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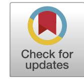

The reproductive geography of miscarriages. Social identities, places, and reproductive inequalities

Chiara Chiavaroli

Department of International Development, London School of Economics and Political Science, UK

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ABSTRACT

Increasing epidemiological evidence demonstrates the correlation between toxic contamination and miscarriages, and the disproportionate exposure of marginalised and racialised groups to environmental burdens. Yet, the debate on environmental reproductive health is still largely underpinned by a reductionist biomedical understanding of the health-place relationship that overlooks the interplay between social identities and places. In this article, I argue that understanding the role that places play in shaping reproductive inequalities, beyond the simplistic recognition of the environment as a factor of risk, is important to design a more inclusive reproductive health agenda that addresses the multiple scales across which reproductive inequalities unfold. These scales span from everyday experiences of reproduction to state-level models of reproductive governance. Drawing on 13 months of fieldwork in coca-farming territories in the Bajo Cauca region (Colombia), the aim of this paper is to conceptualise the reproductive geographies of miscarriages related to toxic contamination. This article contributes to debates on reproductive inequalities by discussing the complex and dynamic relationship between social identities and places, and theorising the spatiality of miscarriages.

1. Introduction

In recent reproductive health scholarship, consistent epidemiological evidence has established a correlation between miscarriages and toxic contamination (Woodruff et al., 2008; Sutton et al., 2019), recognising the environment as a crucial determinant of reproductive health. Furthermore, environmental burdens leading to reproductive disruptions emerge as unevenly distributed across different racialised, income, and gender groups (Pulido, 2017; Nixon, 2011), and therefore strongly related to social inequalities. Yet, lack of attention for the interplay between environmental and reproductive justice persists in this debate. On the one hand, social identities are understood as "self--explanatory, fixed and homogenous" (Sochas, 2021:1141921) across different geographies (ibid.), overlooking their context-specific meanings, which emerge from their symbolic (emotional, cultural, spiritual) and material (livelihood strategies, everyday habits, food consumption practices) relation with the environment (Nightingale, 2011; Sultana, 2009). On the other hand, the relation between the reproductive body and places is understood in reductionist biomedical terms, conceptualising the environment solely as a source of toxic risks that has specific reproductive impacts on the "biophysical" body as opposed to the "social" body (Mansfield, 2008). This restricts our understanding of reproduction to the geography of the womb, overlooking the role that the broader reproductive environment plays in this process (Theidon, 2022) and the interplay between social, cultural, and biological reproduction (Di Chiro, 2008).

Lack of understanding of the role played by "places"understood as the relational spaces where people's everyday life and social and power relations unfold (Bernard et al., 2007) in shaping reproductive experiences has important implications for policy-making. It leads to a white bias (Smith, 2005) in the definition of a reproductive health agenda, which is set to address reproductive priorities that are conceptualised as identical across different socio-economic contexts (Smith, 2005; Zavella, 2017). In particular, reproductive justice scholars and activists have contested the disproportionate focus given, in this debate, to access to abortion and contraception services as universal reproductive health priorities, when this framing mirrors the grievances of white pro-choice feminist movements located in specific geographies in the so-called Global North (Luna, 2020:15). On the other hand, reproductive concerns related to marginalised and racialised geographies, for example, access to clean water and air, and food security and the barriers that women exposed to environmental burdens experience in attempting to "sustaining life" (Di Chiro, 2008) in challenging geographies, are often overlooked. This determines a blind-spot in policy-making in relation to

E-mail address: c.chiavaroli@lse.ac.uk.

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reproductive concerns that do not easily fit within a pro-choice framing of reproductive justice and, on the other hand, within a framework of linear causality between environmental risks and reproductive outcomes. Miscarriages related to toxic contamination, for example, hardly emerge as a priority in the reproductive health agenda (Layne, 2003).

In this paper, I argue that designing a more inclusive reproductive health agenda requires understanding the role that places play in shaping reproductive inequalities beyond the simplistic recognition of the "environment" as a factor of biomedical risk and the focus on the womb as a reproductive environment (Theidon, 2022). Drawing on long-term ethnographic research on miscarriages in toxic coca-farming territories in the Bajo Cauca region (Northern Colombia), the aim of this paper is to re-spatialise our understanding of reproductive health by engaging with the concept of "reproductive geographies" (England et al., 2018). An ethnographic engagement with this concept has the potential to challenge the epistemological premises of quantitative and epidemiological research; add complexity to our understanding of the body-place relationship; and engage with a "distributed approach to reproduction" (Theidon, 2022:81) that recognises "the structural forces that shape reproductive outcomes" (81). In particular, it can highlight the ways in which multiple scales of these geographies such as: the body, everyday geographies, and regional and national models of reproductive governance shape women's reproductive experiences (Calkin et al., 2022). "Everyday" geographies represent, according to Dyck (2005), an entry-point that, "through the routine, taken-for-granted activity of everyday life in homes, neighbourhood and communities" (234) can show the connection between local and wider geopolitical geographies. Building on this ethnographic material, I argue that reproductive inequalities are not only related to fixed categories of identity such as race, gender, and class (Sochas, 2021), which determine differential exposure to environmental burdens, but emerge from the complex entanglement between places, social identities, and reproductive experiences.

