“Lighting The Way For Those Not Here”: How Can Technology Researchers Help Resist the Missing and Murdered Indigenous Relatives (MMIR) Crisis?

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Fig. 1. **Artifacts** – Advocates and families shared noteworthy artifacts with us at [National-level Conference on Violence against Native peoples]: The (**left two**) flyers for talking circles run by Mother Nation, (**middle**) an action plan for families to find their relatives, created by Alaska Native Women's Resource Center [14], and (d) (**right**) a doll we created to honor our lost relatives in the doll-making workshop. Talking circles and doll-making workshops are sacred traditional healing practices in some Indigenous communities (♥ A3, § 6.2.1).

Indigenous peoples across Turtle Island face disproportionate rates of disappearance and murder, a genocide rooted in settler-colonial violence and systemic erasure. Technology plays a crucial role in the Missing and Murdered Indigenous Relatives (MMIR) crisis: it perpetuates systemic violence and impedes investigations, yet also enables sites of advocacy, healing, and resistance. For example, Native communities utilize AMBER alerts, digital news, sovereign crowdsourced databases, social media groups, and resistance movements to mobilize searches, amplify awareness, and honor missing relatives. Yet little research in HCI has critically examined the role of technology in shaping the MMIR crisis. Thus, we qualitatively analyze 140 webpages to identify sociotechnical barriers that hinder communities' efforts, while highlighting actions that foster healing, safety, and resilience. We grounded our analysis in stories that resist epistemic erasure through relational accountability, critical humility, cultural sensitivity, and refusal. Finally, we provide recommendations for HCI to recognize self-determination and sovereignty of Indigenous technologies, direct action to support families, and honor Indigenous onto-epistemologies that cease epistemic violence.

2026. ACM XXXX-XXXX/2026/10-ART
https://doi.org/10.1145/nnnnnnn.nnnnnnn

Content warning: *The paper may be disturbing for some readers. The paper contains stories of physical and sexual violence, genocide, trafficking, stalking, homicide, substance abuse, forced sterilization, profanity, harassment, and abduction. Please take care of yourself while reading the article.*

> *Think of a woman in your life with whom you are close.*
> *Consider how special she is to you, how much you care about her, and how she makes your life better.*
> *Now. . . What if she disappeared? The experience, for many, is that while you worry about her greatly, you trust authorities will find and bring her back safely. But for some of us, these authorities do not seem interested in helping. Pause and feel this. The authorities are not helping you find her. You do not know where else to turn. Weeks, months, and years pass, and yet you hear nothing about what happened to your loved one. No explanation from authorities. No one even seems to be talking about finding your loved one; in fact, no one has really acknowledged that she is missing. How would you feel? Sadness? Anger? Anguish? What if no one even validated your grief? How would you go on from day to day? What would you do? Where would you turn?*
>
> *Ficklin et al. [112]*

1 Introduction

Missing and Murdered Indigenous Relatives (MMIR[1]) is a human rights and public safety crisis impacting Indigenous people throughout Turtle Island (North America). Indigenous peoples across genders and ages face high rates of violence and disappearances. Indigenous women are murdered at rates more than ten times the national average in the United States [35] and six times the national average in Canada [214]. Native women are over-represented among domestic violence victims in Alaska by 250% [156]. In the US, more than four in five Indigenous women (84.3%) have experienced violence — almost always by non-Indigenous perpetrators (96% of cases) [291]. In 2015, across four sites surveyed in the US and Canada, an average[2] of 40% of sex trafficking victims in the US are Native women [242]. The 2019 National Inquiry into MMIR, established by the Government of Canada in 2016, concluded that the systemic violence experienced by Indigenous peoples — particularly Indigenous women and girls — constitutes an ongoing genocide [159]. In the US, federal reports and commissions have similarly recognized the MMIR crisis as a systemic national issue shaped by jurisdictional failures, inadequate data systems, and the enduring impacts of settler colonialism, though without formally adopting the genocide framing [257, 344].

To address the MMIR crisis, State and grassroots organizations are using technologies to find and protect Indigenous relatives [111, 231, 253]. For example, to help investigate and collect information about missing persons, governments use a centralized database [5, 294], DNA sequencing technology [36], and alert systems [1, 328]. Families and tribal police frequently use social media platforms to raise awareness of the crisis [48, 90, 111, 231]. Despite these efforts, modern technologies infrastructures do not translate to safety of Indigenous communities, rather reinforce unsafe conditions. We argue that this is because technologies perpetuate epistemic silencing through a lack of Indigenous voices and knowledge in their design and deployment [107, 219]. These technologies embed

[1]While "Missing and Murdered Indigenous People" (MMIP) or Missing and Murdered Indigenous Women, Girls, and Two-Spirit people (MMIW or MMIWG2S) are also widely used terms, many advocates prefer "Missing and Murdered Indigenous Relatives" (MMIR) to emphasize kinship, relationality, and global solidarity. Jodi Voice Yellowfish $_{15}$ [374] verbalizes this strong solidarity within MMIR movement "I haven't been [to] a space where everyone . . . doing that work were so open to having so much care for the work, that everyone is called a "relative" in that space."

[2]"In Hennepin County, Minnesota, roughly 25 percent of the women arrested for prostitution identified as American Indian...In Anchorage, Alaska, 33 percent of the women arrested for prostitution were Alaska Native...In Winnipeg, Manitoba, 50 percent of adult sex workers were defined as Aboriginal... and 52 percent of the women involved in the commercial sex trade in Vancouver, British Columbia were identified as First Nations." [242].

deeply rooted settler-colonial and oppressive logics and perpetuate systemic erasure, rather than protecting Indigenous lives. Without centering community needs, colonial infrastructure renders the effort ineffective and actively harmful to the families of missing or murdered relatives. Ficklin et al. [112] questions the ubiquity of modern technology and its ineffectiveness in addressing the crisis: "*Technology is so embedded in our society that it seems impossible for anyone to maintain their privacy, much less go missing.*" For example, despite the efforts of using technology to record MMIR cases in US and Canada, comprehensive data on missing and murdered Indigenous survivors does not exist, leaving most cases uncounted, unsolved, or improperly investigated. MMIR advocates at Urban Indian Health Institute (UIHI) [206] — an Indigenous-led independent effort to document the missing or murdered victims — reported 5,712 cases, yet only 116 (2%) appeared in the US National Missing and Unidentified Persons System (NamUs) and National Crime Information Center (NCIC). In Canada, a 2014 RCMP (Royal Canadian Mounted Police) [294] recorded 1,181 cases, excluding suspected homicides, deaths deemed suspicious, and cases where the victim was missing for more than 30 days. Importantly, most grassroots advocacy groups believe this to be a severe undercount.

Technology has increasingly become central to address the MMIR crisis. The MMIR resistance movement emerged from stories shared by grannies and aunties of K'emk'emeláy (now Vancouver, Canada) to make Indigenous loss within dominant public discourse [32]. Social media has become a critical infrastructure for sustaining the movement, enabling families, survivors, advocates, and Tribal communities to mobilize transnational solidarity [48, 90, 111, 231]. However, technologies are not neutral infrastructures: they shape whose voices are amplified, which cases become visible, and how communities access healing and justice. The MMIR crisis reveals how sociotechnical systems facilitate settler-colonial violence by side-stepping Indigenous agency and self-determination. This tension reveals an urgent need for HCI engagement with the MMIR crisis. Yet, little is known about how technologies shape MMIR response efforts in practice, including how Indigenous communities adapt, resist, and reconfigure them for search, advocacy, remembrance, and healing. To address this gap, we conduct a large-scale content analysis of articles available online related to MMIR to examine how technologies support or hinder community-led MMIR responses with the goal of understanding how HCI researchers and practitioners can better support Indigenous communities through culturally grounded and sovereignty-centered design. We ask the following research questions:

RQ1 *How do technologies create barriers for Indigenous communities in searching missing or murdered relatives?*

RQ2 *How do communities reconfigure technologies to resist, heal, and advocate for the MMIR movement?*

In this work, we critique how data infrastructures and Western epistemologies reinforce colonial violence by creating "death spaces in darkness" that render Indigenous lives uncountable through bureaucratic systems instead of affording safety. Drawing on necropolitics [219], we capture the haunting perpetuated by technology infrastructures by confronting the sovereignty over who gets to live and stay dead. Federal databases like NamUs or NCIC fail to register Indigenous victims through inaccurate data collection and opaque data sharing policies, creating barriers for communities to find safety and reproducing epistemic erasure. Colonial institutions repeatedly misuse or appropriate Indigenous knowledge. For example, the RCMP installed five 5G cell towers along the "The Highway of Tears" to close the gap in cell service. However, they used a narrow definition of "missing"/"murdered" and left out many highways with spotty cell coverage. Moreover, most Tribes lack the agency and access to the State criminal databases and are unable to release alerts, forcing dependence on colonial institutions. At the same time, Indigenous communities mount a generational resistance against State technologies and reclaim them as spaces of advocacy, ceremony, memory, and care. Families and tribal police circulate missing-person posters, coordinate

search efforts, document violence, and preserve collective memory. Communities form ecosystems of care through social media campaigns, sovereign and crowd-sourced databases, and digital maps supporting three action pillars: (1) search and rescue for relatives (§ 6.1), (2) providing support and healing to relatives and their families (§ 6.2), and (3) raising awareness of the MMIR crisis (§ 6.3).

By centering Indigenous voices, we make the following four contributions across disciplines:

(1) **Knowledge Contribution:** We outline five technology-related barriers (denoted by BX) addressing the MMIR crisis. To fight systemic injustice, we highlight six socio-technical actions (denoted by AX) taken by Indigenous communities to find missing or murdered relatives (§ 6.1), seek safety, support, and healing (§ 6.2), and mobilize the MMIR movement (§ 6.3). These three action pillars form what we call Interconnected Infrastructure of Care (IIC) (Figure 4).
(2) **Methodological Contribution**: We created a culturally-sensitive content analysis pipeline to identify and analyze 140 web pages. We analyze pages by employing value-sensitivities rooted in decolonial feminist onto-epistemologies such as critical humility, relational accountability, and refusal (§ 3). We demonstrate how empirical HCI methods and automation can be re-imagined to engage critically with settler-colonial systems by centering Indigenous meaning-making.
(3) **Data Contribution**: We create a dataset of web pages that resists epistemic erasure and transcends Western academic knowledge, holding sacred stories of missing or murdered relatives, families, advocates, and tribal police. The dataset includes news articles, reports by advocates and police agencies, podcasts, and court hearings. This dataset will be open-sourced to support future HCI research and Indigenous advocacy.[3] We expand the concept of technology to include doll-making, talking circles, and storytelling as healing infrastructures. The notion that technology can carry spirit, memory, and ceremony pushes HCI to rethink what counts as a technological artifact altogether.
(4) **Design and Practice Recommendations**: We invite HCI scholars, platform designers, and policymakers to reckon with epistemic injustices and center Indigenous voices. Our work seeds generative efforts by inviting relational work that supports the sacred ties that bind together the pillars of IIC (Figure 4). We propose design implications for (a) sovereignty and governance of data infrastructures (§ 7.1), (b) platforms and system design (§ 7.2), and finally, (c) researchers practice (§ 7.3).

2 Background

A historical grounding is crucial in enabling readers to resonate with intergenerational violence and trauma faced by missing or murdered relatives, their families, advocates, and tribal police [30, 308]. Addressing the MMIR crisis necessitates reckoning with these historical harms. These structural issues do not work in favor of Indigenous communities, as technology design often extends or mirrors historical structures that excluded Indigenous communities. We briefly outline the settler-colonial root-causes of violence and structural barriers underlying the MMIR crisis in US and Canada (see Dunbar-Ortiz [98], Blackhawk [46], and Stannard [313] for a comprehensive historical account). Although, each country has their own policing and governance structures, our goal is to show how the structural failure exposes the communities to MMIR crises. Then, we outline limited prior HCI research that resists extraction and centered Indigenous meaning-making. Finally, we describe how we utilize decolonial feminist lenses to ground our research.

[3]The dataset is provided in the supplementary materials. We will only open-source the links to the sites, along with metadata generated from our analysis. Sharing only links maintains community sovereignty (ownership, control, and stewardship) over the content and honors any desires of the original content creators to remove, modify, or hide content.

2.1 Historical Overview of the Missing and Murdered Indigenous Relatives Crisis

" Why is it that we are more likely to be raped and murdered than go to college? Why is it that our young girls are just trying to survive? " — Desi Small-Rodriguez Lonebear [30] [347]

Intersecting regimes of settler-colonial governance and coercively negotiated treaty frameworks exemplify the institutionalized normalization of violence against Indigenous peoples that underlies the MMIR crisis. Rooted in the 'doctrine of discovery' or 'manifest destiny', 'White savior complex' emerged from white-supremacist ideologies that justified the theft of Indigenous land under the guise of "saving" Indigenous peoples [117, 171, 172, 222, 367].

2.1.1 Structural Dispossession and Isolation. The legacy of land dispossession, extractive industries, and residential schools has produced intergenerational trauma, perpetuating identity loss, cultural disconnection, poverty, and cycles of violence that continue to harm Indigenous communities today and fuel the crisis. Colonial land policies such as forced relocation, land allotment, and the creation of reservations stripped access to lands that Indigenous communities have stewarded since time immemorial [369]. In the U.S., the General Allotment Act of 1887 (Dawes Act) divided communally held Indigenous lands into individual parcels, sold to European settlers [7, 365]. The reservation system confined Indigenous peoples to small, often remote tracts of land with few economic opportunities [265, 365]. Similarly, on the pretense of reparations for stolen land, federal recognition process fail to reflect the full diversity of Indigenous identities and governance systems, while reinforcing colonial control over who is considered "legitimately" Indigenous [5]. The US and Canada recognize 574 and 634 tribal nations, respectively, leaving unrecognized tribes vulnerable (e.g. Métis and Inuit First Nations) [267, 365]. Recognition perpetuates settler-colonial dynamics; forcing Tribal Nations to depend on the State for economic resources, creating significant barriers to justice, health, and victim services such as limited access to protections, legal recourse, and culturally appropriate services [67]. Forced displacement into urban centers under the guise of employment, without adequate housing or social support, often left them isolated and vulnerable [99, 116, 210]. Currently, over 70% of Indigenous peoples reside in urban areas [342]. However, MMIR crisis continues in both rural and urban cities, shattering misconception that violence only happens in reservations. For example, as many as 94% of Native women reported being raped or coerced in urban Seattle, US [99].

Moreover, the expansion of extractive industries (oil-gas pipelines, mineral mining, cannabis, and recently, AI data centers) on reservation lands trespasses on sovereignty and endangers safety. Industries establish *man camps*, housing that brings thousands of transient labor (predominantly male), which have been linked to increased rates of domestic violence, sexual assault, stalking, trafficking, and labor exploitation, adding stress on the tribal police's capacity [21, 159, 306]. For example, "man camps" in North Dakota have led to a 300 percent increase in sex crimes [306]. Modern extractive industries (e.g., AI data centers) replicate colonial dispossession and exploitation in remote areas (see our limitations in § 4.3). Finally, coercive residential schools used law enforcement to forcibly remove Indigenous children from their families (1880s to 1970s in the US; till 1996 in Canada) [6, 239]. Children were prohibited from speaking their languages, practicing cultural traditions, or maintaining family ties. Many were sent to remote, inaccessible institutions far from home. Students suffered widespread physical, emotional, and sexual abuse, as well as neglect through malnutrition, overcrowding, and unsanitary conditions. Thousands died and were buried in unmarked graves near school sites [6]. The consequences remain profound. Indigenous children are still disproportionately represented in state child welfare systems [47, 249].

