

The impact of the Covid-19 pandemic on North American milk banks

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Abstract

This study aims to understand the impact of the Covid-19 pandemic on human milk banking services in North America, with a focus on the United States. We triangulated questionnaire data with interviews and text-based website data. Of the 30 human milk bank services from which data were obtained, the majority faced substantial internal organization change in terms of staffing and protocols and experienced financial hardship in particular because of decreases in donor human milk orders. At the same time, most banks reported an increase in their numbers of donors and in the volume of milk collected. These results show that the pandemic significantly affected the way in which many North American milk banks operate, some lactating mothers donate their milk and, at least during the first few months of the crisis, certain hospitals' donor human milk ordering patterns changed. It suggests in particular that stay-at-home orders and the turn to remote work created the potential for a surge in human milk available for donation as a number of parents no longer needed their surplus for their own children. Legal and policy reform should focus on replicating the positive effects of the pandemic on breastfeeding by guaranteeing paid parental leave and flexible work conditions. Initiatives should also aim at counteracting its negative effects by mandating the insurance coverage of donor human milk, supporting milk banks financially and, more generally, integrating lactation and human milk banking services within the health system.

KEYWORDS

breastfeeding, Covid-19 pandemic, donor human milk, human milk banks, lactation, neonatal health, NICU

1 | INTRODUCTION

Institutionalized human milk services exist in North America at least since the beginning of the 20th century (Golden, 1996; Swanson, 2014), although these services are predated by the older system of using wet nurses in the hospital (Barrett & Hiscox, 1939). Now commonly known as human milk banks (HMBs), the majority of these

HMBs are not-for-profit organizations that belong to the Human Milk Banking Association of North America (HMBANA). HMBANA is a non-profit accrediting association established in 1985 to standardize and facilitate the establishment and operation of HMBs in the region (Jones, 2003). A few services have chosen to not be linked to HMBANA, and another few services are linked to for-profit companies.

North American HMBs have faced several health crises, from

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HIV/AIDS, which led to the closure of many HMBs (Cassidy, 2013), to Ebola and Zika (Gribble, Mathisen, et al., 2020). Based on over a century's worth of experience and an excellent safety track record, they were well prepared to handle Covid-19 (Carter & Reyes-Foster, 2016; Cassidy & Dykes, 2019). However, in the first weeks of the pandemic, two unknowns destabilized HMBs globally: Would there be a donor human milk (DHM) shortage? Could SARS-CoV-2 be transmitted through DHM?

There were fears that DHM would be scarce because donors would be stressed, have diminished lactation support or be unable to travel for blood testing and dropping off their milk (Furrow, 2020). As an HMB director interviewed for this project recounts, 'what we did not expect was that donors, instead of retreating and not donating milk, wanted to help ... women came out of the woodwork and said, "what can we do to help? We'll donate our milk."' HMBANA (2021) reported that a 'record-breaking 14,093 donors gave ... in 2020, a 13% increase from 2019'.

Human milk experts assumed that breastfeeding and DHM would be safe because respiratory viruses are typically not transmissible through milk and that viruses present in milk are inactivated through pasteurization. There was early evidence that SARS-CoV-2 itself was not present in milk (Chen et al., 2020). Accordingly, HMBANA issued guidance on 6 March 2020 recommending that HMBs screen donors for Covid-19 and apply a temporary 28-day deferral to those infected or exposed, but not otherwise change their protocols. In the following months, a number of studies confirmed the safety of DHM (Chambers et al., 2020; Palmquist et al., 2020; Pitino et al., 2021; Unger et al., 2020; Walker et al., 2020). Several research groups investigated the antibodies secreted in milk by Covid-positive people or Covid-19 survivors, suggesting a protective effect on infants and potential for use in drugs and therapies (Fox et al., 2020).

Building upon the growing literature on the effects of the pandemic on HMBs worldwide (Azevedo et al., 2020; Bhasin et al., 2020; Jayagobi & Mei Chien, 2020; Marinelli, 2020; Rigourd & Lapillonne, 2020; Shenker, 2021; Shenker et al., 2020; Shenker et al., 2021; Spatz et al., 2020), this study examines its impact on North American HMBs' personnel, work organization and DHM supply and demand, with the aim to propose law and policy reforms to better support HMBs and infant feeding emergency preparedness (Gribble, 2018).