In the attempt to re-spatialise the debate on reproductive inequalities, I focus on miscarriages related to toxic contamination as a largely under-studied reproductive experience (Layne, 2003) that does not easily fit within a reductionist narrative of biomedical causality, and therefore represents a crucial entry-point to understand the pitfalls of the Environmental Reproductive Health (ERH) framework. I draw on 13 months of fieldwork conducted in the municipality of Tarazá, in the Bajo Cauca region (Northern Colombia), that, since the late 1970s, has been one of the hotspots of the Colombian armed conflict (IPC, 2021), with armed actors controlling the territory and managing the illegal economies of coca farming and gold mining. Both economic activities are associated with persistent processes of toxic contamination. Coca farming requires the use of pesticides, herbicide, and several chemicals for the processing of coca leaf into coca paste (Acero et al., 2023). Furthermore, between 2000 and 2015, the Bajo Cauca region was a target of the policies of forced eradication through glyphosate spraying over coca crops (PECIG), which has been associated with an increase in the rate of miscarriages in epidemiological (Camacho and Mejia, 2017) and *in vitro* studies (Mendez et al., 2021). Meanwhile, artisanal gold-mining requires the use of mercury in the extraction phase, generating other toxic environmental and health impacts that may also be associated with an increase in miscarriage rates (Bjørklund et al., 2019). These socio-economic dynamics frame this territory as a *toxic* place, and a *place at war*, shaping women's reproductive experiences and leading to a series of reproductive disruptions. In this paper, I locate these reproductive disruptions in the everyday geographies (Dyck, 2005) that women navigate during their pregnancies, but also in the context of the Colombian armed conflict and the militarisation of rural regions (Ojeda, 2013) to argue that reproductive disruptions emerge from a complex entanglement between social identities and places.

This article contributes to current debates on reproductive health inequalities in several ways. First, it places miscarriages as a pressing reproductive concern. These have been largely ignored in debates on health inequalities, which are disproportionately focused on abortion and contraception (Ross and Solinger, 2017). Second, by theorising the spatiality of miscarriages, it proves the importance of engaging with the concept of reproductive geographies in the debate on health inequalities, in order to understand the multiple scales through which such inequalities unfold. In particular, understanding the entanglement between reproductive geographies and social identities allows us to move beyond "categorical thinking" (Sochas, 2021), recognising the context-specific meanings that gender and race assume in different geographies. Finally, by highlighting factors that exceed women's individual decision-making processes as determinants of women's reproductive experiences, it contributes to current theorisations of reproductive agency beyond individual decision-making power (Smith, 2005; Zavella, 2020).

In the first section of this paper, I engage with the debate on environmental reproductive inequalities and argue for the need to include a focus on reproductive geographies. I then present the case study of the Bajo Cauca region as an example of a toxic geography where reproductive inequalities unfold across multiple scales. In section four, I discuss my results and conclude by arguing for a stronger integration of reproductive geographies in the reproductive health agenda.

2. Theoretical debate

2.1. Putting reproductive inequalities in place

Scholarship in feminist geography has extensively discussed the relation between health and places (Longhurst, 2000; Mansfield, 2008; Petteway et al., 2019), and important cross-disciplinary work has been conducted to understand the body-environment relation in contexts of toxic contamination (Nading, 2020; Chen, 2012) and unpack the political ecology of health (Baer and Singer, 2016; Harper, 2004; Jackson and Neely, 2015). Critical feminist social scientists have also proposed the environmental reproductive justice framework to uncover the interplay between environmental and reproductive rights (Di Chiro, 2008; Hoover, 2018). Yet, while the Environmental Reproductive Health framework recognises the biophysical environment as a determinant of reproductive health (Woodruff et al., 2008; Sutton et al., 2019), it still mostly conceptualizes the environment as a determinant of toxic exposure that affects, in disproportionate and differentiated ways, gendered and racialised social groups. Attention to the ways in which social identities assume specific meanings in the context of their symbolic and material relationship with the environment (Nightingale, 2011; Sultana, 2009), is missing from this debate.

This has important implications for the conceptualisation of reproductive inequalities. By failing to put reproductive experiences "in place," reproductive health scholarship shows a tendency to overlook "everyday geographies" (Dyck, 2005): the geographies of routine, taken for granted everyday activities in "home, neighborhoods and communities" (ib., 234) as a crucial scale of investigation of reproductive inequalities. Disproportionate focus has been placed on access to medical settings such as the hospital and the clinic (Herrick, 2017) as a universal reproductive priority. Medical spaces have thus become "archetypal spaces" of suffering in global health scholarship and "truth spots" (ibid: 4) from which health inequalities can be dissected. Miscarriages, which often happen outside the medicalised setting of the hospital and are not directly related to the quality of medical care received, are rarely considered a reproductive priority (Layne, 2003). Meanwhile, the socio-economic and political dynamics that shape everyday places, such as militarisation and distribution of access to clean water and food, disappear from the gaze of the reproductive health agenda. While environmental reproductive justice scholars (Di Chiro, 2008; Hoover, 2018) argue that these processes fundamentally intersect with reproductive inequalities, these issues are mostly overlooked in reproductive health scholarship.