2.1.2 Jurisdictional Maze and Law Enforcement Neglect. The persistence of police violence and jurisdiction tension reflects the broader extension of colonial control where Indigenous lives are routinely devalued. In the US, the 1978 Oliphant vs. Suquamish Indian Tribe [9] ruling curtailed jurisdictional

powers of Indigenous nations and banned tribal courts from prosecuting non-Native perpetrators for their crimes on reservations. This split authority leaves tribal police under-resourced, and State agencies slow to intervene, leading to significant delays in investigations [89], especially when 96% of domestic violence perpetrators are non-Native [291] or the crime is committed on non-tribal lands [67] On the contrary, the Federal Bureau of Investigation (FBI) can prosecute violent felonies on tribal lands; however, closed zero cases of sexual assault from non-Native perpetrators [343]. The Public Law 280 (PL280)[4] gave some US states authority over criminal and certain civil matters on tribal lands (some tribes are exempt from PL280, most are not). In Canada, the 1876 Indian Act governs the legal status of First Nations (except Metìs and Inuit Nations [267]), but it does not recognize separate Indigenous criminal jurisdiction. Although tribal police exists, the criminal prosecutions on reserves are administered by provinces, with no equivalent to the tribal courts of the US. State law enforcement agencies fail to protect Indigenous peoples and investigate cases of disappearance or murder [159]. Reports made by families are often dismissed, misclassified, or subjected to victim-blaming narratives that minimize the seriousness of the violence [40, 285]. Many cases go cold for decades without recourse for families [86, 206]. Indifference from the police has historically accompanied harassment, physical violence, including fatal shootings, and even sexual assault [89, 266, 285]. This neglect and abuse of power reinforces mistrust of state institutions and discourages families from seeking help.

2.1.3 Media Invisibility and Health Disparities. Invisibility in Western media and the legacy of forced sterilization persists today, enduring racist narratives and lost trust in State institutions. Capitalist and patriarchal belief systems (e.g., viewing women as less valuable, violence against women, ownership of women [112]) and hierarchical institutional structures eroded and replaced matrilineal societies where women often held central positions [22, 89, 124, 194]. Colonial narratives systematically devalue Indigenous peoples as "less worthy", irrational, and hypersexualized them; legitimizing their mistreatment and violence and reinforcing cycles of abuse and impunity [82, 166, 217, 284, 285]. Popular mainstream media (big news media outlets, Hollywood films, radio, literary books) reproduce these white-supremacist and racist violent narratives and stereotypes such as "Indian Princess" or the "sexualized squ*w"[5], and patterns of invisibility through "colonial amnesia" [303]. Cases are often covered through a deficit-centered gaze, highlighting the vulnerability and brokenness of Native lives; hapless victims as opposed to survivors of targeted violence spanning generations [28, 125, 166, 284]. Lucchesi and Echo-Hawk [206] found that news coverage comprised "racism or misogyny or racial stereotyping, including references to drugs, alcohol, sex work, gang violence, victim criminal history, victim-blaming, making excuses for the perpetrator, and publishing images/video of the victim's death." In contrast, cases involving white women tend to garner far more extensive and sympathetic coverage, described as the "missing white woman syndrome" [28, 125, 142]. This lack of visibility reflects and reinforces systemic racism, minimizing the perceived urgency of the violence and reducing public and political pressure for accountability.

Health disparities among communities cause high rates of lifetime substance abuse, suicide, homicide, incarceration, and anxiety/affective disorders [53, 83, 103, 108, 127, 359]. In rural communities, health facilities may be underfunded and understaffed, forcing women to travel long distances to receive care [35, 132, 176, 210]. In urban cities, relatives and families often encounter racism and

[4]Six are mandatory PL280 states— Alaska (except the Metlakatla Reservation), California, Minnesota (except Red Lake), Nebraska, Oregon (except Warm Springs), and Wisconsin. Ten states assume full or partial jurisdiction — Arizona, Florida, Idaho, Iowa, Montana, Nevada, North Dakota, South Dakota, Utah, and Washington.

[5]These stereotypes falsely degrade Indigenous women as weak and vulnerable, waiting to be saved from a 'white prince or savior'. This stereotype mimics the 'doctine of discovery'; a narrative historically and currently used by settlers to justify colonization of Indigenous peoples of Turtle Island.

discrimination in "mainstream" healthcare and social services, actively violating and discouraging them from seeking assistance [19, 210, 267]. The absence of accessible shelters, underfunded Indian Health Services (IHS) facilities, and culturally-grounded and trauma-informed healing programs disenfranchises families' grief, leaving many without protection or resources [53, 54, 93, 210]. Finally, under the guise of public health, eugenics, and population control, the US and Canada implemented forced sterilization programs to exercise control over Indigenous women's bodies, devaluing their lives and treating them as expendable. These programs sterilized thousands of Indigenous women (1960s and 1970s, till 2000s in Canada [318]), often without proper consent or through coercive practices such as withholding medical care [195, 295, 318].

2.1.4 Inadequate Legislation and Policy Efforts. Advocacy led by Indigenous women guided a series of legal policies and reforms to address the crises, yet the enforcement remains uneven and inadequate. Unlike policy reforms that seek to make colonial systems more inclusive (e.g., diversity, equity, and inclusion policies), advocates have fought for the restoration of Indigenous sovereignty, recognizing Indigenous jurisdiction over justice systems and reclaiming control of land and resources. After years of deliberate ignorance and inaction, the US finally addressed the crisis through the Tribal Law and Order Act (2010) and the Violence Against Women Act (VAWA) (reauthorized in 2013[6] and 2022), aimed to improve coordination across justice systems [89, 155, 287]. The 2019 "Operation Lady Justice" (aka U.S. Presidential Task Force) established state task forces to improve coordination among State agencies.[7] However, the initiative faced criticism for a lack of transparency and tribal involvement. More recently, Ashlynne Mike AMBER Alert In Indian Country Act (2018)[8], Savanna's Act (2020),[9] and the Not Invisible Act (2020) [74] were passed to improve alerting systems, data collection and inter-agency task forces (35 states have a MMIR taskforce) [244]. In Canada, the 2019 national inquiry [159] forced the government to make specific recommendations to improve collaboration among federal, provincial, and Tribal partners. Beyond recognition, implementation has been slow and inconsistent, with critics noting a lack of Native representation, adequate funding, oversight, and concrete action; some calling it performative liberal politics to garner Native votes [111]. Similarly, the National Action Plan on MMIWG (2021) exists largely as an aspirational document without enforceable accountability mechanisms [294].

2.2 Decolonial Academic Research to Address MMIR

Coloniality in Academic Research. Coloniality has long silenced Indigenous peoples' voices, languages, histories, and experiences as inferior, thereby justifying dispossession, assimilation, and neglect, rendering them "invisible" [133, 215, 224, 271, 276]. Following the "colonial impulse" [17, 94], HCI often reproduces such colonial and hegemonic power structures through Eurocentric epistemologies, universalizing design methods, parachuting, and extractive methodologies [15, 23, 43, 160, 201, 319], deficit-oriented design [329, 336, 371], and lack of citations on methods from the Majority World [61, 75, 184, 187–189]. "Epistemicide" is not just the systematic destruction of Indigenous knowledge systems, but also the absence in state records, as demonstrated by the

[6]The 2013 Reauthorization of the Violence Against Women Act (VAWA) reaffirmed tribes' inherent power to exercise Special Domestic Violence Criminal Jurisdiction (SDVCJ) "though it does not cover all forms of domestic violence." [241]. Till 2021, only 28 tribes implemented SDVCJ, leading to 128 prosecutions of perpetrators [240].

[7]Departments of Justice (DoJ), Interior (DOI), Health and Human Services (HHS), Federal Bureau of Investigation (FBI), Bureau of Indian Affairs (BIA), along with state and tribal law enforcement, organize listening sessions with Native communities.

[8]Ashlynne Mike, an 11-year-old Navajo girl, was abducted and killed. The lack of a sovereign alert system on the Navajo Nation and jurisdictional confusion among law enforcement agencies. Named after her passing, the law provides funding to help tribes establish their own emergency alert systems.

[9]Named after Savanna LaFontaine-Greywind, a Spirit Lake Tribe member, had dreamed of becoming a registered nurse and was 8 month pregnant when she was brutally murdered.

vast discrepancies in the data on missing persons in government databases [206]. Unfortunately, much of the scholarship has been produced through extractive empiricist frameworks. Computing research sometimes extracts knowledge and resources from marginalized communities without reciprocity and tangible benefits [79, 192, 223, 296], sidelining Indigenous perspectives on justice and safety. We discuss how the extractive logics embedded within State technologies perpetuate epistemic violence by failing to address the MMIR crisis.

Decolonial Academic Research. Decolonial research challenges the dominance of Western epistemologies, instead emphasizing relationality, pluraliversality, and the co-creation of knowledge with marginalized communities, re-imagining design and technology as sites of care, resistance, and possibility [107]. 'Decoloniality' in computing resists narratives of white-hetero-patriarchal construction of technology and "progress" as inevitable [78, 107]. HCI scholars have worked with Indigenous communities through participatory design practices across the globe. Many research partnerships have resulted in innovative design technologies such as broadcasting technologies [134], language revitalization applications [37, 120, 197, 290, 341], and online groups to preserve stories and Indigenous knowledge [179–181]. We use Indigenous decolonial feminist lenses to acknowledge the impacts of historical and ongoing injustices on Indigenous peoples. Indigenous feminist lenses call for a transformational shift; depict stories of resilience and healing rooted in Indigenous onto-epistemologies, and not just stories of pain and suffering through a Western empirical lens [45, 308]. Prior work in HCI has utilized transformational justice lenses through asset-based HCI [77, 144, 370, 371] and transformative justice or restorative justice [68] in a variety of contexts such as child sexual abuse [321], domestic abuse [277–279], youth trust in social media [298] and criminal justice [236]. Escobar [107] invites us to consider technology design as a space of autonomy that carries spirit, memory, and ceremony, and re-think the technologies of domination. Through a descriptive research positionality and methodology, we have provided a methodological contribution to HCI that bridges Western and Indigenous ways of knowing and being. We are inspired by Anzaldúa's "boundary work" [25, 26], Mbembe's necropolitics [88, 219, 220], and Smith's decolonial research [308] as guiding lenses for capturing this transformation and reconfiguration. Inspired by Anzaldúa's theorization of nepantla/mestiza, we embrace the liminal space between our identities as colonized peoples from the Majority World. We take the quantitative logics that usually flatten human experience and turn them toward accountability, situating this work in a tradition that treats research as ceremony, as an act of care. We become co-participants in this continuously reshaping liminal space that allows us to center this research work through reflexivity (§ 3.1), reciprocity and relational accountability (§ 3.2), critical humility and cultural sensitivity (§ 3.3), while respecting communities' right of refusal (§ 3.4).

Infrastructural Invisibility. Technologies and infrastructures perpetuate epistemic silencing through a lack of Indigenous voices and knowledge in their design and deployment [107, 219]. In CSCW, Star and Ruhleder [315] argue that infrastructure is "inherently" invisible when it works smoothly and becomes visible only upon breakdown, especially, when it fails to those who need it the most. Star [314] show how mundane systems such as records, forms, and databases quietly shape what can be known and done. Infrastructures are embedded in standards and conventions, developed by biased assumptions of their designers which are incredibly difficult to see from the inside [51, 102]. This ideas of invisibility and epistemic erasure are also shared by scholars from Global South. Mbembe [219], through his theory of necropolitics, shows how neoliberal infrastructures perpetuate invisibility by making marginalized black & brown Indigenous bodies searchable and others vanish in data voids: *who gets to live and die*. For example, Bowker and Star [51] show that classification systems create "residual categories" of people and events that do not fit the gold standard and are rendered unrecordable. Star and Strauss [316] show that labor and people are

systematically deleted from such formal representations of legitimacy. Murphy [235] uses the notion of the "regime of imperceptibility," where Indigenous lives are made uncountable through extractive industries (oil, gas, pipelines), scientists, bureaucratic, community groups, or non-government organizations (NGOs). Absence from an information system is not a neutral gap but an outcome of how the system was built and for whom. We utilize this concept of infrastructural invisibility to show the settler-colonial logics embedded in State's use of technologies to perpetuate the MMIR crisis.

Consequently, CSCW has theorized how marginalized groups respond to epistemic infrastructural violence. Pipek and Wulf [273] describes "infrastructuring" as the ongoing work of adapting and building infrastructure for public good. Infrastructuring can help form publics around issues that institutions ignore [85]. Bowker [50] conceptualized "infrastructural inversion" to show how invisible infrastructures remain hidden in social action. He illustrates this by challenging the role of improved scientific knowledge in advancements in life expectancy by foregrounding food production systems and improved sewage systems. Kaltenbrunner [168] illustrates that re-purposing infrastructure has the generative potential that can be leveraged by scholars through a collaborative design agenda. Simonsen et al. [304] examine how "infrastructural inversion" enriches participatory design and helps them trace relations and improve interdepartmental coordination in healthcare contexts. We center infrastructural inversion to foreground how Indigenous families re-imagine new sovereign infrastructures to bring healing, safety, and care back to the communities.

Rurality and Indigeneity. Although MMIR is prevalent in both rural and urban environments (as we noted in § 2.1.1), grounding experiences of communities in rural lived realities is essential (e.g., privacy needs in rural communities [162] may differ from urban residents). Prior research has surfaced advanced the definitions of 'rurality' and unique characteristics and methods to work with with rural communities. Hardy et al. [143] show that the characteristics such as lack of phone infrastructure, geographic isolation, values/culture, digital literacy, social and health services, population density, kinship, and proximity to urban centers add barriers to social justice. Survivors in rural communities have complex needs with the availability of fewer support services [135, 164, 221, 270] and public infrastructure [115], adoption of technology in health ecosystems [148], gendered roles and ownership of technology [24, 44], economic precarity and financial resources [229], and lack of affordable housing [158] making it difficult for them to leave the relationship with cohabiting abusers. On one hand, a smaller population size may result in an increased familiarity among locals that facilitates trust [137, 152]. On the other hand, reporting and seeking support services for violence anonymously and confidentially often becomes complex in close-knit rural communities, as it may lead to judgment, victim-blaming, or further isolation [115, 221, 275]. Finally, law enforcement may take longer to respond to calls for assistance in remote rural communities [202]. In our findings, we ground the lived experiences of communities impacted by the characteristics of rurality and Indigeneity and how these characters add barriers to investigations and their fight for resistance.