2 | METHODS

This study is based on triangulated data collection combining questionnaire responses, with interviews, and data collection from HMBs' websites, eliciting detailed understandings, conceptions, beliefs and attitudes towards the pandemic.

We designed and distributed a Qualtrics-hosted online structured questionnaire in which participants replied to prompts by selecting from predetermined answers but also had opportunities to respond to open-ended questions or to add their own comments at the end of Likert scales or multiple-choice responses. Table 1 provides the exact

Key messages

- The pandemic significantly affected the way in human milk bank services operate.
- During the first months of the pandemic, a number of hospitals decreased their donor human milk orders mainly due to financial and trust issues.
- Stay-at-home orders and the turn to remote work created the potential for a surge in human milk available for donation as some lactating parents no longer needed their surplus milk.
- Legal and policy reform should focus on guaranteeing paid parental leave, flexible work conditions, insurance coverage of donor human milk, financial support to human milk services and integration of lactation support and human milk services within the health system.

wording of the questions used in this analysis, and a complete copy of the questionnaire can be provided upon request.

The survey was approved by HMBANA, which sent it out electronically in December 2020. Currently, there are 34-member and developing HMBANA HMBs. With help from HMBANA, we classified the HMBANA HMBs as either independent or hospital based and received information that there are currently 19 independent HMBANA HMBs and 12 hospital HMBANA HMBs. Additionally, two independent and one hospital HMBANA banks are currently developing. To ensure anonymity for the developing HMBANA HMBs, we decided not to separate out the developing from established HMBANA HMBs. We also emailed the survey to six non-HMBANA HMBs (i.e., human milk services that are not members of HMBANA, some of which are not-for-profit whereas others are for-profit companies). We had responses from a total of 30 HMBs, but not all of the responses were complete. We made every effort to get completed information from all of the responding HMBs and decided to include all 30 responding HMBs for additional website data collection. Twenty-six of 34 (76.5%) HMBANA HMBs responded to the online survey, and four of six (66.7%) non-HMBANA HMBs. All but one (20 of 21 or 95%) of the independent HMBANA HMBs answered at least some of our questions, but less than half (6 of 13 or 46%) of the hospital-based HMBANA HMBs responded.

Ten in-depth semistructured interviews were conducted by the first author with the personnel of nine different HMBs in Canada and the United States. The interviews took place remotely via video conferencing or over the phone between June 2020 and March 2021. Participants were recruited through a combination of snowball sampling and an invitation to participate circulated at the end of the survey questionnaire. Interview questions focused on how the pandemic affected HMBs' personnel daily work and understanding of it; milk demand, supply and handling; and relationships to co-workers and others. The interviewer followed the active interview approach (Holstein & Gulbriun, 1995) whereby participants have an active role in the process of interpretation and reflexivity rather than being

TABLE 1 Type and summary of data from 30 responding human milk banks (HMBs)

Question	Response	Independent HMB (20 or 67% out of the 30 HMBs) ^a		Hospital HMB (6 or 20% out of the 30 HMBs) ^a		Non-HMBANA HMB (4 or 13% out of the 30 HMBs) ^a	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
We wish to ask some questions about the effects of the pandemic on your staff.	Yes	7	23	2	7	1	3
	No	13	43	4	13	3	10
Has the crisis affected your personnel in terms of number of workers?	Yes	13	43	5	17	3	10
	No	6	20	1	3	1	3
Financial changes	Yes	13	43	3	10	3	10
	No	6 ^b	20	3	10	1	3
Did you notice changes in milk orders since the onset of the pandemic in March 2020 compared to previous years?	Increase	0 ^b	0	0	0	1	3
	Decrease	12	40	3	10	3	10
	No change	6	20	3	10	0	0
Has the number of donors changed since March 2020?	Increase	14 ^b	47	5	17	0 ^b	0
	Decrease	2	7	0	0	0 ^b	0
	No change	2	7	2	7	3 ^b	10
Has the volume of milk collected changed since March 2020?	Increase	14 ^b	47	5	17	0 ^b	0
	Decrease	1	3	0	0	0 ^b	0
	No change	2	7	1	3	3 ^b	10
Website appearance of term Covid, Covid-19 or pandemic.	Yes	12	40	5	17	1	3
	No	8	27	1	3	3	10

Abbreviation: HMBANA, Human Milk Banking Association of North America.