2.2. From the risky "environment" to the reproductive geographies of miscarriages

To overcome this reductionist understanding of reproduction as only located in the biomedical body, Theidon (2022) argues for the need for a distributive approach to reproduction that recognises "reproductive environments" beyond the "uterine myopia" (ib. 80). This implies recognising, more broadly, the role that places play in shaping women's reproductive experiences. In this paper, I argue that a better understanding of the role that reproductive environments play can be reached through an engagement with the concept of "reproductive geographies" (Calkin et al., 2022; England et al., 2018). Analyzing the different scales of reproductive geographies can, in fact, offer a fruitful pathway to uncover the entanglement between social identities, places, and reproductive inequalities. In their foundational work on the geographies of abortion, Calkin et al. (2022) propose to understand "reproductive geographies" as spanning from the intimate scale of pregnant embodiments and the everyday to specific modalities of national or regional reproductive governance (Mansfield, 2012). None of these scales can be conceptually separated from another, as none "has primacy" (Pain, 2015: 2). As "equivalent strands winding into a single structure" (Pain, 2015: 8), these scales need to be understood in their interconnected spatiality, which shapes reproductive inequalities. Intimacy thus "stretches out" (Pain, 2015:8) to include the "geopolitical," which becomes embodied in women's intimate experiences of reproduction. Taking this into account means to drastically change the spatialisation of reproductive experiences that is proposed in reproductive health debates and engage with interplay between the "intimate" and the "geopolitical" (Pain, 2015).

In the context of Latin American critical scholarship, for example, the investigation of reproductive geographies has led to identifying the multiple scales, ranging from the body to geopolitical power dynamics that shaped the Zika emergency in the region (Rivera-Amarillo and Camargo, 2020; Carvalho, 2017), access to abortion (Freeman, 2017; Pheterson and Azize, 2005), and the management of infertility in specific geographies (Perler et al., 2024). A focus on place in these analyses allows us to recognise these reproductive experiences as profoundly shaped by the dynamics of socio-economic and racialised marginalisation that exist in some Latin American geographies. Moreover, the inclusion of place allows us to rethink the neoliberal, white-biased idea of reproductive agency as limited to individual decision-making processes related to specific reproductive choices (Zavella , 2017,Ross and Solinger, 2017). In Colombia, for example, important work conducted by urban feminist movements led to the decriminalisation of abortion in 2022 (González-Vélez and Jaramillo-Sierra, 2023). While this represents a crucial step in the advancement of reproductive rights in the country, a place-based analysis of reproductive experiences across the rural-urban divide shows that women inhabiting the rural and militarized peripheries of the country continue to experience other structural barriers, which are not related to the individual possibility of accessing abortion services, to the exercise of their reproductive agency. In this sense, it is important to acknowledge that, beyond the level of individual-decision-making, reproductive experiences are strongly informed by a set of collective socio-political and geopolitical dynamics that need to be acknowledged.

Across these scales, the body represents an important entry point to look at the scale of intimacy in reproductive geographies. Longhurst's foundational work on "pregnant embodiments" (2000) conceptualizes reproductive experiences as a way to actively be in the world and in a specific place. Biological reproduction is, in fact, always interplaying with processes of social and cultural reproduction (Hoover, 2018) that are sustained by a specific relation with the environment. Engaging with embodied experiences of reproduction therefore allows us to include the "social body" (Mansfield, 2008), in its relation with the broader surrounding environment, in the reproductive health debate. At the same time, the experience of being a racialised and gendered subject is always enacted through embodied everyday performances (Butler, 1990) that unfold in the context of a specific environment. In toxic landscapes, the lived and embodied experience of toxic contamination (Nading, 2020; Chen, 2012) becomes a component of the reproductive process. Racialised and gendered bodies therefore experience reproduction within the context of their symbolic and material relation with the environment and this makes it necessary to locate the debate on reproductive inequalities in places.

Calkin and others (2022) identify the "geopolitical" in women's reproductive experiences of reproduction by looking at national and regional mechanisms of reproductive governance (Mansfield, 2012). The implicit political rationality (Jokela-Pansini, 2022) that underpins public health interventions, biomedical discourses, and different medicalised practices (Mansfield, 2012) have direct impacts on women's reproductive bodies. Apparatuses of reproductive governance, for example the legal frameworks that determine access to abortion and contraception services, are co-productive of specific subjectivities (Hanafin, 2007; Freeman, 2017, Pheterson & Hazize, 2005), as they fix women's social roles and often reduce them to their reproductive function. This generates gendered imaginaries of women's role in society (Jokela-Pansini, 2022; Mansfield, 2012), as well as geographies of access (or lack thereof) to reproductive services (Calkin et al., 2022). The legal body emerges as another crucial scale (Jeffrey, 2020) of reproductive geographies serving as a ground for the collection of scientific knowledge that can be considered worthy or unworthy of being included in public debates. Understanding which bodies can be included in public debates as truth spots is important to recognise what reproductive concerns can enter the reproductive health agenda.