Research to Address MMIR. Academic research on the MMIR crisis has played a dual role; it has illuminated the scale of the violence and, at times, ceased epistemic violence and brought interventions to investigation agencies. Ficklin et al. [112] represent stories of MMIR victims highlighting the art-based and academic decolonial actions taken by Indigenous scholars in Psychology. Bailey and Shayan [36] call technology a modern tool of colonial oppression; how it enables stalking, domestic violence, online harassment, and trafficking to harm Indigenous women. The authors contextualize how the RCMP has historically used DNA technologies to take away agency in the guise of "effective investigations". In HCI, scholars traced Native political tweets such as #MMIW, #NativeLivesMatter and #pipeline during elections in Canada [111] and U.S [348, 349]. Bleeker [48], Diehl [90], and Moeke-Pickering et al. [231], show how Indigenous advocates "reframe" a racialized violent discourse on social media as a display of sovereignty. Globally, scholars have imagined frameworks

towards "Data Sovereignty" [63, 183, 199, 289, 333, 372]. Such frameworks provide design guidelines to ensure Indigenous ownership, responsibility, sovereignty, and stewardship over data. Continuing with its ethos, cartographers like Lucchesi [203, 207–209] and Kidd [173] create digital maps to trace the connections between land-based violence and Indigenous bodies. Miner [225] argue that these are how visual mapping technologies (e.g., Native Land Map[10] and Kitikmeot Atlas Project[11]) disrupt settler-cartographic practice to decolonize maps and borders. Finally, Waking Women Healing Institute created a resource map to help families quickly locate grassroots agencies [2]. In the absence of data, Ricaurte [289] argued that grassroots data activism practices around feminicide acts as a form of "epistemic disobedience" to the colonial extraction prevalent in Western data science. D'Ignazio [91, 92] extends Ricaurte's framework to generate counter-data that can combat this absence of data. In this vein, Suresh et al. [322] designed an ML-based tool to help Sovereign Bodies Institute (SBI) count missing persons data more effectively. Counting empirical data about missing cases is essential political act of resistance to epistemic injustice [91]. However, a holistic account of how the settler-colonial infrastructures perpetuate oppression introduce challenges to grassroots communities. Moreover, it is important to recognize how resistance actions by the communities to form the counter-infrastructure of healing, care, and safety (count data, document and memorialize victims, sovereign databases, hashtag campaigns). We consider this work is an essential contribution to HCI literature and, especially, inform potential interventions in the future.

Research Gap. Limited CSCW research has honored the experiences of murdered or missing relatives, families, advocates and tribal police. The lack of grassroots voices at the forefront of the #MMIR movement has long been overlooked in technology design practices in HCI, perpetuating cycles of violence and invisibility. Thus, in this research, we investigate the socio-technical barriers faced and grassroots strategies taken to locate missing or murdered relatives, seek safety and support, and raise awareness of the MMIR movement.

3 Situating Ourselves

> *" We repeat statistics about our sexual assault and violence and the attempts to take our futures from us and the stories about our deaths, not our lives, not our futures. That's not what I want to do ... this is a story about us and if we recenter our resurgence, our fights, our resistance and the fact that we will do it. "* — Cutcha Risling Baldy $_{35}$ [234]

3.1 Reflexivity

We acknowledge our research training in Western epistemologies with a strong sensitivity to Decolonial and Indigenous onto-epistemologies, reflecting on our distance to the Indigenous peoples of Turtle Island [119, 268, 269, 272]. We are an interdisciplinary team that holds academic positions in a Predominantly White [U.S. University]. We embrace the hybridity of Western and Indigenous ways of being, and we weave the empirical data statistics with grassroots stories (§ 4.2). All but two authors provide direct support services to survivors of domestic violence. Three authors have provided trauma-informed support for 180+ survivors through [Victim-Advocacy organization], a non-profit organization that works in collaboration with 26 violence shelters in [US. State]. One author is a nurse-scholar with expertise in Indigenous healthcare, an enrolled member of [Tribe], and serves as the data subcommittee chair of Department of Justice (DOJ) [US. State] MMIR Taskforce. A few authors have experienced loss of families & relatives personally and through second-degree connections. Some have participated in doll-marking workshops in relation with families that have experienced loss across the Turtle Island (see Figure 1). Finally, a few authors are violence survivors,

[10]Native Land Map http://native-land.ca
[11]Kitikmeot Atlas Project https://atlas.kitikmeotheritage.ca

and their experiences have been instrumental in embodying trauma-informed lenses (see our approach to qualitative analysis § 4.2). Reading and writing about the traumatic stories is emotionally daunting. The authors felt the vicarious trauma from engaging with this work and took intentional steps to care and support each other (e.g., taking breaks, checking in with each other) [39, 73]. Finally, we obtained approval from the [U.S. University] Institutional Review Board (IRB) and the [U.S. University] Tribal Liaison Office. The project was determined to be non-human-subjects research.

3.2 Reciprocity and Relational Accountability

We led this study from a place of knowing and heart, with a greater sense of purpose to reckon with and give back to the land that we live on and generations of Indigenous peoples that it has supported. Three authors were born and raised in the US. Four authors immigrated from Majority World countries; we share a deep connection with the colonized Indigenous communities across the globe. All authors deeply respect the knowledge embedded in the [Tribe] custodianship of [City] and recognize their continuing connection to land, water, and community in [City]. [U.S. University] occupies [Tribe] land and has the largest grouping of Indian burial mounds on a university campus; anywhere in the world. Our university could not have been established or sustained were it not for state and federally sponsored settler colonialism that dispossessed and displaced American Indian nations and communities. Through this work, we must now confront the outcomes of unjust land treaties and the harm caused by [U.S. University]'s complicity in an ongoing genocide as we seek reconciliation with Indigenous communities of [US. State]. We use a desire-centered framing [336] to upend commonly held assumptions of responsibility, cohesiveness, ignorance, and paralysis within dispossessed and disenfranchised communities. By centering desire, we account for the loss and despair, but also the hope, the visions, the wisdom of lived lives and communities. Thus, we turn the research process itself into a ceremony [368] towards a generative offering [216] – an act of reciprocal resistance to bring medicine and healing to the Indigenous communities. Finally, we provide MMIR advocates and future researchers with an editable spreadsheet of web pages during publication. This will allow the advocates to crowd-source stories residing in news articles and reports. For reviews, we have uploaded a CSV file (supplementary materials) containing a list of coded pages, domain categories, technology categories, LLM-generated summaries, and direct quotes from the pages. We have held conversations with NIWRC on how their advocates can utilize this data going forward. In our future work, we commit to sustaining relationships and work with Indigenous organizations to realize interventions that support families, but also, bring an end to this cycle of violence.

3.3 Critical Humility and Cultural Sensitivity

To personify utmost cultural sensitivity and respect for Indigenous ways of being and knowing, we followed several practices to develop "thread sensitivities" [165, 373]. Thread sensitivities asks scholars to check presumed entitlement, extractive tendencies, and acknowledge the uneven power dynamics. It asks us to cultivate a sense of opennness to pluriversal ways of knowing and being, to critique the self (reflexivity), and transcend complicity through generative sense-making. From May 2024 to August 2025, we met with knowledge-keepers and Elders, and board members and advocates of the National Indigenous Women's Resource Center (NIWRC) [253], Urban Indian Health Institute (UIHI) [342], Navajo Missing & Murdered Diné Relatives (MMDR) [227], MMIWhoismissing [230], Healing Intergenerational Roots (HIR) Wellness [151], and Our Native Daughters [258] in developing a reciprocal relationship. We were invited to present our research plan to the US Depart of Justice [US. State] MMIR taskforce, [U.S. University] MMIR taskforce, [Tribe], and [Tribe] reservations, where members provided crucial feedback (edits, revisions, comments, feedback) via electronic media, presentations, and engagements. The consultations led to careful considerations in representing the crisis in academia to drive meaningful action, the choice of methodologies and

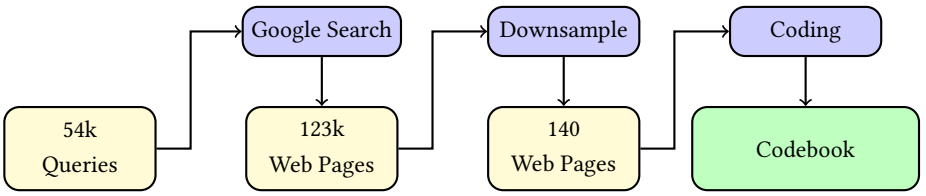


Fig. 2. **Data Processing Pipeline** – shows the data collection, downsampling, and qualitative analysis of web pages on technology use in the MMIR crisis.

analytical frameworks (non-empirical and empirical), and envisioning technologies that can assist in missing persons investigations and towards sovereignty. We shared a paper draft with scholars and advocates at the aforementioned organizations for feedback. A few community members found the Table 5 to be useful in forming academic collaborations and policy interventions. Moreover, NIWRC invited us to conduct two trainings (one virtual, one in-person) on technology-facilitated violence to empower advocates to build agency over technology and violence that stems from it. We absorbed Indigenous teachings, wisdom, and creation stories from families, advocates, and Elders. We participated in spiritual ceremonies, including Powwows, a doll-making workshop, and smudging to cleanse our spirits and heal from vicarious trauma (see Figure 1). We witnessed stories of trauma, pain, and suffering from family members involved in support and advocacy work for decades [272]. The stories also highlighted the coordinated efforts to resist and heal, which further strengthened our resolve to center Indigenous analytical frameworks (see § 4.2).

3.4 Right of Refusal

We hope to bring forth Indigenous activism and knowledge systems to the attention of the Western academic world through "citational justice" [11, 161]. At the same time, right of refusal means some forms of knowledge are "sacred" and should not be shared or scrutinized by academia, as doing so risks commodifying or misusing culturally significant information [121, 128, 305, 337, 338, 360]. Scholars argue for a protective boundary that respects knowledge as community-held and not necessarily subject to external validation or control. Not every issue within a community needs academic intervention. Sometimes, research fails to address the actual needs or wishes of a community. We use the right of refusal as an intentional lens to make choices on how, why, and what to represent in this paper. Many search-&-rescue Facebook groups clearly stated their refusal for research in their policies. Of the ones that did not, we emailed and held conversations with activists who run these groups. Taking a cautious approach, we asked what would be the most respectful way to cover this crisis in academia, and all of them explicitly said NO to analyzing the stories and missing posters shared by families within these groups. Therefore, we make a careful effort to respect their refusal by not analyzing missing posters in search and rescue groups, pages with Indigenous languages, and ensuring that traditional spiritual practices are not appropriated.

4 Methods

To answer the research questions, we collect web pages that cover facets of the MMIR crisis instead of interviewing advocates and families to avoid retraumatization through an extractive inquiry. Our goal is not to collect new testimonies but rather to surface and represent existing knowledge that is already publicly available and not usually represented in academia. We conducted a preliminary search to examine the kinds of resources available and help ascertain that the web pages can be a viable data source. We searched for MMIR-related articles popular platforms such as Google, Facebook, and Twitter/X. We found news articles covering specific cases, blog posts and reports

that contextualize the broader crisis and social media posts with missing persons posters to help locate missing relatives. The content in these pages were created by former survivors, families, and advocates, including comments expressing solidarity from relatives worldwide. We see this as an initial, respectful methodology within HCI research that can later inform whether and how more direct, participatory forms of inquiry (e.g., interviews, workshops) might be needed or ethically pursued. Next, we describe our data pipeline (see Figure 2) through data collection (§ 4.1) and analysis (§ 4.2). Finally, we acknowledge the limitations of our study, especially in using automation tools such as LLMs in a decolonial project and the epistemic and ecological harms they may entail (§ 4.3).

4.1 Data Collection

Collecting Pages. We gather public pages indexed on the most widely used search engine (Google).[12] We collected 2,265 tribe names that have inhabited Turtle Island (now North America) from 5 independent websites [8, 16, 105, 113, 357]. The US and Canadian governments only recognize a limited number of tribal nations, the recognition process takes decades, and adds divisive barriers between tribes that are recognized and those that are not. The tribes are spread across the US-Canada border or the "Medicine Line" [260]. The Medicine Line counters the unnatural manifestations that have long governed settler definitions of peoples' mobilities. Following LaDuke and Cowen's [193] footsteps, we broaden the scope of our inquiry by including tribes across the settler boundary.

Next, we generated 54,528 seed queries by using four templates ('Murdered and Missing OR Missing "[*T*]" [*A*]', 'Violence against "[*T*]" [*A*]', 'Sex trafficking against "[*T*]" [*A*]', 'Human trafficking against "[*T*]" [*A*]'). Here, *T* (*Tribe*) can be "Native", "Indigenous", "Native American", or a specific tribe name. *A* (*Actor*) can be "women", "girls", "sisters", "peoples", "communities", or "Nations". An example query is 'Missing and Murdered "Shawano" women.'[13] Next, we queried Google Search[14] and retrieved the first 20 results. We collected data from December 2024 to February 2025. In total, we collected 348,380 results. On average, we received 7 results per query. Next, we removed duplicates to create a set of 123,029 unique web pages hosted on 28,800 domains.

Overview of the Data. We categorize 28,800 domains into 10 categories of pages (see Table 1). To do this, we use a llama-3.1:8b LLM model (aka Domain Categorizer (DC-LLM)) and prompt (Appendix Figure 8) with each domain's title and description meta HTML tag. The first author manually verified the accuracy (with 3% misclassifications) of DC-LLM with the 100 most popular domains. Although, accuracy on a random sample would have been authentic evaluation, we wanted to collect the most frequent and perhaps, most visited pages indexed by Google on the internet. Educational pages—including academic articles, academic library websites, and Wikipedia articles—were the most prevalent, making up 22% of the dataset. 20% of the pages were created by nonprofit organizations. News and social media websites accounted for 14% and 13% of the pages, respectively.

Next, we show the top ten most popular domains in Table 2. Four of the ten most common domains were social media websites (Facebook, Instagram, Reddit, and LinkedIn). These four domains alone contributed 13,420 pages to our dataset (10.9%). The popularity of the social media websites can be owed to the grassroots activism (❤ A5, § 6.3.1). Other top domains related to national (cbc.ca) and Indigenous news (ictnews.org), education and research (en.wikipedia.org, researchgate.net, jstor.org), showing the initiative by Native journalists to represent families' stories through independent news websites. Finally, the government pages (justice.gov) contained reports

[12]We recognize that not all information about the MMIR crisis is likely to be indexed by Google (see our limitations noted in (§ 4.3)).

[13]We tried small variants of these queries, like replacing "against" with an "AND", and did not observe any meaningful difference in the results beyond minor reordering.

[14]To respect Google's fair use and terms of service and throttling, we made fewer than two queries per second, which should have a negligible effect on Google's regular operations.

Table 1. **Overview of the Data** – Categories of pages' domains in our (a) full dataset and (b) sample we used for qualitative coding.

	Full Dataset (N=123,029)		Stratified Sample (N=140)	
Category	# Pages	% Pages	# Pages	% Pages
Education	30,749	24.99%	25	17.86%
Non Profit Organization	26,932	21.89%	16	11.43%
News	19,224	15.63%	47	33.57%
Social Media	17,328	14.08%	9	6.43%
Government	14,587	11.86%	13	9.29%
E-commerce platform	9,397	7.64%	6	4.29%
Blog article	8,437	6.86%	21	15.00%
International Organization	5,623	4.57%	6	4.29%
Law enforcement	1,228	1.00%	17	12.14%
Unknown	531	0.43%	9	6.43%

Table 2. **Top 10 domains** – represented in our dataset. * denotes that the domain is created by Indigenous advocates.

	Full Dataset (N=123,029)		Stratified Sample (N=140)		
Domain	# Pages	% Pages	Domain	# Pages	% Pages
facebook.com	7,776	6.32%	en.wikipedia.org	4	2.86%
instagram.com	3,627	2.95%	indianz.com*	4	2.86%
cbc.ca	1,387	1.13%	facebook.com	3	2.14%
reddit.com	1,175	0.96%	nativenewsonline.net*	3	2.14%
en.wikipedia.org	1,029	0.84%	doj.state.wi.us	3	2.14%
ictnews.org*	927	0.75%	legendsofamerica.com*	2	1.43%
researchgate.net	868	0.71%	t3ps.ca*	2	1.43%
linkedin.com	842	0.68%	rcmp-grc.gc.ca	2	1.43%
jstor.org	825	0.67%	gsps.ca*	2	1.43%
justice.gov	771	0.63%	tsuutinapolice.com*	2	1.43%

written by advocacy organizations, task forces, tribal police departments, and government agencies. The law enforcement and government pages focused on legislative policies, bills, and laws to improve investigations and reconciliation efforts with Tribal Nations (❤ A6, § 6.3.2).