^aPlease note that information about the HMBANA HMBs classification was confirmed by Pauline Sakamoto.

^bPlease note that this indicates missing data. We had complete survey data from 27 HMBs, but we included the others because they did begin the survey. So they were included in the website analysis.

passive producers of answers. Accordingly, participants were encouraged to elaborate on ideas and explain perspectives in their own words, thus creating the opportunity to gather depth of detail. Interviews were recorded and transcribed. The themes that emerged from the first five interviews were used to support content validity and generate the survey questionnaire, whereas the five last interviews were analysed to confirm findings. The protocol was approved by the UConn IRB Protocol H20-0101. All interview participants gave their informed consent, and their identities are concealed to preserve their confidentiality. Additionally, both authors conducted in-depth interviews with parents lactating during the pandemic, including human milk donors, for other projects. Though not included in the data of the present study, they informed some of its interpretations.

Thirty HMB websites were visited by both authors, and the second author conducted an additional systematical review using the Wayback Machine digital archive, which enabled the collection of all references to Covid-19 (Table 1). The Wayback Machine is a non-profit digital library of websites that includes over 25 years of web history (Arora et al., 2016). Websites offer unobtrusive data, and the Wayback Machine can be used to trace changes in specific websites over time, enabling researchers to analyse websites before and after specific dates (Rogers, 2017). Researchers have long recognized the reliability of these results (Vaughan & Thelwall, 2003). The second author looked at the

websites in both March 2020 and 2021 for each of the 30 HMBs. This third component of data was used to further inform the increased confidence in our interpretations of the other data collected.

Despite the fact that our sample size was 30, we choose not to conduct an inferential statistical analysis but did make use of some descriptive statistics to help to frame our data. Some of the results are presented numerically 'to facilitate pattern recognition or otherwise to extract meaning from qualitative data, account for all data, document analytic moves, and verify interpretations' (Sandelowski et al., 2009, p. 210). The numerical data and corresponding percentages are thus not intended to create the impression that a prevalence having significance for generalization was identified. The goal is rather to highlight the connection between the various verbal data, situating research participants' responses vis-à-vis one another (Maxwell, 2010).

We used constructivist grounded ethnographic theory (Glaser, 1978; Glaser & Strauss, 1967; Schmied et al., 2015) as our primary analytic technique. This approach is rooted in the Chicago pragmatic social sciences, combining understandings of multiple realities with the mutual creation of knowledge by researchers and research participants (Altheide & Johnson, 1994; Charmaz, 1995, 2000; Guba & Lincoln, 1994; Prus, 1987, 1996; Schwandt, 1994). We also rely on elements of Erving Goffman's (1974/1986) study of interactions to develop interpretive understanding of the data. According

to Goffman, to frame a situation (i.e., to make an interpretation and adjust to it) is a strategy used to understand and give meaning to everyday life. Frame analysis is particularly helpful when studying individuals and organizations that are familiar with and sometimes involved in scientific production, as HMB personnel tend to be aware of the formalized practice of social interaction through interviews and surveys, shaping their self-presentation and responses accordingly.

All of the data collected (online questionnaire responses, interview responses and website review) were utilized to help to inform the authors regarding key themes. Initial coding began with the reading and coding into broad themes of the first five interview transcripts, which revealed that the pandemic had primarily affected HMB personnel's material and social world in very concrete ways. Thereafter, we engaged in focused coding involving in-depth analysis of the interviews together with the survey results and the websites review so as to assess similarities and differences and infer more nuanced themes. To increase the reliability of the content analysis, each author engaged in coding independently, before comparing and discussing findings with one another.

The three forms of data collection have complementary strengths and weaknesses but together offer triangulated data, increasing reliability and validity in the results. The survey provided evidence of patterns among the majority of HMBs; the interviews gathered insights on HMBs' personnel attitudes, thoughts and actions; and the website provided additional text-based information. Whereas questionnaires are often seen as a more objective research tool allowing larger sample sizes, faulty design and non-responses can limit the data. All respondents were invited, so even though the survey was hosted online, concerns did not arise about the legitimacy of participants. Interviews are interpersonal, and therefore, the role of the researcher must be taken into consideration, especially when using a small sample size. The unobtrusive nature of text-based data, such as that available on websites, makes them a useful additional form of data, particularly as information changes quickly. Although our systematic analysis of HMBs' websites is limited to answering the question of whether or not Covid-19 or the pandemic were mentioned, our individual review of these websites further validated the other two sets of data and informed our interpretations.