3. The war on drugs in the Bajo Cauca region

To investigate the reproductive geographies of miscarriages, I conducted 13 months of ethnographic research in the municipality of Tarazá, in the Bajo Cauca region (Northwestern Colombia), which emerged from ethnographic fieldwork as a *toxic* place and a *place at war.* Between 2000 and 2015, this municipality was a target of the policies of forced eradication through glyphosate spraying over coca crops (PECIG). Since the cessation of this policy in 2015, prompted by the World Health Organisation's publication of a precautionary note (WHO, 2017), it has continued to be the target of manual forced eradication strategies. To date, even though glyphosate spraying has been recognised as a form of reproductive violence by the Colombian Commission for the Establishment of Truth (CEV) (Sanchez-Parra, 2023), the only two cases of miscarriages related to the aerial glyphosate fumigations accepted before a legal court are that of Yaneth Valderrama, who lost her baby when she was three months pregnant and died in the aftermath of a glyphosate fumigation in 1994 in Caquetá, and Doris Yaneth Alape Reyes, who experienced a miscarriage in 1999 after the fumigations in the municipality of Chaparral, Tolima. In the public debate, denunciations of miscarriages related to glyphosate spraying continue to mostly be framed as "rumours" lacking scientific evidence.

Narco-paramilitary actors and the Colombian state are key actors within the network of socio-political and economic relations that shape the Bajo Cauca region as a *risky place* for processes of reproduction (Di Chiro, 2008). The expansion of coca crops in Tarazá begins with the territorial occupation of the paramilitary group Bloque Mineros of the AUC[1] that has operated in the Bajo Cauca region since the late 1970s (IPC, 2021). This group established an economic relationship with impoverished, racialised communities that, given a dearth of livelihood activities, entered the coca value chain as farmers or coca collectors. Women from rural areas often performed cooking and cleaning tasks in coca instalments (Vélez-Torres and Author, Forthcoming). Located in a strategic position between Medellín, the capital of the department of

[1] Autodefensas Unidas de Colombia.

Antioquia and the Caribbean coast, Tarazá became an important regional hub of narco-paramilitary operations in the 1980s. Freddy Vanoy, a local paramilitary leader, established the basis of his power in this municipality and, throughout ethnographic fieldwork, local social leaders shared abundant memories of their interactions with him and other paramilitary leaders in the everyday geographies (Dyck, 2005) of Tarazá main square, in community meetings in different *veredas* (rural districts), local restaurants, and commercial facilities. The coca boom turned this region into one of the national hotspots of coca production, and, since the 1990s, the War on Drugs became a national priority for different right-wing Colombian governments, which labelled this region as a "red zone," prioritising securitisation strategies and military interventions over public investments (Vélez-Torres & Author, Forthcoming).

Within the context of the War on Drugs, the state played a major role in framing coca geographies as a landscape of conflict through the exercise of violent and military interventions against coca farmers (Vélez-Torres and Author, Forthcoming). Between 1999 and 2015 Tarazá was consistently fumigated through aerial glyphosate spraying. During social cartography activities conducted with local social leaders, a timeline of approximately one fumigation every 6 months between 2000 and 2008, and of one fumigation per year afterwards, was reconstructed. Forced eradication of coca crops involving the army led to increased conflict with local armed groups and the incarceration of several coca farmers. At the same time, lack of public investment in what was considered a "red zone" resulted in the lowest development indexes in the department of Antioquia, high indexes of unmet basic needs (DANE, 2022), and a very weak health sector. Tarazá has only a low-complexity hospital, and medium-complexity cases are remitted to Caucasia. Weak road infrastructure makes access to these services particularly difficult for several rural communities. A system of rural health brigades and medical day centres managed by one nurse are available for some of the most densely populated *veredas.* Local paramilitary structures compensated for the lack of public investment by providing health assistance through the construction of several private clinics. After the demobilisation of the AUC in 2006, these private clinics closed, resulting in a lack of services in rural areas.

After the signing of the Peace Agreement with the FARC-EP in 2016, Tarazá was one of the municipalities chosen as a pilot for the implementation of the PNIS (Programa Nacional Integral de Sustitución de Cultivos Ilícitos), which entailed the voluntary substitution of coca fields. This programme resulted in institutional failure, generating further socio-economic disruptions, food insecurity, and forced displacement (Vélez-Torres & Author, Forthcoming). Moreover, the recrudescence of the conflict placed the municipality within the blurred temporality of a "constant oscillation between war and peace" (Pinto, 2019:99), where armed confrontations among local armed groups continued to frame the everyday life of rural communities. After the demobilisation of the AUC in 2006, a new paramilitary structure, the AGC (Autodefensas Gaitanistas de Colombia) came to occupy the local political space. Conflict with the FARC dissidents of the EMC (Estado Mayor Central) and the ELN (Ejercito de Liberación Nacional) created a series of invisible barriers that people cannot contravene without risking being accused of complicity with other groups.

4. Materials and methods

In order to engage with the different geographical scales through which miscarriages unfold, I conducted fieldwork across multiple sites in Tarazá. To locate experiences of miscarriage in the broader context of state-citizen relations in coca-farming territories, I initially focused on understanding community-level perceptions of the impacts of glyphosate fumigations, other forced eradication strategies, and the armed conflict on the health of rural communities. For this purpose, I conducted semi-structured interviews with local social leaders in Tarazá (N:14). Collective workshops for the construction of social cartography maps and participatory historical timelines were conducted in five different localities selected across the north and south of the municipality (N:15). These localities were selected in collaboration with local social leaders who helped identify the areas that were most heavily targeted by the fumigations. Two additional focus groups: one with both male and female social leaders, and one with only female leaders, were conducted in the urban centre of Tarazá. The leaders came from seven different localities to reconstruct the history of aerial fumigations at the municipal level. Data emerging from these workshops has been triangulated by searching news articles related to fumigations and *cocalero* strikes in Tarazá between 2000 and 2015 in three different journals: two national ones, El Espectador and El Tiempo, and a regional one, El Colombiano.