Data Downsampling. Not all of 123,029 web pages discuss technologies used by the communities. Manually filtering relevant pages from all 123,029 pages was not feasible. Therefore, we employed an LLM-assisted filtering method to create a set of relevant pages that reference "technology use". To ensure that pages from all domain categories sampled roughly equally, from each domain category, we use a frequency-based stratified sampling method [251]. (Note: pages may have multiple domain categories.) We use the domain category as the strata for the sampling method. We start with the 500 most popular web pages (50 pages per domain category, 50 times 10 $\bar{5}00$ pages). We prompted the Qwen2.5 14b 1M[15] LLM model (aka Content Categorizer (CC-LLM)) to categorize 335 pages

[15]We use a 1 million token context window size to adapt to the content size of the web pages.

into one or more of the technology categories (see Figure 9). We excluded 166 pages—5 pages were PDFs which had parsing errors while loading into LLM, 8 resulted in timeout (limited LLM runtime to 10 minutes), 96 were too large (more than 25000 words), and 56 were too small (fewer than 20 words). First author manually verified and adjusted the categorizations to ensure accuracy (only 4 out of 335 were assigned a false technology use category). Then, two authors read 335 pages collectively and reduced our sample to 116 pages, excluding 219 pages that were deemed not relevant to technology use. Since news articles contained heartfelt stories with direct quotes from survivors, families, advocates, and tribal police, we oversampled 23 relevant news articles for qualitative analysis. We ensured that Native-led websites were included in the final analysis to highlight grassroots voices. The final total that we analyzed was 140 pages.

4.2 Qualitative Analysis

Our analysis was primarily guided by answering the questions. In § 5 and § 6, we present our findings for RQ1 and RQ2 respectively.

Inductive Coding. Our coding process was rooted in Indigenous onto-epistemologies of oral traditions, relational accountability, and community-based ethics, where survivors', families', and advocates' stories embody both data and theory [11, 22, 182]. To create an initial codebook, the first author coded the 50 most popular pages that contain "technology" in their URL to create the top-level codes. Two authors independently coded 140 web pages and then collaboratively generated a initial codebook. Our coding and analysis was critically guided by one Native author who serves as the data subcommittee chair of DOJ [US. State] MMIR taskforce to ensure cultural grounding. All authors discussed emerging themes, resolved disagreements, and iteratively refined the codebook until reaching thematic saturation. We carefully read the stories by inviting senses: emotional, spiritual, intellectual, and physical. We engaged with our own embodied memories, dreams, and experiences of violence, loss, and resilience. This interpretive stance allowed us to witness harm but also resilience, reclamation, and resistance [272]. Absolon [11] show that Indigenous research must be conducted "with spirit" (Kaandossiwin), emphasizing that knowledge emerges through relationships, ceremony, and lived experiences rather than a detached objective and mechanical way. Therefore, rather than siloed constructs, we viewed themes of barriers, actions, and recommendations as interconnected with personal and cultural loss, identity, and community well-being.

Storytelling Representation. Storytelling is both a methodological and political act: it validates the lived realities of Indigenous women and families, creates collective memory, and resists the epistemic violence that has reduced Indigenous lives to statistics. Indigenous epistemologies embed identity, womanhood, resistance, and healing through heartfelt stories [11, 22, 182, 293, 373]. Many reports contained stories and ancestral teachings to guide their actions in seeking healing and justice. We ask the readers to emotionally connect to the stories and witness the grief and resilience of generations of Indigenous peoples. The names of the pages mirror this balance between grief and strength. Some signify the stories of intergenerational trauma felt from the violence (e.g. "A mother's worst nightmare" [213], "When Your Loved Ones Go Missing and Authorities Don't Care" [118], "They Trespass Her Body Like They Trespass This Land" [323]) and resilience (e.g. "Our Bodies, Our Stories" [99], "Lighting the way for those not here" [123], "Looking Ahead to Build the Spirit of Our Women" [131], "Every Number is a Person" [38]). Although we wanted to share grassroots stories, we considered our goal of inspiring action among the CSCW and broader HCI communities and decided that centering thematic commonalities and contestations would benefit the readers the most. Therefore, in a limited capacity, we incorporate storytelling into the design of our own paper, allowing the title, section headings, and direct quotes to carry narrative weight. We attribute the quotes from MMIR advocates and their role in the MMIR crisis (Table 5).

4.3 Limitations

Our work is not without limitations. First, although our web crawling collected 123K unique web pages, we manually coded only 140 pages. Moreover, we rely on Google's search index to create a comprehensive dataset of web pages. Search engines are known for localizing their search results to a geographical area, which may contribute to the epistemic exclusion of Indigenous onto-epistemologies [126, 255, 259, 345]. This limits our ability to fully capture the landscape of how the MMIR crisis and technology intersect. However, despite excluding pages, we ensured that our qualitative analysis reached thematic saturation. To counter exclusion, we oversampled 23 more news articles to amplify the grassroots stories of families.

Second, we only analyzed English-language pages (with occasional Native language text). Our sole Indigenous author is not a fluent Ojibwe speaker and neither are any of the DOJ MMIR [US. State] taskforce members. Ojibwe is an endangered language. Some Elders may be fluent speakers, but very few Ojibwe speaking Elders are on the taskforce or any of the Ojibwe tribes in [US. State]. English, as a colonizing language, cannot fully capture the deeper meaning behind Indigenous voices, yet we avoid translating the texts into Indigenous languages to prevent misrepresentation and respect their cultural significance. We trust that authors deliberately represented stories in English without losing relationality and kinship [175].

Third, we used LLMs to assist with preliminary analysis. We did not have a good source of dataset about the MMIR crisis to start with due to epsistemic limitations. If we used a manual approach to sample web pages, we would have missed out on relevance and on diversity of domain categories, adding to epistemic blind spots. To avoid these blind spots, LLMs benefited us a lot as it allowed us to automate the categorization of domains to expand the scope of our 54k search queries and capture voices, that otherwise would not have been able manually possible. We restricted LLM use to filtering. We manually verified all categorizations, and used a hosted LLM instance to protect the privacy. We also recognize the contentious harms that come as a cost of this automation. Big Tech LLMs are largely trained on dominant internet sources, reinforcing epistemological erasure through Western epistemologies and definitions of technology [327, 375]. We expanded our own blind spots in vocabulary by extending the notions of technologies. Also, LLMs disproportionately extract from economically vulnerable, disenfranchised, and historically marginalized populations with reduced political power. The proliferation of AI data centers in Indigenous lands reinforces colonial logics of extraction through displacements, ecological damage, and man camps [79, 296]. Moreover, LLMs perform poorly in violence-related research due to built-in censorship guardrails [10]. Recognizing these harms, many communities refuse to use, train, or allow AI data-centers on their land [153]. For example, Māori technologists have created locally sustainable models that respect and preserve endangered Indigenous languages [52, 146]. We extend an ethical invitation for future scholars to use AI sustainably with the communities.

Finally, the history and experiences of communities with tribal law enforcement, tribal governments, and across tribal nations is diverse and contentious. There is a lot of lateral violence and disrupted governance structure, as a consequence of intergenerational trauma, paternalistic intrusion by settler policies, and cycles of violence that stemmed from colonization. We make a deliberate choice in our findings to portray tribal governments and tribal law enforcement as allies and not villainize them. We take this stance as a political choice that doesn't fracture the community efforts and cause rifts.

Table 3. **Summary of Socio-Technical Barriers** – Faced by relatives, families, advocates, and tribal police.

B#	Barrier	Pages	Summary	Recommendations
B1, § 5.0.1	Inaccurate Data Collection	47	Law enforcement does not collect the data on missing persons correctly.	R1, § 7.1.1
B2, § 5.0.2	Opaque Data Sharing Policies	47	Law enforcement does not share the data on missing persons correctly.	R1, § 7.1.1
B3, § 5.0.3	Extractive Programs	10	Colonial-extractive use of technologies and policies that silence Native voices.	R1, § 7.1.1 R2, § 7.1.2 R3, § 7.2.1 R4, § 7.2.2 R5, § 7.3.1
B4, § 5.0.4	Lack of Safe Online Spaces	10	Racial and colonial violence from non-Native perpetrators that transcends online spaces.	R3, § 7.2.1

5 RQ1: Barriers Faced by Indigenous Communities: *Safety is a Broken Promise*

We show how the extractive use of state and digital technologies perpetuates the epistemic exclusion of Indigenous peoples, fueling the MMIR crisis (see Table 3). In this section, we specifically report socio-technical barriers and leave out purely structural barriers in the background (§ 2) due to word and space constraints. However, we note that technology design often mimics structures of oppression that have historically excluded Indigenous communities.

> *"They go missing in life, they go missing in the media, and they go missing in the data."*
> — Jordan Marie Brings Three White Horses Daniel [1] [323]

5.0.1 **B1** *Inaccurate Data Collection.* State agencies fail to keep an accurate track of data related to MMIR, rendering the missing or murdered relatives invisible. State datasets frequently contain incorrect names, gender, race, ethnicity, tribe affiliation/citizenship, location of the incident, and even the type of incident.

Name: Traditional names, nicknames, and tribe affiliation/citizenship are an "*important kinship marker that often are not legalized.*" [27] Failure to record the name correctly, renders the relatives *nameless.* Lela Mailman [5] [232] recalls her experience "*When the police finally opened an inquiry, it felt perfunctory. One report referred to Melanie [her daughter who went missing] as 'Melissa' [Melanie's sister]; . . . Melanie's name wasn't entered into NamUs . . . until three years later.*" Moreover, rooted in racial profiling, police conflate Indigenous names with Hispanic, African-American or Indian-American names (e.g., Singh [a common Indian surname]) [206].

> *"[Many] Native Americans adopted Hispanic names back during colonial times.... . "N" was being used in the 60s up through the late 70s and early 80s – meant Negro not Native American. . . . Our crime systems are not flexible enough to pick out Native Americans from others in the system...it would be impossible to compile any statistically relevant information."*
> — Police Representatives from Santa Fe and Seattle [206]

Race & Ethnicity. When most crime is perpetrated by non-Native peoples (96% [291]), the classification of race of both perpetrator and victim becomes crucial. A misclassification of race "*generally favors the larger race, so while [Indigenous peoples] are often misclassified as white, the reverse of that is rare.*" [206]. For example, following a "bias-free policing policy", the RCMP did not collect or disclose statistics on the perpetrators' race and rejected calls for internal scrutiny about their

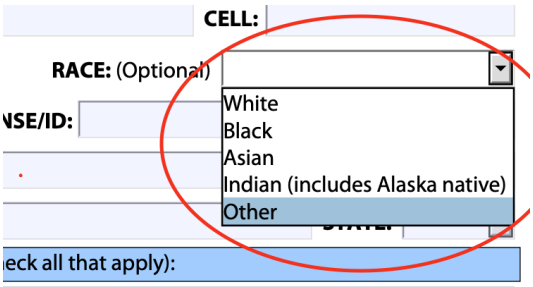


Fig. 3. **Online Reporting Form** – An online reporting form by the City of Wasilla Police Department.

practice [362]. Similarly, Wasilla Police Department's missing persons reporting form collapses races into "Other" category [27] (see Figure 3).

> *" The standard four-box race and ethnicity options of White, Black, Asian, Indian originating with the US Census have been a colonial tool that works to eliminate the existence of Indigenous peoples, instead of truly enumerating us. "* — Charlene Aqpik Apok et al. [21] [27]

Location and Cause of Death. The jurisdiction tension (§ 2.1.2) complicates the case when the location of the incident isn't accurately collected. Many times, the location is reported through a larger nearby hub in cities, which may obscure cases happening in small rural towns [27]. Further, cases are closed with false causes: "unknown" or death: "undetermined" due to lack of evidence. For example, Rep. Tawna Sanchez [20] [288] recalls "*suicides are not often investigated, because they're assumed to be suicides rather than, possibly murders.*"

> *" Rhonda did not overdose and jump naked headfirst into a trash can. Kristin was not likely hiding in this TV cabinet when she died... the people who found Megan used the word 'beaten' to describe how she looked. It just doesn't make sense, and the undetermined status feels hurtful to those who are still seeking answers. "* — Jamie Day [38] [87]

5.0.2 **B2** *Opaque Data Sharing Policies.* Even if the data is collected, there is a lack of a standard policy to share data across tribal and State law enforcement, and no centralized system to correct and verify data. When tribes ask, agencies often provide incomplete or unreliable data; partial information, or recalled cases from memory, highlighting that "*institutional memory is not a reliable or accurate data source*" [206]. Moreover, getting access to data is crucial given the urgency of missing persons cases where time to report can be a decider between life or death. Unfortunately, "*families have to wait a certain number of hours to file a missing persons report.*" [27].

> *" The lack of centralized systems leads to missing data but also means in many cases reports cannot even be generated at a community or agency level. ... the data collected is not even digitized to be used at the system level. "* — Charlene Aqpik Apok et al. [21] [27]

5.0.3 **B3** *Extractive Programs.* Institutions repeatedly misuse or misappropriate Indigenous knowledge, including community-generated data, testimony, and research findings. Some agencies reproduced community reports without attribution, distorted facts, or treated community participation as a procedural requirement rather than meaningful collaboration [363]. Moreover, law enforcement often victim-blames and "*skeptical, uncaring or minimizing their loved one's disappearance.*" [74]. These practices reinforce mistrust, particularly when institutions adopt digital systems or technologies without Indigenous governance.

[15] https://www.cityofwasilla.gov/DocumentCenter/View/623/Citizens-Report-Form-PDF?bidId=

Lack of Agency. State programs rarely include "*Native American voices in their efforts.*" [149] For example, in 2019, the National Inquiry in Canada ended up extracting stories from families [159]. Many refused to share their stories, disturbed by the lack of trauma-informed care offered by the commission as an act of defiance.

> *" The [Canadian] Liberal government made the national inquiry a campaign promise. . . . It went from something that was personal, that was grassroots, that was family, to something that became a political thing. . . . The national inquiry has bulldozed through our communities and with an extension will continue to exacerbate the emotional and psychological burden on the very people it is intended to solace. "*
> — Maggie Cywink $_3$ [55]

Most tribes lack access to the State criminal databases or the ability to release alerts. Advocates and families reported that alerts are not released or cases are never registered. Some US states and Canada provinces have created missing Indigenous persons alerts that can be requested by families or tribes,[16] however, they are not used properly and often detrimental. For example, Feather Alerts (California) are broadcast through "*broadcasters, social media, digital billboards and other outlets.*" [84] are denied even when missing relatives are facing a serious risk. Since Jan 1, 2023, about 60% of Feather Alert requests have been rejected by California Highway Patrol (CHP) [226][17]. The alert system requires local law enforcement to determine whether the person is missing or seriously endangered enough to merit an alert. The request is sent to CHP, who do another evaluation before releasing the alert. This criterion is prone to fail due to a biased definition of who qualifies as "missing" and who it excludes. Recent amendments proposes to drop the criteria "*reducing the likelihood that bias or ignorance of Tribal cultures would affect the decisions.*" [84] It will also require them to respond within 48 hours with a written notice to tribes and families if an alert is denied [138].