3 | RESULTS

Three main themes emerged in participants' narratives, survey responses and websites. Rather than abstract concepts, concrete assemblages of people, things, ideas and processes appeared key to understanding how HMBs function and were affected by the pandemic. By focusing on the material elements of human milk banking, we gain understanding of how HMB personnel articulated and represented the crisis.

3.1 | Operational challenges

Twenty-five HMB employees (83.3%) reported in our survey results that their organization experienced substantial organizational change,

be it in terms of staffing, logistics or finances. HMBs adopted Covid-response plans and adapted their internal work practices to follow state, Public Health Agency of Canada and Centers for Disease Control (CDC) guidelines—as well as their host organization's policies for in-hospital services. They took measures such as temperature checks, symptom reporting, Covid testing, universal masking, new facility cleaning and sanitation protocols and quarantining.

To implement social distancing, a majority of HMBs prohibited visitors and donors from entering their premises and turned to remote work for all administrative tasks. To lower the density of the in-person staff—primarily laboratory technicians and workers shipping or receiving DHM—shifts were staggered. One HMB director stated, 'we had some employees coming in at night and on weekends, so that people didn't have to work together.' Several HMBs allowed employees to leave early, cross-trained their production staff, prohibited staff meals except outdoors and briefly shut down when community transmission was at its highest or an employee tested positive to Covid-19.

Nineteen HMBs (63.3%) declared having experienced or continuing to face financial instability due to revenue loss and increased expenditures. Delays in accreditation and contracting with hospitals accrued losses for HMBs that were still developing. For more established HMBs, the inability to secure new accounts halted growth or caused hardship. Expenditures to sanitize and disinfect facilities and to secure personal protective equipment (PPE) skyrocketed. Screening donors and transporting milk became more expensive. Some donors felt uncomfortable travelling to laboratories for their blood tests, prompting HMBs to send mobile phlebotomists to their homes, which came at a price. The closure of milk depots (i.e., DHM collection sites in medical offices, businesses or day-care centres) and the loss of volunteers—who, as one director stresses, 'were like our couriers. We call them "The Milk Express"'—led to pricier shipping alternatives. 'We spent \$7000 more on shipping than we had budgeted,' commented one HMB director. At the same time, some HMBs were able to cut back on expenses such as travel.

To weather these financial difficulties, nine HMBs mentioned obtaining Paycheck Protection Program (PPP) loans established by the US federal government to help small businesses continue to pay their workers during the crisis; HMBANA itself obtained a PPP loan. Seven HMBs brought up other forms of support, including local Covid relief grants, state grants, private grants, philanthropic gifts, special fundraisers and partnerships with businesses donating a portion of their profit to the bank. Others tried to increase their DHM sales but found it difficult given their limited outreach opportunities.

3.2 | Demand and supply

3.2.1 | Demand

From about March until July 2020, 20 HMBs (66.6%) saw a drop in DHM orders from hospitals. Orders only slightly declined for some HMBs, whereas others indicate that they experienced declines in the range of 30% to 50%, with the most dramatic fall reported in April. The

diminution was sometimes preceded by a short-lived surge in demand towards the end of February and in early March, right before Covid-19 was declared a pandemic, which HMBs attribute to hospitals' anticipatory concern with a DHM shortage. DHM orders picked up again towards the summer or fall of 2020, except for a few HMBs continuing to report lower than usual demand. Three of the HMBs that did not witness a diminution in orders were not yet open during the period, but one declared long delays in contracting with hospitals. Four key reasons for reducing the demand for DHM were highlighted by our data.