In the second stage of the research process, I focused on women's experiences of miscarriages, conducting gender-focused body cartography and "pregnancy mapping" activities (Author, Forthcoming). Workshops were conducted in the same localities to discuss women's experiences of pregnancy and pregnancy loss. The research participants were then interviewed to reconstruct their reproductive life story. Six cases of miscarriages directly related to glyphosate fumigations emerged from these workshops (Table 1). Additional in-depth interviews with women who related a story of miscarriage during the workshops, or their relatives, were conducted after the workshops (N:6) (see Table 2).

In order to map women's interactions with medical service providers and other local institutions, I conducted interviews with local health professionals (N:5) to understand the ways in which information was recorded by doctors and nurses when women arrived reporting a risk of miscarriage. Reconstructing medical practices to diagnose and attend pregnancy losses has been important to understand what type of knowledge was being collected and how institutional practices contributed to silencing cases of miscarriage from public debates. Moreover, representatives of local and regional institutions were interviewed (N:6), and denunciations by local citizens related to the impacts of glyphosate fumigations were solicited to the local regional office of the Environmental Authority (Corantioquia).

Finally, I conducted archival work in Tarazá hospital, analysing the medical files of women who delivered between October 2012 (the earliest available date in the archive) and December 2013 to engage with the legal dimension of the experience of miscarriage. This data was retrieved from the registers of the maternity ward, which contained the ID numbers of the mothers, and was used to identify a sample of women of reproductive age who lived and delivered in the municipality during the years of the fumigations. Of the 287 women who delivered in that period, I had access to only 189 files. In the analysis of these medical files, I recorded (i) access to prenatal care (ii) reported miscarriages (iii) pregnancy complications (iv) possible complications for the baby (v) other health related issues that could have been related to glyphosate fumigations.

Table 1
Cases of miscarriage related to glyphosate fumigations.

Age at the time of the interview	Year of miscarriage	Month of pregnancy	Time after exposure	Looked for medical assistance
36	2005–2008	3	1 day	Yes
37	2007–2008	3–4	Few days	Yes
32	2008	3	Few days	Yes
48	2007 or 2008	3	1 day	No
47	2008	3	1 day	No
Deceased. Her story is told by her son.	Between 2000 and 2002	2–3	1 day	No

Table 2
Archival work in Tarazá, miscarriages found.

Year of delivery in Tarazá hospital	Number of women who delivered in Tarazá hospital	Available medical files	Women who experienced at least one miscarriage	Experienced more than one miscarriage
2012	100	67	22	6
2013	187	122	32	5
Total:	287	189	54 (28.57%)	11 (5.89%)

5. Discussion

5.1. The everyday embodied geographies of miscarriages

In Tarazá, miscarriages and reproductive risks are embedded in the everyday geographies (Dyck, 2005) of a *toxic place* and a *place at war*. Rather than "fetishizing and reifying" (Liboiron et al., 2018:333) toxicity and reducing it to "toxins behaving badly" (ibid:331), it is therefore important to understand toxic reproductive risks as entangled with the gendered and racialised structures of socio-economic power that frame women's everyday lives in this geography. In my ethnographic fieldwork, I collected six stories of miscarriages that took place a few hours to two days after exposure to glyphosate fumigations, and a seventh case where it was more difficult for the research participant to remember the time frame between exposure and the miscarriage (Table 1). While these reproductive disruptions related to glyphosate exposure have been described as a form of "conflict-related reproductive violence" (Sanchez-Parra, 2023:31) by the CEV, they are still conceptualised as "exceptional" cases in the Colombian public discourse. On the contrary, women's everyday reproductive experiences highlight that miscarriages are not an "exceptional" event in Tarazá, but are among the reproductive risks that are consistently experienced within a spatial continuum ranging from people's homes and places of work to the everyday geographies of community life. In particular, racialised categories of identity assume specific meanings in the geography of coca-farming territories, where the lack of alternative livelihood strategies forces racialised subjects to navigate exposure to toxic contamination in the coca farms and the gold mine, and carry out heavy work (Vélez-Torres and Author, Forthcoming). Reproductive risks therefore emerge from the racialised processes of socio-economic marginalisation and the relation of these social actors with their everyday material environment. In this sense, inhabiting a *toxic place* and a *place at war* frames the meanings that categories of identity assume in this specific geography. The reproductive inequalities that unfold in this geography cannot therefore be understood simply by analysing the ways in which racialised and gendered subjects experience reproductive services differently, but by also taking into account how different environments shape the contextual meanings of the categories of identity.

