. *American Journal Of Public Health*. 103, 1, E9–18.
12. Comber, R., Hoonhout, J., Van Halteren, A., Moynihan, P. And Olivier, P. 2013. Food Practices As Situated Action : Exploring And Designing For Everyday Food Practices With Households. *In Proc. CHI '13* (2013), pp. 2457–2466.
13. Comber, R. And Thieme, A. 2012. Designing Beyond Habit: Opening Space For Improved Recycling And

- Food Waste Behaviors Through Processes Of Persuasion, Social Influence And Aversive Affect. *Personal And Ubiquitous Computing*. 17, 6, pp. 1197–1210.
14. Consolvo, S., Mcdonald, D.W., Toscos, T., Chen, M.Y., Froehlich, J., Harrison, B., Klasnja, P., Lamarca, A., Legrand, L., Libby, R., Smith, I. And Landay, J.A. 2008. Activity Sensing In The Wild: A Field Trial Of Ubit Garden. *In Proc. CHI '08* (2008), pp. 1797–1806.
 15. Disalvo, C., Lodato, T., Jenkins, T., Lukens, J. And Kim, T. 2014. Making Public Things: How HCI Design Can Express Matters Of Concern. *In Proc. CHI '14* (2014), 2397–2406.
 16. Edwards, R. A, Bickmore, T., Jenkins, L., Foley, M. And Manjourides, J. 2013. Use Of An Interactive Computer Agent To Support Breastfeeding. *Maternal And Child Health Journal*. (Jan. 2013).
 17. Enquist, H. And Tollmar, K. 2008. The Memory Stone – A Personal ICT Device In Health Care. *In Proc. NordiCHI '08*, pp. 103–112.
 18. Gibson, L. And Hanson, V. 2013. Digital Motherhood: How Does Technology Help New Mothers? *In Proc. CHI '13*, pp. 313–322.
 19. Health and Social Care Information Centre (2012). *Infant Feeding Survey*.
 20. Healthtalkonline.Org: [Http://Healthtalkonline.Org/](http://Healthtalkonline.Org/). Accessed: 2014-09-18.
 21. Henderson, L., Kitzinger, J. And Green, J. 2000. Representing Infant Feeding: Content Analysis Of British Media Portrayals Of Bottle Feeding And Breast Feeding. *BMJ*. 321, 7270, 1196–8.
 22. Knaak, S.J. 2010. Contextualising Risk, Constructing Choice: Breastfeeding And Good Mothering In Risk Society. *Health, Risk & Society*. 12, 4, 345–355.
 23. Kosaka, T., Misumi, H., Iwamoto, T., Songer, R. And Akita, J. 2011. “Mommy Tummy” A Pregnancy Experience System Simulating Fetal Movement. *SIGGRAPH 2011*, Article 10.
 24. Lawrence, R. A 2000. Breastfeeding: Benefits, Risks And Alternatives. *Current Opinion In Obstetrics & Gynecology*. 12, 6, 519–24.
 25. Lee, E. 2007. Health, Morality, And Infant Feeding: British Mothers’ Experiences Of Formula Milk Use In The Early Weeks. *Sociology Of Health & Illness*. 29, 7, 1075–90.
 26. Maitland, J. 2011. Towards Negotiation As A Framework For Health Promoting Technology. *ACM SIGHIT Record*. 1, 1, 10.
 27. Maitland, J., Chalmers, M. And Siek, K.A. Persuasion Not Required Improving Our Understanding Of The Sociotechnical Context Of Dietary Behavioural Change. *In Proc. PervasiveHealth '09*, pp. 1-8
 28. McIntyre, E., Hiller, J.E. And Turnbull, D. 1999. Determinants Of Infant Feeding Practices In A Low Socio-Economic Area: Identifying Environmental Barriers To Breastfeeding. *Australian and New Zealand Journal of Public Health*. 23, 2 (1999), 207–209.
 29. Van Mierlo, T. 2014. The 1% Rule In Four Digital Health Social Networks: An Observational Study. *J. Of Medical Internet Research*. 16, 2 (2014), E33.
 30. Monk, A., Wright, P., Haber, J. And Davenport, L. 1993. *Improving Your Human- Computer Interface: A Practical Technique*. Prentice Hall.
 31. Mums Furious As Facebook Removes Breastfeeding Photos: 2008. <http://www.theguardian.com/media/2008/dec/30/facebook-k-breastfeeding-ban>. Accessed: 2014-09-17.
 32. Nelson, A.M. 2006. A Metasynthesis Of Qualitative Breastfeeding Studies. *Journal Of Midwifery & Women’s Health*. 51, 2 (2006), E13–20.
 33. Pain, R., Bailey, C. And Mowl, G. 2001. Infant Feeding In North East England: Contested Spaces Of Reproduction. *Area*. 33, 3 (Sep. 2001), 261–272.
 34. Parker, A., Kantroo, V., Lee, H., Osornio, M., Sharma, M. And Grinter, R.E. 2012. Health Promotion As Activism: Building Community Capacity To Effect Social Change. *In Proc. CHI '12*, pp. 99–108.
 35. Purpura, S., Schwanda, V., Williams, K., Stubler, W. And Sengers, P. 2011. Fit4Life: The Design Of A Persuasive Technology Promoting Healthy Behavior And Ideal Weight. (2011), 423–432.
 36. Renfrew, M. 2011. Infant Feeding Survey 2010: Early Results. (2011).
 37. Rogers, Y., Hazlewood, W.R., Marshall, P., Dalton, N. And Herrich, S. 2010. Ambient Influence: Can Twinkly Lights Lure And Abstract Representations Trigger Behavioral Change? *In Proc. UbiComp '10*, pp. 261-270.
 38. Ruddick, S. 1989. *Maternal Thinking: Towards A Politics Of Peace*. Beacon Press.
 39. Scott, J. A. And Mostyn, T. 2003. Women’s Experiences Of Breastfeeding In A Bottle-Feeding Culture. *J. Of Human Lactation*. 19, 3, 270–277.
 40. Smyth, L. 2008. Gendered Spaces And Intimate Citizenship: The Case Of Breastfeeding. *European Journal Of Women’s Studies*. 15, 2 (May 2008), 83–99.
 41. Stearns, C. 1999. Breastfeeding And The Good Maternal Body. *Gender and Society* 13, 3, pp. 308–325.
 42. Williamson, I., Leeming, D., Lyttle, S. And Johnson, S. 2012. “It Should Be The Most Natural Thing In The World”: Exploring First-Time Mothers’ Breastfeeding Difficulties In The UK Using Audio-Diaries And Interviews. *Maternal & Child Nutrition*. 8, 4, pp. 434–447