> *" A refusal to issue the alert for anyone who has a history of mental health or substance issues shows an incredible lack of understanding for the history of California Indian peoples, and why there are so many struggles. It is also absolutely a violation of Tribal sovereignty. "*
> — Morning Star Gali $_{34}$ [84]

Rural and remote tribal reservations may lack access to transportation, cell service, scarce support infrastructure or internet access, making investigations challenging (§ 2.1.1). Geographic isolation and economic inequity force many domestic violence survivors to hitchhike alone to nearby cities for economic independence, many falling into cycles of promiscuous sex work and substance abuse (e.g. Highway of Tears in British Columbia, Canada [81, 361]). In December 2024, RCMP addressed the cases by "*install[ing] five 5G cell towers along the highway to close a gap in cell service.*" [361]. RCMP [294] partnered with drivers to provide GPS devices to log time, date and coordinates when they see a hitchhiker. However, through a narrow definition of "missing"/"murdered", the RCMP left out many highways with spotty cell coverage. Strictly, RCMP requires "*the crime to have happened within a mile of Highway 16, 97, or 5; their count rejects all cases that take place elsewhere along the route.*" [361]. These policies show dissonance, failing to meaningfully consult with tribes and understand their lived realities.

Silencing voices. Even if families and advocates are invited, they are actively silenced and not allowed to critique the institutions that have harmed them for centuries. For example, "Operation Lady Justice" held virtual sessions to allow the families to voice their opinions. Despite spotty cellular coverage, the online conference calls were moved to phone for the final session. Moreover,

[16] MMIR alerts in US states: California (Feather Alert), Colorado (Missing Indigenous Persons Alert), Washington (Missing Indigenous Persons), New Mexico and Arizona (Turquoise Alert or Emily's Law) and Canada provinces: Manitoba (Red Dress Alert).

[17] This statistic only includes numbers from CHP and does not include numbers rejected by local law enforcement.

many families were deliberately muted and not allowed to speak after the 3-minute mark [12]. Even if Native advocates are invited to speak, they are questioned —

> *" I remember sitting there and . . . and every single one of them spoke directly to me. It was like little arrows trying to penetrate me as they directed the rest of their comments directly against what I had shared. "* — Abigail Echo-Hawk [7] [363]

Families are more willing to share information and stories when those efforts are led by trusted members rather than external agencies, highlighting their desire for sovereignty [55].

5.0.4 **B4** *Lack of Safe Online Spaces.* Online platforms such as social media play a critical role for families and advocates in searching for relatives and raising awareness. However, these digital spaces are also sites of frequent harassment and racist commentary, creating harmful environments that re-traumatize families and hinder their advocacy efforts.

Normalized violence. Hate crimes, hate speech, and harassment are so normalized that they often transcend into online spaces. Racist online spaces threaten digital, physical, mental, emotional, and spiritual safety, continuing cycles of violence.

> *" Think about everyday violence like comments on news stories or postings on social media that justify violence against us, history lessons and books that try to water down the attempted genocide of us. "* — Cutcha Risling Baldy [35] [38]

Advocates draw connection between online harassment and criminal intent in offline spaces. For example, court documents show the racist intent of perpetrators who often "*expressed white supremacist beliefs online through Facebook.*" [49]. As a reflection of hypersexualization and fetishization in Hollywood (§ 2.1.3), Reddit users pointed out the apathy around murders of Native men and women among non-Native users, adding to epistemic exclusion.

> *" [there is] stuff about "f*cking hotter chicks" "butterfaces" "t*ght Native p*ssy" and the usual substance abuse "jokes" etc. If you ever feel really curious just go to /r/canada and look in threads about Natives to see the incredibly racist shit white Canadians will say online but never when we are around face to face to make them regret it. . . . if you want to see how polite Canadians can be, you just have to grow up Native to see how it is untrue and people think we are scum. It really helps explain the apathy around an epidemic of murders for Native men and women. "* — Anonymous Reddit user

Online Privacy Challenges. Families, advocates, and allies share missing posters online to boost investigations and visibility (**A1**, § 6.1.1), sometimes with or without the family's consent. In the course of investigation, they face heavy financial challenges and emotional burnout and vicarious trauma: creating and posting content across platforms, monitoring responses, and removing outdated posts once cases are resolved or relatives are found. However, such noble actions may end up in unintentional harm. It may be hard for the missing poster to be taken down from platforms, leading to financial fraud and perpetrators preying on grieving families.

> *" The average community member does not have thousands of dollars and unlimited time to continue to follow up for the data [on missing relative]. "* — Annita Lucchesi [6] & Abigail Echo-Hawk [7] [206]

Due to the sensitive nature of the posters, some families have to weigh a choice between privacy and providing accessible contact information.

> *" When you're in crisis mode, [families] blast their cell phone number all over social media, all over a flyer, and that is the most unsafe thing to do. I have yet to see a case that doesn't have fake ransom or fake tips. . . . They [scammers] exploit that family vulnerability and call them and give them a glimmer of hope that their kid or their relative or whoever is alive. . . . "Your so-and-so*

Table 4. **Summary of Socio-Technical Actions** – Taken by relatives, families, advocates, and tribal police.

	A#	Action	Pages	Summary	Recommendations
Search & Rescue	A1, § 6.1.1	Investigation by Families and Advocates	54	Families and advocates lead their own investigation to find the missing relative, collect evidence, and distribute information about the case online.	R1, § 7.1.1 R2, § 7.1.2 R3, § 7.2.1 R4, § 7.2.2
	A2, § 6.1.2	Investigative Tools by Advocates	18	Advocates have created their own databases and resource websites to aid the investigation. Tribal police purchase technical equipment and use tools to improve communication with families.	R1, § 7.1.1 R2, § 7.1.2 R4, § 7.2.2
Healing	A3, § 6.2.1	Traditional Storytelling and Spiritual Healing	31	Advocates and families heal trauma by sharing stories and practicing spiritual ceremonies through online spaces.	R5, § 7.3.1 R6, § 7.3.2
	A4, § 6.2.2	Support Material Needs	7	Advocates and tribal police support relatives and families with their material needs.	R3, § 7.2.1 R5, § 7.3.1
Advocacy	A5, § 6.3.1	Advocacy Movements and Campaigns	81	Advocates use online spaces to advocate for MMIR and other anti-violence movements to represent accurate information, organize protests, vigils, prayers, and walks, and creative media.	R3, § 7.2.1 R5, § 7.3.1
	A6, § 6.3.2	Education and Reconciliation Programs	23	Advocates and tribal police conduct safety awareness trainings in the community and collaborate with state and federal police to form advisory groups as a part of reconciliation.	R3, § 7.2.1 R5, § 7.3.1 R6, § 7.3.2

needs their medication, . . . Send this much to this Cash app and you can talk to them tonight at six o'clock." "
— Jodi Voice Yellowfish [15] [374]

To create a safe space for traumatized families, moderators of search-&-rescue Facebook groups added safety norms and advisories to combat harassment. Advocates and tribal police provide helpful privacy tips for sharing posts on social media [131, 374]. For example, the Navajo Nation provides its tribal police's contact information to prevent fraud (see Figure 5).

6 RQ2: Actions Taken by Indigenous Communities: "*We Built Our Own Path*"

Indigenous peoples transform their pain to showcase intergenerational resilience to resist systemic oppression, "*in spite of the police.*" [147]. Communities reclaim and re-configure modern technologies to empower and extend acts of resistance through relationality and care for sisters, daughters, sons, uncles, and cousins. We witness this crucial transformation by acknowledging that data and technologies are not limited to Western concepts; "*instead, . . . [data are] the stories of precious lives. . . data are people, loved ones, gifts from ancestors, who are each deeply missed.*" [27]. We expand the definition of "socio-technical" to include traditional spiritual practices that center digital forms of healing, kinship, and survivance [351, 353]. We frame these online practices as acts of Indigenous data sovereignty and autonomy, where control over stories and memories counters colonial erasure and domination [107]. Demonstrating "infrastructure inversion" at scale, these socio-technical actions form what we call Interconnected Infrastructure of Care (IIC) (Figure 4), an ecosystem that

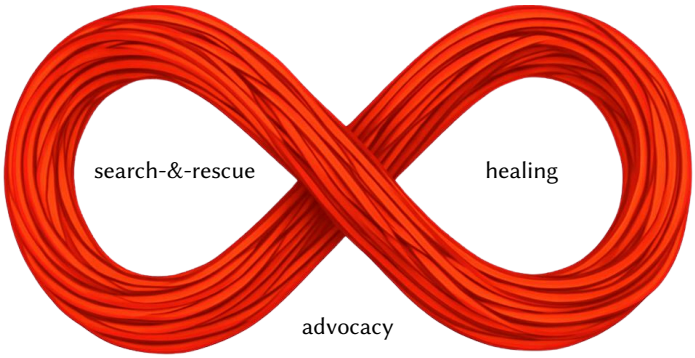


Fig. 4. **Interconnected Infrastructure of Care** – Indigenous communities have established a closed-loop socio-technical ecosystem supporting three action pillars: (a) search and rescue missing or murdered relatives (§ 6.1), (b) provide support and healing to relatives and their families (§ 6.2), and (c) raise awareness of the MMIR crisis (§ 6.3).

weaves three action pillars: (a) search and rescue for missing or murdered relatives (§ 6.1), (b) providing support and healing to relatives and their families (§ 6.2), and (c) raising awareness of the MMIR crisis (§ 6.3). Please see Table 4 for a summary on socio-technical actions. We refer to IIC, a *closed-loop system* to show how these pillars of healing infrastructures are deeply interlinked, reaffirming that any intervention from HCI needs to support the sacred ties that bind them together (§ 7).

> *" MMIW movement is one of not just dismantling systems, but that we're also building. We're building a movement of healing [and] . . . supporting our relatives through these traumatic events and through this crisis. . . . centering the voices and uplifting the stories and sharing those in a very human way. . . . It's shifting that [deficit] narrative to say like, no, every individual deserves to be treated with respect and humanely and to have their story told in a way that is larger than all of us to recognize the systemic injustices . . . and the way that these systems have failed our relatives all around. "*
>
> — Morning Star Gali $_{34}$ [147]

6.1 Search and Rescue Actions for Missing and Murdered Relatives: *"We Carry the Search in Our Bones"*

6.1.1 ♥ A1 *Investigation by Families and Advocates.* Fed up with delayed investigation by law enforcement agencies, the families take matters into their own hands to search for their missing or murdered relatives. Recognizing their desire to investigate, many tribes have launched informal policing programs and search-&-rescue parties.

> *" We took on the role of being the investigating police officer. I always think that was the police's job, but when a mother loses her daughter, it's natural instinct to do whatever you have to do to find her. I really didn't know I was doing the police's job;* ***I was just looking for my daughter.*** *"*
>
> — Malinda Harris $_{22}$ [232]

Collect evidence. Families collect evidence from their community or the places their relative last went missing. Many collected digital evidence from their relatives' accounts, posts on social media platforms, or security-camera footage from their last known location [34, 212, 232]. E.g., Marilene James $_{17}$ [232] shared a Facebook post to collect tips and shared them with the police "*I had all*



Fig. 5. **Social Media Posts** – The posts illustrate actions taken by families, advocates, and tribal police to find missing relatives and raise awareness. (**left**) A note courtesy Cheryl Horn [213] that her daughter left when she went missing. The note provided her name, a description of what she wore and the time she'd left on foot to seek help. The note says "If I do not make it there and you do not hear from me idk (I don't know) someone probs took me" [212]. The (**middle two**) posters found on social media for finding missing relative (♥ A1, § 6.1.1), and (**right**) image is a social media post to raise awareness about the MMIR crisis.

these people calling and messaging me, giving me an idea of what happened, telling me about seeing her [Yazzie] there, or that their boyfriend had something to do with it"

Distribute case information online. Despite harmful racist abuse and challenges in sharing information (❗ B4, § 5.0.4), social media platforms have been instrumental for the communities. E.g., Selena used social media to broadcast her whereabouts and let her family know about her abduction.

> *" After her [Selena] car broke down on a desolate road, left a scribbled note on the back of an envelope. It provided her name, a description of what she wore and the time she'd left on foot to seek help 'If I do not make it there and you do not hear from me idk (I don't know) someone probs took me' "*
> — Cheryl Horn $_{65}$ [213]

Many Facebook search-&-rescue groups and pages are run by survivors, families, activists, and tribal police to search for relatives (see Figure 5).

> *" Social media is a huge repository of information that serves as a tool in gathering data. These days, . . . Facebook and Instagram are go-to communication outlets for family members trying to connect. It also is the first stream of communication to spread word when there is a concern for safety. If a report is made, details are often shared first and widely on social media before any other information is provided to community members. "*
> — Charlene Aqpik Apok et al. $_{21}$ [27]

6.1.2 ♥ A2 *Investigative Tools by Advocates.* Advocacy organizations and tribal police provide crucial technical support infrastructure and tools to aid families in investigations, improve communications, and assert data sovereignty so that the data stays within the community.

> *" We will not let the lives of Native women be a checkbox that meets minimum requirements. "*
> — Annita Lucchesi $_{6}$ & Abigail Echo-Hawk $_{7}$ [206]

Create maps and databases. Indigenous cartographers created GIS maps and visualization tools [4, 56, 150, 207, 208, 225, 261, 292], sovereign maps and databases [27, 56, 80, 170, 205, 206, 228, 283, 328, 362] to support investigations and to trace violence in their communities. Witnessing the

challenges with state databases (B1, § 5.0.1, B2, § 5.0.2), advocates create their own sovereign databases by creatively cross-referencing various informal sources[18]

> *" The original intent of the database was not to solve crimes, ...[but to] identify actions that community activists, politicians and police could take to increase safety. ... but as the names and details grow, ... it could now be used to pinpoint geographic clusters or similar patterns of how victims disappear or are killed. "* — Sasha Reid $_{33}$ [80]

However, as Assistant Chief Jack Austin Jr. $_{66}$ [31] specifies "*[there is] no central database that is routinely updated, spans beyond colonial borders, and thoroughly logs important aspects of the data.*". Addressing this concern, Annita Lucchesi $_{6}$ set up a centralized database through the Sovereign Bodies Institute (SBI) [19]. Moreover, the Yukon territory has created a complete dataset and policies to cross-reference data with the RCMP [56].

Websites with guidance for families. Tribal organizations provided toolkits with resources to support families and tribal police. The toolkits share concrete actions for families including missing persons forms, checklists for investigative evidence, requests for AMBER alerts, additions to bulletin or police website, templates for social media posts and missing posters, guidelines to increase the reach and maximum visibility [246, 253]. For example, NIWRC [253] created toolkits for families on steps to do within the first 72 hours of a relative going missing and contact information of law enforcement specialists through a "Jurisdiction Assessment Tool" .

Purchase technical equipment.

6.2 Actions to Seek Safety, Healing, and Support : *"Coming Back Through Ceremony"*

Many MMIR advocates have personal experiences of trafficking, violence, and loss. Using their own experiences, advocates provide crucial safety, comfort, healing, and validation to the families.

6.2.1 A3 *Traditional Storytelling and Spiritual Healing.* Indigenous spirituality is closely tied to the natural world, where "*land and community have the highest possible meaning and are places to honor and commune with spirits dedicated to helping one another.*" [245]. In many tribes, "Sacred Circle" (Figure 6) recognizes the holistic connection between healing all senses: physical, mental, spiritual, ecological, and emotional. The ceremonies of smudging, sweat lodges, sharing circles, and traditional teachings offer a sacred space for personal reflection, healing, and cultural connection [330]. Since the COVID-19 lockdown, Grandmothers operate online sweat lodges, sharing circles, and smudging to heal sexual violence and trafficking survivors and their families.