1. Hospital resource reallocation. A number of hospitals appear to have reassigned their resources to fight the pandemic at the expense of services seen as non-essential, such as DHM. As hospitals and health systems faced unprecedented financial losses and expected a DHM penury, they may have sought to cut expenses by switching to infant formula. One HMB director recounts speaking to a nurse at one of her ordering hospitals telling her 'that there were budget changes at that time ... so their ability to order was restricted for a while'.
2. Risk aversion. Fear of contamination with Covid-19 may account for the lower demand, at least before studies documenting the safety of DHM were widely disseminated. One HMB director recounts, 'we got a lot of calls and emails from providers asking about the safety of milk', before pointing out that '[t]he rush to publish with inadequate peer review resulted in the publication of multiple 'studies' that implicated human milk as a dangerous vector of COVID-19. One study recommended formula feeding all babies until more research was available Another publication recommended applying high concentration bleach to all milk bags and bottles'. Another HMB employee remarked, 'just like any other time that we've had these pandemics show up, the hospitals tend to not order or they drop. For example, one of the times was during the Ebola, HIV, and Zika.' Additionally, one of the non-HMBANA HMBs reported an increase in sales of its shelf-stable DHM products, which could suggest an initial mistrust of fresh DHM collected during the pandemic.
3. Reduced need for DHM. Neonatal intensive care units (NICUs) specializing in the care of ill or premature newborns are the primary consumers of DHM. The decreased incidence in preterm birth observed during the spring and summer of 2020 may have reduced the need for DHM in those services—there were simply less patients to serve (Berghella et al., 2020; Harvey et al., 2021). Well-baby nurseries' (i.e., nurseries for healthy babies who do not need any special care or monitoring) demand for DHM may have also dwindled on account of families being discharged earlier than usual to prevent Covid-19 contamination. As one HMB director underlined, they 'were going home within 24 hours before they would see that it [DHM] was needed'. Consistent with this hypothesis is the finding that outpatient demand for DHM grew at several HMBs—often for newborns who would have otherwise stayed at the hospital a few days longer or whose parents had difficulties initiating lactation due to insufficient support.
4. Bank rationing. In some cases, the drop may be attributable to HMBs' own behaviour. One HMB director explained that in March 2020, fearing a shortage, she consciously chose to reserve DHM to NICUs, 'we didn't dispense any milk to outpatients, and we said

NICUs got priority, and then we would dispense to full-term nurseries. And then we realized we had plenty of milk, and it took a little time to build that back up.'

3.2.2 | Supply

Nineteen HMBs (63.3%) reported an increase in their numbers of donors and in the volume of DHM collected in 2020. Seven noted that the surge in volume was higher than the surge in donors, indicating that on average individual donors donated more milk and/or for longer periods of time. One bank director noted, 'the donors we are getting are high-volume women.' Another remarked, 'donors are donating for longer periods of time now.' Several factors may explain the overall rise in donations, and again, we developed a typology of four key themes.

1. Outreach and new policies. Several HMBs issued calls for donors through social media and the press all the while adopting policies to facilitate donations, including lowering the minimum donation threshold, sending mobile phlebotomists to donors' home or arranging with local labs to test in the early morning, contactless milk pickups and expanded shipping options. It became possible to donate milk without ever having to leave one's home.
2. Remote work. With non-essential personnel working remotely and stay-at-home orders in a number of states and localities, a greater share of parents could nurse their children and express extra milk available for donation. Without immediate plans to return to work in person, many did not feel the need to hold onto their expressed milk to feed their children (Botz & Cohen, 2021). They needed freezer space as they were making fewer trips to grocery stores and cooking more often.
3. Longer lactation. Homebound lactating parents may often delayed weaning. Breastfeeding provided them and their children with comfort during a very challenging time. Longer lactations increase opportunities for donation and its duration.
4. Altruism. Young parents stuck home feeling powerless and wanting to help may have took to milk donation. One HMB director stated, 'Our typical donor is a working mother who is already pumping for her baby. We don't see people who altruistically want to pump. Ordinarily we don't, but I think during the coronavirus, we did see that.' Another HMB employee compared Covid-19 with 'other big crises, like 9/11 when people came together to give blood and to help people in a way that some of us have never seen before'.

3.3 | Protocols

All the HMBs that answered our question about whether their protocol to screen donors changed reported modifying theirs more than once, often in a 'dynamic' fashion as they 'adapted to the pandemic' and integrated updated guidance from leading public health organizations, whereas 40% of HMBs' websites had zero references to Covid-

19 or the pandemic. Even in ordinary times, HMBs rigorously screen donors verbally, as well as through a written questionnaire, serological testing for blood-borne viruses and other infectious pathogens and bacteriological testing. All DHM dispensed by HMBANA HMBs undergoes pasteurization. Non-HMBANA HMBs may add their own steps in terms of screening, testing and processing.