Reproductive risks emerge in the context of everyday relations with toxins circulating through water and air. Daniela, a 31-year-old female social leader from a rural area in the south of Tarazá, for example, experienced a risk of miscarriage through her everyday contact with the river. In a context of precarious access to water, she used to bathe herself in the river near her house where pesticides from nearby coca farms ended up being discharged, exposing her body to direct contact with these chemicals. Omaira, a farmer from Valdivia who lived in Tarazá during the glyphosate fumigations, told the story of how the wind dispersed glyphosate to her farm, leading her to experience a risk of miscarriage: *"In this time that they started fumigating, I had several risks of miscarriages. When I was two months pregnant, I had to come to the hospital, and they kept me for eight days for a risk of miscarriage (…) I did not bleed, but I felt pain in the lower abdomen, a lot of pain. They told me that it was a risk of miscarriage, even if I was not bleeding." (Own interview, Tarazá, September 2023).*

Processes of toxic contamination also unfold in the context of the armed conflict which generate "intimate" (Pain, 2015) impacts on women's bodies. The presence of illegal armed actors restricts women's freedom of movement and access to medical services. In several focus group discussions, research participants say that rather than travel for prenatal controls during their pregnancy, they preferred to stay at home and avoid exposing themselves to the risks of travelling on unsafe roads to reach the local hospital. In a focus group discussion in Tarazá held in February 2022, Lavinia, a former coca farmer, tells the story of how, in 2008, she had to deliver at the edge of the street because local paramilitary actors did not give her permission to move after dark in the context of an armed strike. All these factors increase the possibility of reproductive losses, which are normalised in the discourse of local women. Catalina, a 48-year-old traditional midwife who experienced a pregnancy loss argues: *"Yes, it (the beginning of pregnancy) is very risky, because the baby is just starting to take his shape, to become hard, so any fear (experienced by the mother), and the baby detaches himself and dies. If you fall from an animal, that is also a risk. If you lift something too heavy … anything. (…). From 3 to* 4 months*, the baby is very soft and anything can happen, not all women have strong enough bellies to keep the baby. (…)" (Own interview, Tarazá, January 2022).*

The experience of inhabiting a specific environment is also materially inscribed on women's bodies through a series of marks (Swistun, 2018). In several focus group discussions, female coca farmers and gold miners mentioned sun burns, for example, as a trace left on the body by the activity of gold panning as well as farm work, which represent the only available sources of income in this geography. Tiredness and pain in the back and hips are the traces left by routinely performed heavy work. The contact with toxic pesticides used in the coca field and with glyphosate also represents a form of toxic embodiment (Nading, 2020) that materialises in skin rashes, which are commonly referred to as the "diseases of the coca harvester" among local coca farmers. These visible marks of involvement in illegal activities, or simply heavy work, contribute to co-producing these social actors as *abjectos*, abject (Swistun, 2018), framing their social interactions and everyday life experiences. Engagement with heavy work also leads to the impossibility of implementing the precautionary behaviour recommended to pregnant women by local medical institutions, which contributes to co-producing rural and racialised women inhabiting these geographies as *bad mothers* in the discourse of medical institutions. In this sense, social identities are also co-produced through specific economic and material relations with the environment, which are evidenced by a range of bodily marks.

5.2. Medical institutions and reproductive governance

Beyond determining a stronger possibility of experiencing a miscarriage or a reproductive risk, the unfolding of reproductive lives in a specific geography determines whether a reproductive disruption can be considered worthy of public attention and investigation. Mapping reproductive inequalities therefore requires understanding the uneven concentration of chemicals in the space and, at the same time, the unevenness of forms of "knowledge and understanding" (Freeman and Rodriguez, 2024: 126) of toxic chemicals. In this case, the normalisation of reproductive injustices starts with women's interactions with medical service providers and a process of institutional blaming of rural mothers that assumes that carrying a pregnancy in a specific place, such as near a coca farm or a gold mine, can be associated with irresponsible motherhood and noncompliance with precautionary practices.

In Tarazá medical professionals argue that women coming from rural settings are generally "less responsible" in relation to their pregnancies and less aware of the need to implement precautionary behaviours to carry them out safely: *"Sometimes we have to chase them,"* says a local health professional, arguing that women often fail to attend prenatal medical checks. The experience of miscarriages is therefore normalised in the contact with medical service providers. Lina, a woman I interviewed in Tarazá who experienced two consecutive stillbirths (not

related to glyphosate) after her first pregnancy, explains that there was "no reason" for it, as she was told by her doctor: *"No, the doctor said that it was only a complication, but they were born dead or when they were one or two days away from being born, they died."(Own interview, Tarazá, February 2022)*. Infant death is also largely normalised when it occurs among women coming from remote rural areas. An Indigenous woman whose child was born premature, for example, tells the story of how her baby died a few months after birth, and she was given no medical explanation for the death: "*When the baby was born, I could tell that he was very small … he looked like a tiny animal. We took him to the doctor and they gave him some pills, but they said that he was okay. Later, we took him to another doctor, but when he was nine months old, he died." (Focus group discussion, Tarazá, February 2022)*.