Passing down stories. Healers, medicine keepers, caretakers, storytellers have provided sacred spaces for the communities to heal through generations. Communities are creatively adopting modern technology to pass down stories of resilience and traditional teachings. Advocates use Tribal Nations' Facebook pages to warn residents of imminent dangers.

> *" You'll see alerts on there about a van that tried to grab three Native kids driving by the elementary school, I've seen four of those now, supposedly white offenders. "* — Kandi Mossett $_{43}$ [49]

Although sharing stories can be re-traumatizing, that can "*reopen those wounds for them.*" [363], families that have personal experience of loss, extend their support to community members to share grief, mourn, and heal.

[18] Lucchesi and Echo-Hawk [206] used informal sources such as "*Freedom of Information Act (FOIA) requests to law enforcement agencies, state and national missing persons databases, searches of local and regional news media online archives, public social media posts, and direct contact with family and community members.*" Many databases utilized advances in DNA sequencing technologies to enable identification, especially in "cases long gone cold".

[19] Unfortunately, due to capacity constraints and dependence on philanthropy for funds, SBI have momentarily paused operations in December 2024 [205].



Fig. 6. **Traditional Healing Practices** – Many Indigenous peoples have been using traditional practices to heal and honor the spirits since time immemorial, such as (**top-left**) sharing circles help create a community of healing [245], (**top-right**) smudging, drumming, singing, food offerings and prayers are held by Elders to cleanse spirits [234], (**bottom-left**) Medicine wheel "represent the alignment and continuous interaction of the physical, emotional, mental, and spiritual realities" [157], and (**bottom-right**) sweat lodge ceremonies led by Elders and Grandmothers [33].

Creative technological platforms. Activists use online platforms to create podcasts [31, 86, 170, 177, 237, 363, 374], plays, films, documentaries and TV shows [29, 31, 42, 59, 122, 129, 264], and artwork [57, 71, 87, 140, 246] to center stories "*as ethically as possible, and also with honor, to ensure that the families were able to speak their truth.*" [154]. For example, The "Giving Voice Initiative" [286] breaks the silence by centering survivors to "*safely express what they've been through, gain knowledge, and begin healing themselves and their communities.*"

> "*[Families] were in charge of letting us know what they wanted to share with us. … We saw a need to tell these stories from an Indigenous perspective because these stories aren't told. We want to bring that to light because this is a silent epidemic here and across the country.* "
>
> — Littledave, Jackson & Stephens [42] [177]

Unfortunately, many non-Native advocates use extractive storytelling to deem these stories as true-crime podcasts and books (sometimes, AI-generated). As Luella Brien [61] [264] counters "*These are not true-crime stories to us. These cases are our relatives.*" Therefore, it is incredibly important to center silenced Indigenous peoples' voices.

6.2.2 ♥ A4 *Support Material Needs.* Advocates support families and relatives with housing, finances, and economic support, and help them file a missing persons report and testify in court.

> "*Supporting families in search of justice sometimes means showing up for people who are engaging with the criminal legal system, while knowing it will most likely disappoint them.* "



Fig. 7. **Art** – Indigenous activists symbolize the resilience of Indigenous peoples through the #MMIR movement. The artworks symbolize (**top-left**) communities wearing red colors at prayers, protests, candle vigils, marches, and marathons to honor the relatives and raise awareness about the crisis [136], (**top-right**) The beadwork portrait of Mavis Kirk-Greeley created by her sister Merle Kirk symbolize of the [MMIR] movement in Oregon [57], (**bottom-left**) the red hand symbol embodying the MMIR movement honoring the spirits of the ones who are lost. [27], and (**bottom-right**) TsuuT'ina Cell Block: cellblocks dorn cultural revitalization art and literature depicting trauma-informed and restorative justice values [335]

— Kelly Hayes [10] [147]

Agencies have set up culturally-sensitive helplines that "*understand the unique barriers to safety and justice that Native peoples face*" [252]. For example, the TsuuTína Nation Police [334, 335] distributes radio advertisements to raise awareness of support services and information for the missing persons helpline on their website. On a national scale, StrongHearts Native helpline, a safe and confidential helpline for suicide prevention, domestic and family violence, and substance abuse, has supported 13,000 survivors through calls, text, and online chat [254]. Some advocates work with tribal police to build apps that support resilience, reduce stigma, and promote mental wellbeing (e.g. Peer Connect App [330]) and to counter hate speech online (e.g. Kenora Makwa Patrol [366]). Advocates urge communities to utilize these services.

> *" You can call them, you can text them, you can spend time in conversation with people talking through. because . . . there are going to be times when nobody is going to believe you. "*
> — Abigail Echo-Hawk [7] [363]

6.3 Actions for Advocacy and Raising Awareness : *"Our Voices Won't Be Silenced"*

Frustrated by the lack of State's urgency, activists and families have been steadfast in advocating for their rights, raising awareness, and sweeping legislation and policy change (§ 2.1.4).

> *" Decades of advocacy and activism fell on deaf ears, while more and more of our women went missing and were murdered. Legislators, government agencies, and media have been forced to pay attention because of the relentless work by the families of MMIWG victims, grassroots activists, tribes, and Native organizations across the country. "* — Abigail Echo-Hawk $_{7}$ [100]

6.3.1 ♥ A5 *Advocacy Movements and Campaigns.* The MMIR movement relies on breaking silences and using social media platforms to amplify suppressed voices and mobilize reforms [234]. The #MMIR movement emerged when stories of loss passed down across generations from mothers to their daughters; found their way on social media platforms with #MMIW, #MMIP, #MMIWR, #NoMoreStolenDaughters, #NoMoreStolenSisters, #NoMoreStolenRelatives. In 2012, Sheila North Wilson $_{31}$ [232] started using #mmiw on Twitter "*It surprised me at how fast the hashtag picked up, and how far it went.*"

> *" The growing movement . . . didn't arise out of data — it came from the fact that so many Indigenous women know someone who has died violently or disappeared. One of the hallmarks of the movement is that it does not center around how the woman was murdered or who killed her. It identifies the generations-long elimination of thousands of women from Indigenous communities as a direct result of government['s] attempts to eliminate Indigenous cultures. "* — Alleen Brown $_{36}$ [55]

Intersectionality with anti-violence movements. Honoring a belief system that treats land as a relative, communities often link violence against their people to violence against the land. As Patina Park $_{12}$ [323] posits "*We can't be surprised that people who would rape our land are also raping our people.*" The MMIR movement have always been deeply intersectional, aligning with anti-violence and feminist movements[20]. This stance challenges systemic harms that disproportionately affect marginalized Black and Brown communities. Similarly, rematriating the land (return land, culture, and governance under the leadership of matriarchs) and knowledge is inseparable from healing intergenerational trauma deeply felt by MMIR families.

Organize protests, vigils, prayers, walks. The online movement also mobilized people in offline spaces (see Figure 7). Activists organized countless marches, vigils, and marathons through Facebook/Instagram events features to raise awareness, a practice that grew especially popular during the COVID-19 pandemic. When in-person gatherings such as marches, prayer circles, and walks became impossible, families, movement leaders, and MMIR groups turned to virtual tributes and online discussions, filling the internet with images and stories of missing and murdered loved ones [118]. Families create art representing red-colored skirts, lamps, dresses, flags, beadwork, prints, and organize art events through e-commerce platforms (e.g Etsy). Their goal is not to earn money from selling art, but to symbolize the movement and raise awareness [280] (see Figure 7).

> *" In various tribes, red is known to be the only color spirits see. It is hoped that by wearing red, we can call back the missing spirits of our women and children so we can lay them to rest. "* — Native Womens Wilderness and Indigenous Women (NWWIW) $_{46}$, an advocacy website

6.3.2 ♥ A6 *Education and Reconciliation Programs.* Tribal programs organize educational sessions for youth, LGBTQ2S+, and frontline support workers on financial crime, phishing, child luring and trafficking, and online harassment. For e.g., frontline professionals utilize the "Sexually Exploited Youth risk assessment tool" to help identify youth at risk [366], enabling them "*to identify red flags*

[20] #MMIR movement intersects with #LandBack, #NoDAPipeLine, #ResidentialSchoolSurvivors,#NotOneDropForData, #DataSovereignty, #IndigenousEnvironmentalJustice, #IndigenousFoodSovereignty, #MeToo, #TwoSpirit, #Indiqueer, #BlackLivesMatter, #Sogorea Te' LandTrust, and #SeedingSovereignty.

of trafficking." [335]. In addition, reconciliation programs strengthen relationships between Tribes and the State, an essential step toward addressing historic and ongoing harms. Indigenous advocates lead education programs using cultural, strength-based, and trauma-informed approaches that respond directly to community needs [366]. These programs hold the State and law enforcement accountable, by ensuring commitments are enacted through sensitizing frontline workers in the justice system to systemic violence against Native peoples [159, 334, 335]. E.g., RCMP [129] created "Lived-Experience Advisory Group" and "Circle of Change", led by Indigenous women, to shape policies on missing persons investigations, new risk assessment tools, and youth engagement strategies. Finally, as non-Native service providers often fail to provide reliable coverage, tribal-led technology companies have expanded high-speed internet access on reservation lands [326].

7 Discussion and Call to Action for HCI

> *" We honor and remember always the lives and legacies of love from each missing and murdered Indigenous womxn and girl. We plant seeds of resistance through lives of health and wellness. Certainly, the complexities and challenges are ever present; but looking forward we remember the vision of living our power to the fullest, in safety, while thriving. We are calling for this vision of justice to come forward in the same way we call to our relatives in an effort to ensure they can rest in peace and with memory eternal."*
>
> Charlene Aqpik Apok et al. $_{21}$ [27]

We show how the data, technology, and infrastructure reinforce colonial violence by creating "death spaces in darkness" that render Indigenous lives uncountable. We weave together calls to action from families and advocates, reflections from our methodology, and and design considerations in prior work across sovereignty, epistemic justice, feminist, Indigenous and decolonial ethos, rurality, privacy and safety, participatory design, and social and transformative justice. And yet, the design practice has not translated into structural change for Indigenous families. We situate these calls to action within prior HCI/CSCW work with the open questions: *Why have the communities' calls to action gone unanswered? Why have the prior HCI works' design recommendations left unaddressed? Who gets to and has to set the research agenda, decide the outcomes, and weigh the benefits? What relational sensitivities and theories of change are required to disrupt the cycle of violence? How can the HCI community support grassroots communities into materializing this theory of change?* We think that this phenomenon perpetuates due to glass ceiling on academic theory of change and epistemic injustice by marginalizing Indigenous voices in scholarship and policy decisions [68, 106, 297, 301]. Historically, Indigenous peoples been only perceived as "data" but not agents of social change with active participation in technology design, governance, and policies to end the cycle of violence and get justice [62]. Pervasiveness of MMIR crisis lies across and beyond data ecosystems, institutions, Indigenous communities, governments, and needs to be addressed at "multiple levels with multi-scale complexity" [63].

We also recognize that, despite our best efforts, a comprehensive design praxis to address MMIR crisis may be insufficient with just one research article. To transcend the boundaries of traditional academic scholarship, we invite HCI scholars, platform designers, and policymakers to reckon with epistemic injustices and center Indigenous voices. Our work seeds generative efforts by inviting relational work that preserves the continuity and sacred ties that bind together the pillars of IIC (Figure 4). We propose design implications for (a) sovereignty and governance of data infrastructures (§ 7.1), (b) platforms and system design (§ 7.2), and finally, (c) researchers practice (§ 7.3). A failure to heed to these calls of action means not risking more relatives to the MMIR crisis, and, as a field, being complicit in the genocide of Indigenous peoples.

7.1 Implications for Sovereignty and Governance of Infrastructure

Technical fixes imposed from outside risk reproducing the extractive relations they aim to repair [160, 281]. Misclassified race, inconsistent tribal, local, state, and federal reporting, and the lack of tribal data-sharing agreements are the kinds of "layers of silence", Star and Strauss [316] describe. Indigenous people disappear from official counts because the infrastructure was not designed to see them, and that invisibility in turn shapes the policing, policy, and public attention they receive.

7.1.1 R1 *Stewardship of Data Infrastructure.*

> *" We need to have Indigenous data keepers that hold that data, because it's sacred to us. It's not just numbers that you throw around. These are people. "* — Trisha Etringer [50] [58]

We echo communities' call for socio-political and technological self-determination. This signals a shift from invisibility to vibrant stewards of data infrastructure as "data are people, loved ones, gifts from ancestors" [27]. Frameworks such as CARE [63–65, 163], Māori Data Sovereignty [325], OCAP [114], United Nations' Declaration on the Rights of Indigenous Peoples (UNDRIP) [340], Ethical Métis Research [238], National Inuit Strategy on Research [243], Indigenous Data Sovereignty Communique [346] have successfully created research practices and frameworks that integrate Indigenous knowledges and onto-epistemologies into data practices and policies. HCI researchers should ensure that tribal nations and families' voices are meaningfully consulted to guarantee a culturally-sensitive data-stewardship practice: giving weight to their lived experiences as equal to the empirical data, how it is collected, stored, and retained, and sustained access to the data. Indigenous-led advocacy from Sovereign Bodies Institute (SBI), National Indigenous Women's Resource Center (NIWRC), and Urban Indian Health Institute (UIHI) have materialized these principles to create missing persons databases [205, 206, 309–312] and predict health outcomes from epidemiology data [342] Policies are needed that enable a sovereign governance model through transparency, accountability, and tribal oversight, especially, when the data is shared between investigative agencies across State and International borders [206, 309, 323]. For example, emphasizing their commitment to protecting the sacredness of the data and respecting families, SBI grants access only to those who can demonstrate the ability to handle the information responsibly and in accordance with Indigenous values. However, the SBI's pause in December 2024 has left a vacuum for its centralized database without a home. This shows that without a long-term economic and governance structure and dependence on philanthropy, emotional and physical labor of a few volunteers, the infrastructure can be fragile. One way tech researchers can support data infrastructures is by creating federated, secure, and usable data-sharing protocols that can improve bottom-up collection and sharing about case data from tribal nations. A cryptographically verifiable access-control protocol can enable Tribal Nations to share data with law enforcement, while retaining agency: being able to approve, deny, and audit data access requests.

7.1.2 R2 *Stewardship of Network Infrastructure.*

> *"Partnerships between network providers and government at all levels are essential for removing the barriers Indigenous communities face to digital connection and unlocking our increased economic potential. "* — Nits'il?in (Chief) Joe Alphonse [49] [326]

Given the rural and Indigeneous reservations' characteristics of network infrastructures, interventions in rural settings must be intentionally reconciled with communities' unique context and choices [145, 167, 191], towards a low-bandwidth and offline-capable alert options. Equitable economic resource distribution would allow tribes to scale up their network infrastructure and improve cellular coverage, especially in rural areas. Ensuring the agency to raise and monitor alerts could help resolve agency problems with the AMBER alerts. At present, only 4 US states and 12

tribes (out of 574)[21] with significant economic power have set up their own alert systems [328, 356], no such National-level alert exists for missing persons. Recently, in Aug 2024, the US Federal Communications Commission (FCC) approved the Child Abduction Emergency (CAE) and Missing and Endangered Persons (MEP) codes [110]. The USA's national alerting framework includes radio and TV, cellphones, and internet-based alerts [356]. FCC consulted with *some* tribal nations, which will allow them to broadcast alerts on the state or federal level. This is a good first step. However, it will take years to implement it since the alerts are transmitted through a "patchwork of notification systems" with varying local and state laws [110]. Duarte [97] recognizes this bottleneck and calls for Indigenous network sovereignty, where Indigenous leaders, technology researchers, and network providers collaborate with policy that informs a large-scale infrastructure build-out.