HMBs changed their intake questionnaires to screen for donors potentially infected or exposed to Covid-19. As an HMB director explained, 'it's not that we're worried about its [SARS CoV-2] getting into the milk. It's (a) there are medications that ... [donors] sometimes take because of it and (b) it's just being aware that the stuff that the milk is held in—the bottles, the bags, the boxes, and so forth could be problematic'. There is now strong evidence that the safety protocols HMBs had in place before the pandemic protected the DHM supply from biological hazards such as Covid-19 and they did not need to employ any new processing methods in the laboratory. The handling and processing of DHM barely changed apart from workers taking heightened precautions to protect themselves from contamination via surface touching and for some of the non-HMBANA HMBs that developed a Covid-19 test to test DHM shipments.

That said, Covid-19 required reorganizing transportation. HMBs typically rely on a combination of shipping, volunteer pickups and donor drop offs. As numerous milk depots closed and volunteers stayed home, HMBs turned to local couriers and contactless pickup and drop off.

Regarding the results from our systematic websites data collection (Table 1), it was most common for hospital-based HMBs to give information on the impact of Covid-19 on their protocols (five out of six HMBs), often with links to information provided by the hospital itself. The second most common result was among the non-HMBANA HMBs to *not* provide any Covid-19-related information at all on their websites (three out of four HMBs). As for independent HMBANA HMBs, the majority included Covid-19 on their websites (12 out of 20 HMBs), with varying levels of detail and often linking to HMBANA's own webpages. These are small numbers, and any extrapolations from these data alone would be unwise. However, coupled with our qualitative impressions from visiting websites and our other data results, these findings help to inform our theoretical discussions and conclusions.

4 | DISCUSSION

In line with 'actor-network theory' (Latour, 1987), according to which scientific knowledge is socially constructed through processes, networks and actors through which the world is constantly being assembled, with the pandemic, DHM appeared more than ever determined by concrete inputs—operational challenges, demand/supply instability and transportation logistics, among others.

Covid-19 significantly affected HMBs' material and social functioning as health organizations that need to keep employees and clients safe. As one bank director stressed, 'I have a company with eleven employees, I really was adamant about trying to keep the employees safe first'. Several HMBs reported that some of their employees contracted Covid, leading to significant operational disturbance. As

organizations that primarily employ women, who tend to carry more intense caregiving responsibilities, HMBs had to accommodate frequent schedule changes as schools closed, opened and closed again. Without the help of volunteers, employees quickly became overworked. One HMB coordinator confided, 'we have been overwhelmed with new donors and incoming donations and myself and my coworker have been working long hours and days and have not had a break in nearly a year.'

The financial impact of the crisis on HMBs is likely to have been even more pronounced than the results show. North American HMBs are primarily 'small businesses' who can sometimes be in 'competition' with one another, as an HMB director emphasized, even if HMBANA members often collaborate and support one another. Some participants may have been reluctant to share information about their finances or may have softened negative information, consistent with Goffman's (1955) 'facework' theory according to which face preservation is a primary constraint on the achievement of goals in social interactions. When finances permitted, HMBs hired staffers, but finding candidates able to work flexibly proved challenging given that most were mothers. The incidence of financial hardship reflects the specificity of North American HMBs, which are predominantly small, stand-alone, private charitable organizations rather than public or in-hospital services. Independent HMBs are more vulnerable to sudden changes in demand and increases in operating costs. In-hospital HMBs tend to be more financially secure and have a built-in clientele serving their own hospitalized babies. However, some suffered too as hospitals' revenues dropped, resulting in hiring freezes and forgoing overtime hours and bonuses.