This process of normalisation of rural pregnancies as riskier determines a reproductive inequality, as racialised and low-income women receive a worse quality of care when coming from a *vereda,* a rural district of the municipality. Of the six women I interviewed who experienced a miscarriage, only three reached the hospital to undertake a curettage after pregnancy loss. In none of these cases was the miscarriage associated by health professionals with the policy of glyphosate aerial fumigations. Women who did attend the hospital were not asked any questions on the suspected causes of the miscarriage, despite coming from locations that were widely recognised, at the municipal level, for being hotspots of coca production heavily targeted by the fumigations. Lina said that when she entered the hospital after starting bleeding, the doctor asked: *"What do you come here for? [...] And I said, I came … Well, I am used to having babies, but you told me to come when I felt the delivery pain, and I did feel the pain of the delivery. He told me to go, that I did not have anything, and the water that I was expelling was just blood." (Own interview, Tarazá, November 2023)*. In other cases, health professionals contributed to performing a "labour of confusion" (Auyero and Swistun, 2008:358). Debora, who was almost four months pregnant when she experienced a miscarriage, was told by the doctor that the miscarriage was related to an ectopic pregnancy. However, in her interview, she explained that she did not believe the doctor, as she remembered having gone through several prenatal checks during which no one had mentioned this risk.

In the case of Luisa, a 32-year-old Afro Colombian woman from Tarazá who suffered a miscarriage in 2008, when she was three months pregnant, local doctors did not believe her when she reached the hospital saying that she was experiencing a miscarriage, and accused her of performing a self-managed abortion (abortion was illegal in Colombia until 2022). Even though Luisa said, several times, that she had already expelled the baby, she had to wait eight days before finally receiving the curettage procedure, as doctors did not believe her. Her husband had to tell the doctors that they had really wanted this baby and she did not take any pill to induce an abortion. When asked about this lack of investigation into the potential causes of miscarriages, local health professionals argue that they preferred not to ask because they believed that it was common for women at that time to conceal attempts at self-managed abortion with the excuse of glyphosate. "*So, all those cases of abortion. Most people blamed that (glyphosate) … They could have taken something, other things, but they did not say so, they said: No, it is because they are fumigating. They took advantage of that."(Own interview, Tarazá, December 2023)*.

Medical risk-framings carry morally charged assumptions (Douglas, 1992), and the bodies of these social actors inhabiting coca-farming geographies are, in this process, co-produced as "risky" themselves and untrustable. As women from racialised contexts are assumed to be at risk of practising self-induced abortion, their cases of reproductive violences are not considered worthy of investigation. Noncompliant mothers who resist the idea of medicalisation or whose possibilities of implementing precautionary behaviour are strongly limited by their socio-economic conditions and the geographies where their pregnancy unfolds are constructed as "inherently abject" (Chadwick and Foster, 2014:68) or faulty and irresponsible (Possamai-Inesedy, 2006). A model of reproductive governance that foresees individual responsibility and individual behaviour as the only mechanisms to limit risks is imposed on rural women by medical institutions (Mansfield, 2012). This framing silences the collective and structural reproductive injustices leading to toxic disruptions which unfold in these geographies (Davies, 2019) as a form of reproductive violence.

5.3. *The geographies of undone science*

Beyond the scale of medical-patient interactions, the spatiality of miscarriages also determines their invisibility in the broader national public debate. Even though the CEV recognised miscarriages related to glyphosate spraying in the context of the Colombian War on Drugs as a form of reproductive violence (Sanchez-Parra, 2023) no further research on the consistency of these cases has been promoted. In the Bajo Cauca region, the cases of miscarriages related to glyphosate spraying have never been formally recognised by local or national institutions.

This institutional silence makes it very difficult for women who experience a miscarriage to recognise themselves as victims of reproductive injustice. For example, none of the seven victims of miscarriages whose stories I collected during fieldwork tried to open a legal case to demand compensation from the state for their loss. In fact, even though exposure to glyphosate emerged as a very clear determinant of pregnancy loss, as few hours passed between the aerial fumigation and pregnancy loss (Table 1), interviewed women and their relatives felt that their stories were not "strong enough" to be able to open a legal case. The temporality (Mansfield, 2017) and material characteristics of glyphosate determine hard-to follow movements of dispersion and concentration in bodies and space, posing important barriers to collect legal evidence for rural women. At the same time, no process of "collective awakening" and "cognitive liberation" (Auyero and Swistun, 2008: 358) leading to collective mobilisation has taken place in coca-farming territories in Tarazá. While local farmers' organizations mobilised to denounce the environmental and socio-economic impacts of aerial fumigations in public demonstrations, specific grievances related to the miscarriages did not emerge in these public spaces of drug policy contestation. Among the health impacts mentioned by local social leaders, only skin rashes and allergies, which were immediately evident after the fumigations, emerged as *obvious* health impacts of the fumigations.

In the absence of clear protocols and information on these cases, local medical institutions also performed an act of concealing by failing to record or denounce these cases as worthy of public attention. In reviewing data recorded in the maternal histories kept in the medical archive of Tarazá hospital, I found that 28.7% of women who delivered in Tarazá hospital between October 2012 (the earliest available date in the archive) and December 2013 experienced a miscarriage between 2000 and 2015, and 5.89% of these women experienced more than one. 59% (32) of these women lived in coca-farming areas that were therefore targeted by the aerial fumigations (Table 3). Of the 69 miscarriages recorded in women's medical files, 46 (66.6%) were recorded because they sought emergency care in the hospital, and 23 (33.3%) were mentioned by women during prenatal checks for other pregnancies. Establishing a comparison with the rate of miscarriages experienced by women that did not inhabit geographies affected by glyphosate fumigations is challenging because of the lack of data on miscarriage rates at the national level, and because the sample of this study is insufficient to establish a solid correlation between exposure to the fumigations and increased rates of miscarriage. However, it is worth noting that the national average of miscarriages in Colombia according to a 2008 study

Table 3
Residence of women who experienced miscarriages.