7.2 Implications for Platforms Design

7.2.1 **R3** *Platform Design for Effective Reporting, Support and Advocacy.* We observed how communities have reconfigured platforms such as Facebook groups, Feather Alerts, social media toolkits, and hotlines for support, care, and memorializing their missing relatives. At the same time, communities face privacy, agency, trust, visibility, burnout, and long-term sustainability challenges. These challenges invite HCI scholarship on supporting platforms and infrastructures for reporting, search-&-rescue, advocacy through hashtags and posters, and support created by tribal support providers and advocates.

Privacy and Safety. Platforms protections are necessary to understand privacy and safety needs of the families against harassment, trolling, and cultural exploitation in the form true-crime content, scams, misinformation, and control of how a loved one's missing posters and stories are circulated over the internet. To counter epistemic invisibility, it may seem that increased access to technology or surveillance may automatically benefit the communities. Such a design space is full of contestations and contradictions: a wide sharing of missing posters brings tips and solidarity, and it also brings scams, harassment, and non-consensual re-sharing. Design interventions may unintentionally reinforce more harm among marginalized communities [107]. For example, Mason and Magnet [218] show how historical State surveillance technologies have plagued Indigenous communities, with millions of young men subjected to carceral violence, on the pretense of providing more privacy to Indigenous communities. Therefore, privacy and safety provisions for families should extend diverse individual and community needs in and beyond anti-carceral, anti-surveillance, de-centered policing and criminal justice pathways [41, 139, 169].

Content Moderation and Algorithmic Amplification. Algorithms for categorization and social media embed racialized and hegemonic algorithms [18, 41, 255], content moderation systems [299], especially through emerging AI technologies [174, 302]. Missing posters and advocacy posts may get suppressed, buried, or flagged or not show in the required geographic spaces, reinforcing layers of invisibility and cultural data erasure. Scholars could facilitate a transition towards transparent, culturally-sensitive, and equitable reporting and escalation provisions for (a) online abuse and scams, and (b) missing persons with law enforcements.

Memorializing family members. HCI could aide memorializing lost loved ones to support spiritual needs of Indigenous families. At the same time, enabling respectful account transfers, archival and

[21] As of December 1 2025, only 4 state-level alerts exist in Washington, California, New Mexico, Colorado and 12 tribal alerting authorities exist in Chickasaw Nation, Cocopah Indian Tribe, Hualapai Tribe, Confederated Tribes of the Chehalis, Navajo Nation, Mandan, Hidatsa, and Arikara Nation, Rincon Band of Luiseno Indians, Eastern Band of Cherokee Indian, Ysleta del Sur Pueblo, Pascua Yaqui, Shawnee Tribe, and Inupiat Community of the Arctic Slope.

investigative evidence collection, account deletion, and stewardship [96]. Prior research has provided crucial theories and design interfaces for platforms to acknowledge disenfranchised grief and institutional betrayal [93], stewardship and disastrous events that prevent end-of-life planning [95], memorializing [282] so bereaved families can reflect and honor their lost ones with respects [198]. Scholars can co-design with communities and Elders to surface individual, community, and diverse spiritual design needs to memorialize and remember their kin who are victimized of violence, trafficking, and genocides. Such a design space can respectfully build on care infrastructures (sweat lodges, healing circles) to provide much-needed care to the families.

7.2.2 **R4** *Platform Design to Improve Law Enforcement's Accountability.* We take inspiration from tribal police's commitment to improve communication and coordination with families. Better coordination with law enforcement could speed up investigations and provide closure to cold cases. However, historically faced with dismissal, misclassification, and silencing, families and advocates are understandably frustrated and distrust these institutions. To build bridges of reconciliation, platform interventions should not assume trust and reinforce skepticism that the community has withheld for good reason. At the same time, critical work is needed to make police technologies transparent and accountable. For example, shifting the onus away from families, technology tools could enable law enforcement to collect digital evidence in a transparent way, ensuring equal access to families, tribal police, and courts [317, 364]. Recently, UIHI [101]'s surveyed survivors and families to understand their needs from law enforcement and provide specific recommendations for law enforcement agencies' MMIR websites. The recommendations range from appropriate information for families (victim resources, steps to report, what to expect, how to contact detectives, misconduct complaints), law enforcement (cultural training, cold case investigations, communication with families), to visual representation and coverage about the crisis (families' stories, links to State policies).

7.3 Implications for Research Practice

We provide reflections based on our own research process to inform the implications on research practices. We echo prior calls in HCI to decolonize epistemologies by working with communities through respect, reciprocity, relational accountability, towards long-term sustainable relationships.

7.3.1 **R5** *Equitable Participation, Relational Accountability, and Long-term Sustainability.* We challenge the scholars to pause and reflect on the biases and notions they bring in before formally consulting with Indigenous communities at the very beginning of the projects, not as an afterthought. Being explicit about your own ancestral relationship and kinship to the communities [324, 358, 368], assessing research questions, benefits, harms, and potential future uses [63, 200], refusal to research [305, 337, 360], ethics review, informed consent, memorandum of understandings, and data-sharing agreements [3, 141], non-extractive and relational ways of collecting sensitive stories [134], publication format and reciprocal ways knowledge will be transferred back to the communities [196, 308] to form long-term sustained relationships and systems [63]. By centering relational and kinship approaches to technology, terminologies, and centering local culturally-grounded meaning making helps de-center Western and State-sanctioned classifications [134, 256]. For example, we challenges the canonical notions of technology infrastructure, privacy, and violence in this study. If HCI treats only modern tangible digital artifacts as "technology", it misses healing infrastructure that communities have built across generations and central to Indigenous ontologies.

Central to the research process is also respecting refusal, since some stories, languages, and practices should not be analyzed or built on to avoid theorizing, fetishizing, or misappropriating sacred traditional and spiritual practices [69, 130, 320, 336, 350, 352]. As we show in our findings, true-crime and AI-generated books prey on Indigenous stories to get "recognition" without returning any benefit back to the communities. Moving from extraction to reciprocity, researchers should

commit to community review of findings before publication, return of data and results in accessible formats, shared authorship or acknowledgment, and fair compensation and reparations. By avoiding damage-centered framing [336], scholarship could pair accounts of harm and oppression with accounts of resilience, sovereignty, and resistance; paving pathways for future scholars to enact generative social transformation [165, 308].

Finally, through our findings on extractive programs, we show how extractive and short research-community engagements can be extremely harmful on high-stakes contexts. Treating research as a "ceremony" [368], scholars should build reconciliation through responsible relationships with Indigenous people and organizations from whom the data originates. This include "investing in capacity development, increasing community data capabilities, and embedding data within Indigenous languages and cultures." [63]. A key feature of such a research should be to emotionally, materially, and economically sustain grassroots infrastructure through funding, technical maintenance, and long-term support for community-run tools, since many initiatives depend on a few volunteers who may burn out. Researchers must budget for long-term maintenance, trainings and handover, drawing on lessons from extractive participatory work that vanishes after a project ends [13, 178]. In our future work, we commit to sustaining relationships and work with Indigenous organizations to realize interventions that support families, but also, bring an end to this cycle of violence.

7.3.2 R6 *Reconciling with Indigenous Epistemologies.*

Embracing Diversity and Local Indigenous knowledges. Researchers should embrace diversity in Indigenous ways of being and meaning-making and not lump all Indigenous complexities together [256, 308]. Researchers should strive for an accurate representation of families' sacred stories of loss, resilience, and justice. Although united, we recognize the diversity of cultures, languages, ways of being and thinking with different socio-cultural and geographical uniqueness. We extend Noe and Kirshenbaum [256]'s invitation for the research community to recognize the specificity of and design solutions rooted in local Indigenous knowledge. Each relative, family, and Tribal Nation may have distinct onto-epistemological needs, situated in their community. Centering their needs, scholars may help support communities reclaim biometrics, mapping, and surveillance technologies and reconfigure logics of colonial domination to find missing relatives [173, 209]. For example, "Restorative justice" frameworks reflect the Indigenous values of respect for women in matrilineal societies "based on a model of healing rather than of punishing." [308].

Intersectionality and Preventing Cission.

> *" Refuse to silo advocacy efforts – that division only serves to foster white supremacist, settler-colonialist, and capitalist power structures. Ask your local leadership in politics, finance, business, and education to honor the treaties, respect Indigenous sovereignty, and advocate for the end of violent environmental exploitation. "* — Tegan Swanson [26] [323]

At the same time, respect the integrity and sacredness of Indigenous knowledge systems to avoid "parachuting" techno-solutionist approaches that side-step their generational work. Solutions to only one of the action pillars without acknowledging other connected pillars may end up reinforcing epistemic injustices. A cission or fracture may occur if HCI research only relies on just (a) one specific topic without addressing the root causes of structural oppression. Echoing intersectional and decolonial feminist ethos, for example, the same infrastructures that perpetuate root cause of racial capitalism [274] also disrupt eco-social relationships [193] and flatten gender into binaries [211, 263]. The same structures that extract oil and gas also results in increased sex crimes near Indigenous reservations [21, 159, 306]. Our work opens a design space in CSCW to critique settler-colonial logics embedded in infrastructural research, inviting scholars to design for sabotage and refusal of extractive infrastructures and build infrastructures of care (e.g. IIC) in-place.

Similarly, researchers could avoid topical research with Indigenous communities that only relying on Western or Indigenous epistemologies. Such a cission may further isolate Indigenous knowledge by separating it from the mainstream [107, 220]. Instead, scholars invite adaptive knowledge that builds "disenclosures" [220], or "reconciliation" [76, 109, 308, 373]; co-designing across knowledge systems by folding in diverse ways of meaning-making. Similar calls have been made by Kumar et. al in their multiple works spanning "HCI Across Borders" [60, 61, 184–187, 189]. Our own method sits in this tension. A large-scale web analysis let us avoid re-traumatizing families, but it relied on Google's index, English-language pages, and LLM-assisted triage, all of which can reproduce the exclusions we critique. We do not offer it as a substitute for relationship-based research. For example, engagements with intergenerational trauma and Indigenous healing practices have been siloed off from prior HCI work, merely adding it as an asterisk [301]. Therefore, we urge HCI to decolonize "trauma-informed care" [30] by respectfully centering historically proven practices of cultural and spiritual healing that has resolved intergenerational trauma [69, 70, 300, 307, 332].

8 Conclusion

We critique how data infrastructures and Western epistemologies reinforce colonial violence by creating "death spaces in darkness" that render Indigenous lives uncountable through bureaucratic systems instead of affording safety. Federal databases like NamUs or NCIC fail to register Indigenous victims through inaccurate data collection and opaque data sharing policies, creating barriers for communities to find safety and reproducing epistemic erasure. Colonial institutions repeatedly misuse or appropriate Indigenous knowledge. Moreover, most Tribes lack the agency and access to the State criminal databases and are unable to release alerts, forcing dependence on colonial institutions. At the same time, Indigenous communities mount a generational resistance against State technologies and reclaim them as spaces of advocacy, ceremony, memory, and care. Families and tribal police circulate missing-person posters, coordinate search efforts, document violence, and preserve collective memory. Communities form interconnected infrastructures of care through social media campaigns, sovereign and crowd-sourced databases, and digital maps to search and rescue for relatives, provide support and healing to relatives and their families, and raising awareness of the MMIR crisis. We conduct a large-scale content analysis pipeline by employing value-sensitivities rooted in decolonial feminist onto-epistemologies such as critical humility, relational accountability, and refusal. We demonstrate how empirical HCI methods and automation can be re-imagined to engage critically with settler-colonial systems by centering Indigenous meaning-making. Finally, we expand the concept of technology to include doll-making, talking circles, and storytelling as healing infrastructures. The notion that technology can carry spirit, memory, and ceremony pushes HCI to rethink what counts as a technological artifact altogether.

We conclude our work by sharing a poem.

> *" Indigenous is not a survival story*
> *it is a genealogy*
> *an ancestral story of Matriarchs*
> *with bright eyes*
> *long hair*
> *fiery strength*
> *and gentle words*
> *tripping over colonial tongues*
> *the settlers language can't translate*
> *the words*
> *it was never meant for their ears "*
>
> — Abigail Echo-Hawk [7] [27]

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Appendix

8.1 Prompts for LLM

```
DOMAIN_CATEGORIES = {
    1: "News",
    2: "Blog article",
    3: "Non Profit Organization",
    4: "E-commerce platform",
    5: "Government",
    6: "International Organization",
    7: "Law enforcement",
    8: "Education",
    9: "Social Media",
    10: "Unknown"
}
```

Given the content, categorize the URL into one or more categories from the list: DOMAIN_-CATEGORIES. Provide the answer in JSON format with 'categories' (list of numbers) and 'justification'. Do not add any additional information or notes.

Fig. 8. **LLM Prompt 1** – For categorization of domains through DC-LLM

8.2 Table of MMIR Advocates

Table 5. **Native Advocates behind the MMIR movement** – The families, advocates, and tribal police are fighting back to reclaim the narrative behind their stolen relatives.