Beyond the concrete effects of the pandemic on operations, a recurrent theme in HMBs' personnel accounts was that the crisis exposed the lack of prioritization of lactation and infant health in North America. As one milk bank staffer observed, 'obviously the hospitals are focusing on Covid, and so since donor milk and breastfeeding are, in most people's opinions not directly related to Covid, the focus is shifting on that'. Several bank directors also lamented the initial 'fear-based' response to lactation among a number of health professionals, who questioned the safety of feeding at the breast and using DHM. The consequences of the overall decline in DHM orders for infants are yet to be determined. Further research is needed to assess whether it translated into an increase in morbidity and mortality related to prematurity and other health conditions. HMBs' ability to accept rising milk donations was also impacted as some lacked the storage capacity or funds to procure new freezers. Other HMBs were uncertain whether they could place their products. Ordinarily, they sell excess DHM to other HMBs, but as an HMB director commented, 'there was no one to send it to because everybody had that problem'.

One positive effect of the surplus in DHM, however, has been to broaden the range of recipients in terms of both indications and socio-economic backgrounds. An HMB director comments, 'we gave a lot of milk to the community at reduced cost or free because we would never let it expire.' Several banks witnessed 'higher demand for scholarship milk among outpatient recipients'. Older outpatient babies with complex medical issues who are usually 'totally forgotten as far as donor milk is concerned' were now able to access it.

These results matter because HMBs provide an essential service, in particular to the most vulnerable babies—hospitalized ill and premature newborns, for whom it is both an essential food and lifesaving medicine (Patel et al., 2021). It is concerning that during the outbreak of a disease that does not circulate through human milk and has a low likelihood of making infants sick, DHM orders dropped. It is also unfortunate that some HMBs had to turn away donors considering that even in normal times too many hospitalized infants fail to receive DHM (Perrin, 2018). Results show that infant health continues to be underprioritized by governments and public health organizations.

Breastfeeding and milk sharing are relational activities involving affect and social connections (Cassidy & Dykes, 2019; Cohen, 2019). The results also reflect the loss—or weakening—of the sense of community some HMBs create. HMBs used to be places of socialization for volunteers and donors, as well as a source of support for young families. As a bank director reminisced, '[w]e liked them [donors] coming into the building because they can see the lab, and we've got baby pictures up, and it's always nice to interface with them, but we completely cut that off'. HMBs that offered in-person breastfeeding support and enrichment or community education had to cancel or transition online, exacerbating new parents' isolation.

4.1 | Limitations

First, our study is limited in its scope. Though a couple of Canadian HMBs are represented in the data set, the vast majority of participating banks are located in the United States. As a result, the analysis is US centric, as we were unable to distinguish the analysis between the two countries without exposing who contributed and who did not in Canada. Additionally, though we also collected data on lactating parents, including some who donated milk, this study centres on the perspective of HMB staff rather than the interaction between HMBs and their donors.

Second, our study is limited in its findings. In the United States, there are significant disparities in the use of DHM and breastfeeding, especially along race, ethnicity and economic status (Kair et al., 2020; Patel et al., 2021; Sigurdson et al., 2019; Spatz, 2020). No specific trend emerged from the data as to whether the decreases in DHM orders originated from private versus public (or 'safety net') hospitals or rural versus urban versus suburban hospitals. As a bank director noted, 'We saw no pattern. Just an overall decrease during that time period'. Within hospitals, it is unclear whether NICUs versus special care or well-baby nurseries changed their demand relative to one another. Therefore, we do not know whether hospitals catering primarily to underprivileged families were more or less likely to limit their use of DHM in a way that could compound pre-existing inequalities in infant health.

Similarly, the data did not reveal whether the surge in DHM donations was associated with a change in donors' demographic or other characteristics. The only recurrent trait pointed by HMBs was that telework enabled a greater number of people to donate, particularly working parents who might have otherwise been too busy. Two

HMBs noted an increase in bereaved donors, which they attributed to the development of 'legacy milk' programmes supporting such donations rather than the pandemic. About half the HMBs stated that they do not collect data on race, ethnicity and/or economic status. Among those collecting it, only a couple recorded a meaningful change—one HMB noticed an increase in African American donors, and another in Asian and Latina donors. Though anecdotal, these developments are welcome considering that middle-class White women have been shown to have more opportunities to donate milk compared with other groups (Pineau, 2012).

5 | CONCLUSION

This study supports the adoption of wide-ranging legal and policy initiatives to increase the visibility and support of HMBs' critical role in infant and public health, particularly in the United States. The pandemic represents a natural experiment revealing what can happen when millions of parents are allowed to work from home or under more flexible conditions—they are able to breastfeed their own children and to produce extra milk available for donation.