Coca-farming areas	Other areas in the Municipalities	N/A
32	18	4

of the Guttmacher institute corresponds to approximately 9% of unintended pregnancies and 6% of intended ones (Guttmacher, 2008). The material on maternal health distributed by the Colombian Health Secretary to which I had access in Tarazá hospital, and that was given to all mothers attending prenatal checks, mentions that approximately 20% of pregnancies can result in a miscarriage. In the dataset retrieved from Tarazá medical archives, 28.5% of the pregnancies registered between 2000 and 2015 in the hospital resulted in miscarriage. 59.2% of the women who experience a miscarriage reported being from a coca-farming district of the municipality that was fumigated with glyphosate.

Despite these indicators pointing to a possible correlation between glyphosate fumigations and miscarriage, the cases of spontaneous abortion attended by first care service providers in Tarazá were considered unworthy of investigation. When women experiencing a miscarriage attended the emergency wards, these cases were recorded with the code "Miscarriage risk," and sometimes kept under observation. If bleeding was more intense, they were sent to the Caucasia hospital (a medium-complexity facility) to perform a curettage. No further information related to the possible causes of miscarriage was sought or recorded during the visit, and no further questions were asked. Some medical professionals argue that "we do not have enough science" to establish a correlation.

Navas uses Frickel and colleagues'(2014) concept of "undone science" (Navas, 2023:1580) to describe an area of scientific knowledge that is not considered worthy of further investigation and therefore remains inconclusive and incomplete. Building on her case study of DCBP (Dibromochloropropane) pesticide intoxication among farmers in Nicaragua, she argues that areas of "undone science" emerge through macro-dynamics of power production that generate, for example, a lack of gender-specific epidemiological studies on toxic pesticides, as they represent a health concern only for marginalised and racialised social actors (2023). These black holes of "undone science" emerge according to a deeply spatialised logic that regulates the process of knowledge production. Disinterest for toxic exposure in so-called "developing" countries and, in particular, for rural marginalised areas, reflects the unjust geographies of knowledge production in the reproductive health debate. For the case of glyphosate, an international network of collaborations among legal experts, risk analysts and corporate actors creates a complex web of knowledge (un)making that makes it particularly "hard to decipher whether harm is being done" by glyphosate (Adams, 2022: 36), complicating the possibility to demonstrate toxic harm. At the national level, the definition of the geographies of coca production as "red zones" requiring military interventions (Ojeda, 2013) also determine that they are not prioritised for data collection on reproductive health by Colombian medical and academic institutions. In this sense, knowledge is "done" in specific geographies and "undone" in others, excluding pressing reproductive issues, like miscarriages related to glyphosate spraying, from public debates.

6. Conclusions

Engaging with the concept of "reproductive geographies" has important implications for the debate on reproductive inequalities. In the first place, recognising the multi-scalar nature of reproductive experiences and the interplay between intimate and geopolitical dynamics (Pain, 2015) allows one to better understand the relation between social identities and reproductive inequalities. In this paper, I argued that social categories of identity do not only mediate exposure to toxic contamination, but emerge in the relation with the specific "place" of coca-farming geographies in Tarazá, which is, at the same time, a "red zone" targeted by state securitisation strategies, a toxic place, and the place where women's everyday lives unfold.

Furthermore I argued that putting reproductive experiences in *place* has important implications for conceptualising reproductive agency. Recognising the role played by broader reproductive environments exceeding the narrow geography of the womb (Theidon, 2022: 80) in determining specific reproductive outcomes allows recognition of the structural factors that exceed women's individual decision-making. In particular, the need to engage with *risky* everyday life practices and the broader dynamics of securitisation policies and the armed conflict have emerged, in this work, as crucial determinants of women's reproductive experiences. This demonstrates the importance to include broader concerns for environmental and social justice in the debate on reproductive inequalities. While reproductive health scholarship has mostly understood reproductive agency as decision-making power in relation to specific reproductive choices (e.g. access to abortion, access to contraception services) (Smith, 2005; Zavella, 2017), other scales of collective decision-making (Di Chiro, 2008; Hoover, 2018) emerge as equally important in framing women's reproductive experiences. In this case study, the exclusion of some gendered and racialised social actors from public debates, for example, emerges as an important determinant of reproductive inequalities that limits the possibility to position glyphosate spraying as a pressing health concern.

Finally, looking at miscarriages in their spatiality highlights the shortcomings of reductionist biomedical understanding of the bodies-places relation in the Environmental Reproductive Health debate. In geographies of socio-economic and racialised marginalisation that emerged from the context of the Colombian armed conflict and from extractivist economies, reproductive inequalities do not require only technoscientific solutions (Pinto, 2019) and better access to medical services, but also a change in state-citizen relations, and in the dynamics that determine the emergence of specific places as *toxic* and *at war*.

Ethics statement

This research received Ethical Clearance from the LSE Research Ethics Office (Reference number: 32214). Verbal or written informed consent was collected from all research participants.

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CRediT authorship contribution statement

Chiara Chiavaroli: Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization.

Data availability

The data that has been used is confidential.

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