#	Advocate	Role in advocating for the MMIR movement
1	Jordan Marie Brings Three White Horses Daniel	"Jordan Marie Brings Three White Horses Daniel, a Kul Wicasa Oyate/Lower Brule Sioux MMIW activist in the documentary short No More Stolen Sisters: Real America with Jorge Ramos." [323]
2	Julia Annette Woock	"Julia Annette Woock is a Latina born in Tijuana, Mexico, raised in a binational borderlands community by a single mother. Woock is the Editor-in-Chief of America's #1-ranked community college newspaper, The Southwestern College Sun, where she covers local politics, immigration and indigenous civil rights." [354]
3	Maggie Cywink	Maggie Cywink's sister Sonya Nadine in 1994. In 2004, Cywink shared her story with Amnesty International in their groundbreaking report titled "Stolen Sisters: A Human Rights Response to Discrimination and Violence Against Indigenous Women in Canada." Cywink has become a strong advocate for the movement since then [55].
4	Lisa Brunner	Lisa Brunner [is] co-director of Indigenous Women's Human Rights Collective and professor and cultural coordinator at White Earth Tribal and Community College in Mahnomen, Minnesota. Brunner, who is also an Anishinaabe member of White Earth Nation in Minnesota, told News21 that she has survived numerous sexual assaults by non-Native and Native American men alike, which drove her to advocate for the past 20 years on behalf of other victimized Native American women." [49]
5	Lela Mailman	Lela Mailman lost her eighteen year old daughter Melissa. "She went to the police in Farmington to report her missing, but was dismissed." In the following years, Mailman became a strong activists at marches, protests, and prayer gatherings. [232]

Continued on next page

Table 5 – continued from previous page

#	Advocate	Role in advocating for the MMIR movement
6	Annita Lucchesi	Annita Hetoevehotohke'e Lucchesi, a Southern Cheyenne cartographer, researcher, and advocate for Indigenous cartography, geography, and earth sciences; Indigenous data sovereignty and research methodologies; and violence against Indigenous peoples. As the director of Sovereign Bodies Institute (SBI), she built and maintains the MMIR database. [204]
7	Abigail Echo-Hawk	"Abigail Echo-Hawk, Pawnee Nation of Oklahoma, is currently the Executive Vice President at Seattle Indian Health Board and the Director of Urban Indian Health Institute." [101]
8	Mary Kathryn	"Mary Kathryn Nagle is an enrolled citizen of the Cherokee Nation of Oklahoma, a playwright and partner at Pipestem Law and the executive director of the Yale Indigenous Performing Arts Program."[363]
9	Matika Wilbur	Matika Wilbur is "a visual storyteller from the Swinomish and Tulalip peoples of coastal Washington, for the past five years has been traveling and photographing Indian Country in pursuit of one goal: To Change the Way We See Native America." [363]
10	Kelly Hayes	Kelly Hayes is "a Menominee author, organizer, movement educator and photographer. She is the host of Truthout's podcast Movement Memos, and the creator of Organizing My Thoughts, a weekly newsletter about politics and justice work." [147]
11	Meg Singer	Meg Singer is "the Indigenous Justice Program manager with the American Civil Liberty Union's Montana chapter in Missoula." [49]
12	Patina Park	Patina Park is the "Executive Director of the Minnesota Indian Women's Resource Center." [323]
13	Native Hope	Native Hope "has made a profound impact through its mission to empower Native voices, preserve cultural heritage, and create positive change for Indigenous communities." [246] [246]
14	Tsuut'ina Nation Police Service	"In consultation with Tsuut'ina First Nation elders, the Tsuut'ina Nation Police Service designs and delivers a comprehensive cultural training program for Alberta law enforcement agencies and other representatives in the justice system that will challenge and dispel stereotypes of Indigenous peoples and address unconscious biases." [335]
15	Jodi Voice Yellowfish	"Jodi Voice Yellowfish is founder and chair of the Missing or Murdered Indigenous Women Texas Rematriate, a Dallas-based organization that helps Indigenous families search for and bring home missing and murdered relatives, to support and offer healing processes to the missing and murdered and their families, and to advocate for social change." [374]
16	Fawn Douglas	"Fawn Douglas is an indigenous American artist, activist and registered member of the Las Vegas Paiute Tribe." [234]
17	Marilene James	"Marilene wrote a Facebook post asking people to share information with her about Yazzie's disappearance. She made a list of all the tips and provided it to the police." [232]
18	Deborah Maytubee Shipman	"Deborah Maytubee Shipman of Portland, founded the Missing and Murdered Indigenous Women USA page on Facebook, adds two: #MMIWUSA and #JUSTICEFORYAKAMA." [34]
19	Stacey Schreiber Schinko	"Stacey Schreiber Schinko, whose children are related to Decorah, was relieved by the conviction and 25-year prison sentence Decorah's partner ultimately received. She knows all too well that many never find their missing family member or never see a conviction." [355]
20	Rep. Tawna Sanchez	In 2019, Oregon State Rep. Tawna Sanchez, sponsored a bill focused on "increasing and improving the reporting, investigation, and response to incidents involving Missing and Murdered Native American Women" [288]
21	Charlene Aqpik Apok	"Charlene Aqpik Apok (Iñupiaq), Malia Villegas (Native Village of Afognak), Abigail Echo-Hawk (Pawnee Nation of Oklahoma), Jody Juneby Potts (Han Gwich'in from Eagle Village, Alaska), and Kelsey Ciugun Wallace (Yup'ik, Yaaruin Creative LLC) created a report for the Data for Indigenous Justice (DIJ). They say "This report is a reclamation of our stories that we have always had and maintained. This ancestral knowledge of data that we put forward is for our families and communities to self-determine our pathways to justice." [27]

Continued on next page

Table 5 – continued from previous page

#	Advocate	Role in advocating for the MMIR movement
22	Malinda Harris Limberhand	"Malinda hadn't heard from her 21-year-old daughter, Hanna Harris, since she'd left to watch fireworks the previous night. Malinda babied her "Hanna Bear" or "Hanna Banana," but her youngest daughter was now a mother herself. Her son, Jeremiah, was 10 months old, and wasn't taking his bottle. He was hungry, and Malinda was worried. It wasn't like Hanna not to come home to breastfeed him." [213]
23	Hunter Old Elk	"Hunter Old Elk (Crow & Yakama) of the Plains Indian Museum at the Buffalo Bill Center of the West, grew up on the Crow Indian Reservation in Southeastern Montana. Old Elk uses museum engagement through object curation, exhibition development, social media, and education to explore the complexities of historic and contemporary Indigenous culture." [104]
24	Monte Mills	"Monte Mills is a professor and co-director of Indian law clinic at the University of Montana." [213]
25	Cheryl Bennett	"Cheryl Bennett is an Arizona State University professor "researched the race of perpetrators and the use of racist slurs during sexual assaults targeting indigenous women. She believes that they should be considered in most cases to be hate crimes." [49]
26	Tegan Swanson	"Teegan Swanson is a Systems Change Coordinator at End Domestic Abuse Wisconsin member, Missing and Murdered Indigenous Women (MMIW) Task Force of Wisconsin" [323]
27	Paula Castro	"Paula Castro is the mother of Henny Scott — "Henny Scott was 14 years old, a high school freshman on the Northern Cheyenne Indian reservation in Lame Deer, Montana, when she went missing after a house party in late December 2018" [154]
28	Carolyn DeFord	"Carolyn DeFord, a Puyallup tribal member Leona, who lost her mother LeClair Kinsey in 1999. "She is now a member of Washington's recently created Missing and Murdered Indigenous Women and People Task Force". [339]
29	Renee Gralewicz	"Dr. Renee Gralewicz, Brothertown Indian Nation Peacemaker, retired Professor of Anthropology in the University of Wisconsin Systems, and co-chair of the Wisconsin MMIW Task Force Legal/Policy subcommittee" [323]
30	Desi Small-Rodriguez Lonebear	"Desi Small-Rodriguez Lonebear (Northern Cheyenne & Chicana) is a dual PhD candidate in sociology at the University of Arizona and demography at the University of Waikato in New Zealand. She is an incoming assistant professor in the departments of sociology and American Indian studies at UCLA. Her research examines the intersection of Indigenous erasure and inequality, including health equity for Indigenous Peoples."[66]
31	Sheila North Wilson	"Sheila North Wilson, the former Grand Chief of Manitoba Keewatinowi Okimakanak Inc., who coined the hashtag #MMIW while working for the Assembly of Manitoba Chiefs in 2012." [231]
32	Melinda Harris Limberhand	"Melinda Harris Limberhand is a a member of the Northern Cheyenne Tribe, was twenty-one when she disappeared on July 4, 2013, in Lame Deer, Montana. The previous night she had gone to meet some friends. Like many Native women who vanish inexplicably, Harris was a mother, the devoted single parent of a ten-month-old son. The "National Day of Awareness for Missing and Murdered Native Women and Girls" honors the memory of Hanna Harris and countless missing relatives." [118]
33	Sasha Reid	"Sasha Reid is the former University of Calgary instructor and current law student" [80]
34	Morning Star Gali	"Morning Star is a member of the Ajumawi band of the Pit River Nation. She is a lifelong Indigenous activist and the project director of Restoring Justice for Indigenous Peoples. Morning Star is also a tribal water organizer for Save California Salmon. She supports Indigenous families who have been impacted by the crisis of missing and murdered Indigenous relatives." [147]
35	Cutcha Risling Baldy	"Cutcha Risling Baldy is an assistant professor and department chair of Native American Studies at Humboldt State University." [234]
36	Alleen Brown	"Alleen Brown is a New York-based reporter, focused on environmental justice issues. Her work has been published by The Intercept, The Nation, In These Times, YES! Magazine, and various Twin Cities publications." [55]

Continued on next page

Table 5 – continued from previous page

#	Advocate	Role in advocating for the MMIR movement
37	Renee Gralewicz	Dr. Renee Gralewicz, Brothertown Indian Nation Peacemaker, retired Professor of Anthropology in the University of Wisconsin Systems, and co-chair of the Wisconsin MMIW Task Force Legal/Policy subcommittee
38	Jamie Day	"Jamie Day works full time as an evidential medium and spiritual development teacher. [87]
39	Andrea "Andry" Lemke-Rochon	Andrea "Andry" Lemke-Rochon is a member of Wisconsin's MMIW Task Force [323]
40	Lt. Gov. Peggy Flanagan	Minnesota Lt. Gov. Peggy Flanagan is a member of the White Earth Band of Ojibwe [250]
41	Razelle Benally & Matthew Galkin	Filmmakers Razelle Benally and Matthew Galkin spent more than two years working on the documentary focuses on Montana cases of missing, murdered Indigenous girls. Series details the murder of three girls found dead in Big Horn County and the lack of law enforcement response. [264]
42	Sheyahshe Littledave, Maggie Jackson & Ahli-sha "Osh" Stephens	Sheyahshe Littledave, Maggie Jackson and Ahli-sha "Osh" Stephens launched the "We are Resilient" podcast in 2021. The true-crime podcast shines a light on missing Indigenous women with a community perspective. All three are members of the Eastern Band of Cherokee. [177]
43	Kandi Mossett	Kandi Mossett is a member of the MHA Nation and the director of the Native Energy and Climate Campaign of the Indigenous Environmental Network [49]
44	Dolly Alfred	Dolly Alfred is a Wet'suwet'en language teacher who is friends with Gracie and Florence and joined us at Gracie's house, believes the spirits of MMIWG are restless. [233]
45	National Indigenous Women's Resource Center (NIWRC)	"NIWRC made the MMIW Toolkit for Understanding and Responding to Missing and Murdered Indigenous Women for Families and Communities is designed to assist families, communities, and advocacy organizations in understanding and responding to a case of a missing or murdered Native woman. While there is no one-size-fits-all approach to developing a community response, these resources provide a starting point and outline important information and resources available." [253]
46	Native Women's Wilderness and Indigenous Women (NWWIW)	Native Women's Wilderness was created to bring Native women together to share our stories, support each other, and learn from one another as we endeavor to explore and celebrate the wilderness and our native lands. [248]
47	Treaty Three Police	Treaty Three Police is a self-administered Policing entity under the First Nations Policing Program in serving First Nations in the greater Treaty #3 region. [330, 331]
48	Kenora Makwa Patrol	Kenora Makwa Patrol "project will provide an opportunity for people to share their own stories and engage with local service providers and law enforcement The project aims to address hate motivated speech in social media and counteract it with true stories and an understanding of the effects of systemic and structural racism." [366]
49	Nits'il?in (Chief) Joe Alphonse	"Joe Alphonse has served as head of the Tl'etinqox Government for 16 years and has been tribal chair of the Tŝilhqot'in National Government for nearly as long." [190]
50	Trisha Etringer	"Trisha Etringer, Muriel Walker's daughter, said Indigenous people need to be the ones controlling their own data. She cited the MMIWG2 Database, which Annita Lucchesi, a Cheyenne descendent and executive director of the nonprofit Sovereign Bodies Institute, created to log cases of missing and murdered Indigenous women, girls and those who are two-spirit – a term used in some Native American cultures to describe gender-variant individuals in their communities." [58]
51	Abby Abinanti	"Abby Abinanti is the chief judge of the Yurok Tribe and the first Native American woman to be admitted to the California State Bar" [262]
52	Isabelle Meawasige	"Isabelle Meawasige is a bear clan woman from Serpent River, whose roots are Ojibway and Algonquin." [33]
53	Lupe Lopez	Lupe Lopez is a counselor and workshop leader [280]

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Table 5 – continued from previous page

#	Advocate	Role in advocating for the MMIR movement
54	Emma Hall	Emma Hall covers Sacramento County for The Sacramento Bee. Hall graduated from Sacramento State and Diablo Valley College. She is Blackfeet and Cherokee. [138]
55	Mike Balczer	Mike Balczer is the father of a 18-year-old daughter, Jessica Patrick. [233]
56	Amanda	Amanda is a news reporter at ListVerse [20]
57	Tamara Colaque	Tamara shares her journey to know herself through her mother's MMIW story. An aspect that is often forgotten when someone goes missing or is murdered is the impact on the family—especially the children. The wound is deep and the answers often intangible. [72]
58	M. Elise Marubbio	M. Elise Marubbio examines the sacrificial role of what she terms the "Celluloid Maiden"—a young Native woman who allies herself with a white male hero and dies as a result of that choice. Marubbio intertwines theories of colonization, gender, race, and film studies to ground her study in sociohistorical context all in an attempt to define what it means to be an American. [217]
59	Erica Ficklin	Erica Ficklin is a proud member of the Tlingit and Oglala Lakota tribes. She is currently in the Combined Clinical and Counseling Psychology program at Utah State University and mentored by Dr. Melissa Tehee. [112]
60	The Amber Advocate	The mission of the AMBER Alert Training and Technical Assistance Program (AATTAP) is to safely recover missing, endangered, or abducted children through the coordinated efforts of law enforcement, media, transportation, and other partners by using training and technology to enhance response capacities and capabilities and increase public participation. [328]
61	Luella Brien	Luella Brien is a journalist based in Hardin who grew up on the Crow Reservation [264]
62	Mona Gable	Mona Gable is a journalist in Los Angeles who covers gender, science, and travel. Her work has appeared in The New York Times, Outside, The Atlantic, Vogue, Los Angeles magazine, BBC, the Los Angeles Times and many other publications. Her story in Los Angeles magazine about sexual assault at Occidental College was named one of the Best Longreads of 2015. [118]
63	Brennan McCullagh	Brennan McCullagh is a Grade 11 student at St. John's Ravenscourt School, Winnipeg, Manitoba [239]
64	Deborah Haaland	Secretary of the Interior Deb Haaland established the Missing and Murdered Unit (MMU) within the Bureau of Indian Affairs (BIA) to investigate MMIR cases in Indian Country. [247]
65	Cheryl Horn	Cheryl Horn, Magazu Nahzi (Standing in the Rain), an Assiniboine from Ft Belknap, MT. She is a Member for the Montana Missing Indigenous Persons Task Force.
66	Assistant Chief Jack Austin Jr.	Jack Austin, Jr. is the Assistant Chief of the Choctaw Nation of Oklahoma, the third-largest Indian tribe in the United States. Austin serves as the primary Oklahoma delegate to the Tribal Technical Advisory Committee for the Substance Abuse Mental Health Services Administration (SAMSHA) and Indian Country Energy and Infrastructure Working Group (ICEIWG).

```
TECH_CATEGORIES = {
    1: "social media platforms",
    2: "smart-home or Internet of Things (IoT) devices",
    3: "mobile or phone applications",
    4: "software databases for storing information on missing persons",
    5: "search engines to find information",
    6: "software or hardware for general-purpose computing",
    7: "cloud computing for storing and accessing data",
    8: "privacy for protecting personal information",
    9: "security for protecting information from unauthorized access",
    11: "podcast or films",
    12: "AMBER alerts or other network-based broadcast alerts",
    13: "digital photo or sharing photos for a missing poster",
    14: "tools for reporting missing persons",
    15: "Data Sovereignty: having control over Indigenous data",
    16: "DNA databases to find missing persons"
    17: "Other: any other technology not listed",
}
```

Given the document, identify if it mentions one or more of the following technology categories: TECH_CATEGORIES. Provide only the answer in de-serializable JSON format: “categories“: [list of numbers], “justification“: “brief explanation“, “direct_quotes“: [direct text quotes if applicable]. If no technology use is mentioned, say ‘No’. Do not summarize or explain the rest of the content. If no technology is mentioned, say ’I don’t know’.

Fig. 9. **LLM Prompt 2** – For categorizing web pages with technology categories through CC-LLM.