To durably bolster the supply of DHM, systemic legal overhaul is needed to guarantee 6 months of fully paid parental leave in addition to breastfeeding leaves and flexible work arrangements. This would allow parents to meet the 6 months of exclusive breastfeeding recommendation issued by the American Academy of Pediatrics (2012) and other health organizations, as well as donate any extra milk. Lactation support and DHM should be incorporated into the health care system with the generalization of Baby-Friendly Hospitals and affordable, skilled and culturally competent lactation counselling. Governments should support HMBs financially and logistically to protect them from financial insecurity and having to reduce or suspend their services in times of crisis. In many countries, including most European countries and Brazil (the global leader in milk banking), milk banks are integrated into the public health system and are themselves either public entities (or branches of public entities) or private entities benefitting from public subsidies (Pittas & Dri, 2017). This support is urgent considering North America is expecting a sharp drop in births, which could cause further revenue loss for HMBs (Kearney & Levin, 2021). This public support should not just be limited to disaster and emergency situations, however. With more resources, HMBs would be able to meet the DHM needs, not only of all hospitalized infants, but also of an increased number of outpatient babies who would benefit from DHM, broadening the indications for which it is prescribed.

On the demand side, the cost of providing DHM to infants, be it as inpatients at the hospital or as outpatients, should be fully covered by public and private health insurance. Currently, in most states, Medicaid does not cover DHM in the hospital, let alone at home. HMBs developed charitable programmes to deliver free or sliding scale DHM, but they cannot service all applicants.

One of the silver linings of the pandemic is that it has reconfirmed that milk banking is an extremely safe and well self-regulated pursuit and that there is no need to ratchet up regulation (Picaud et al., 2021).

As a bank director put it, the 'HMBANA standards are written very carefully, very thoughtfully. We have 30 years of experience writing them. They are written with the FDA, the CDC, and Health Canada. Those standards have become stricter over the years, as they should'. Yet, in the first weeks of the pandemic, HMB personnel spent considerable time and resources reassuring health care providers that there was no or inadequate evidence that Covid-19 was transmitted through DHM. To avoid this happening again, investment should be made in research programmes dedicated to studying the safety of DHM and educating hospital administrators and health care providers on its benefits. In the face of new infectious microorganisms, these programmes would be able to rapidly conduct research and safety assessments, the results of which could be widely disseminated by leading public health and food agencies.

Finally, the pandemic exposed the need for systematic infant feeding emergency preparedness given the infant formula shortages and disruption in breastfeeding support it engendered. Access to human milk can be especially critical to the survival of infants during emergencies and disasters and a major part of both maternal and infant care (Gribble, Marinelli, et al., 2020). Richard Banati, Medical Director of the Mothers' Milk Bank (n.d.) in Australia, refined a freeze-drying technique for DHM with the idea that it could serve to establish a human milk emergency reserve. Smith and Iellamo (2020) advocate for the adoption of a specific regulatory environment to ensure that skilled lactation support is available during emergencies as well as the option of wet nursing and peer-to-peer donor milk sharing. Emergency plans should also involve policies to keep parents and babies together, systematically teach hand expression in case of unavoidable separation so that lactation can be maintained and support the operations of HMBs.

Overall, we have seen what we feel is clear evidence that HMBs deserve government support to enable and encourage breastfeeding especially during a pandemic. Some of these results may or may not be similar to those found around the world. We are currently working on a comparative research study of human milk services in several countries that will shed light on the commonalities and differences of the North American HMB pandemic experience.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTIONS

MC conceived the idea for the manuscript, reviewed the literature, conducted the survey and interview data collection, interpreted and

analysed the data, drafted the article and reviewed websites. TC helped with the data collection and methods design, reviewed the literature, supported data interpretation and analysis of the data, conducted the websites data collection, prepared the table and reviewed and edited the manuscript. All authors read and approved the final submitted manuscript.

DATA AVAILABILITY STATEMENT

The data collected for the study will not be made available to others as it would compromise research participants' confidentiality. Even deidentified data could be linked back to individuals or organizations given that the qualitative data collected present rich and detailed accounts of participants' thoughts and actions.

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